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ESG Management Adoption Strategies for Korean SMEs: Focusing on Global Case Studies

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Abstract: ESG (Environment, Social, Governance) management has emerged as an essential strategy in the modern corporate environment for ensuring sustainability and competitiveness. Beyond mere corporate social responsibility, ESG management serves as a critical driver of long-term corporate growth and investor trust, especially as global challenges such as climate crises, social inequality, and demands for corporate transparency intensify. However, small and medium-sized enterprises (SMEs) face structural challenges in adopting ESG management. Limited resources, the burden of initial costs, a lack of skilled personnel, and insufficient systematic support hinder SMEs from effectively integrating ESG practices. (1) Background/Purpose: This study explores strategies to overcome these challenges by examining the theoretical foundation and significance of ESG management, reviewing prior studies to identify the primary challenges SMEs encounter, and proposing policy approaches and support frameworks required to address these challenges. (2) Study Design/Methodology/Approach: Based on case studies using MSCI ESG Ratings, EcoVadis, and the Korea ESG Standards Institute evaluations, the study examines companies such as Vestas Wind Systems, Ball Corporation, Orsted A/S, First Solar Inc., Milliken & Company, Pulmuone, and Hanssem. (3) Findings: Three essential conditions for successful ESG adoption in SMEs were identified: financial support from government and public institutions to alleviate initial costs; establishment of collaborative networks with stakeholders; and provision of systematic and continuous education and consulting. (4) Originality/Value: This study presents concrete strategic recommendations including financial incentives, collaborative network development, and tailored support programs to facilitate ESG implementation among Korean SMEs.

Keywords: ESG management; Korean SMEs; sustainable management; MSCI ESG Ratings; EcoVadis; KCGS; supply chain sustainability; circular economy; policy support

1. Introduction

1.1. Research Background and Objectives

Today, as corporate sustainability and social responsibility are increasingly emphasized worldwide, ESG (Environmental, Social, Governance) management is becoming an essential strategy for businesses. International attention and regulations on environmental issues are intensifying, and consumers and investors are demanding social value from corporations. Accordingly, ESG has been established not merely as one element of management but as the standard that determines long-term competitiveness and survival. In this environment, large corporations are rapidly adopting ESG management by leveraging their resources and capabilities, solidifying their leading positions in the market.

In contrast, SMEs are experiencing practical difficulties in adopting ESG management due to resource constraints, lack of expertise, and absence of systematic support. According to Park and Shin (2021), SMEs face greater difficulties in adopting ESG management compared to large corporations due to resource shortages and capability limitations, and customized support to address these issues is urgently needed [1]. In particular, the burden of initial investment costs and administrative burdens from mandatory disclosure obligations frequently serve as major challenges. These initial investment costs were specified by Shin and Kim (2024), who noted that companies adopting ESG management typically invest significant resources in environmental management techniques such as purchasing carbon credits, transitioning to renewable energy, and waste disposal costs [2]. SMEs often find it difficult to secure resources to invest in these elements due to lack of resources and capabilities.

Against this background, this study aims to explore what policy considerations and guidelines are needed to promote the adoption of ESG management among SMEs. The study seeks to derive the success factors of globally successful companies in adopting ESG management practices, and by exploring their action plans and the various political and social considerations they were able to utilize, to create strategic recommendations that encourage SMEs to overcome various constraints and successfully adopt ESG management.

1.2. Research Methodology

This study aims to diagnose the difficulties SMEs face when adopting ESG management through a qualitative research method based on case studies and to present policy and strategic measures to resolve them. The research methodology is as follows. First, companies that received high scores in MSCI ESG Ratings and EcoVadis evaluations were selected as case subjects. This is because these indicators comprehensively evaluate environmental, social, and governance performance, respectively, and are widely recognized as credible standards among global companies. Second, in addition to the above indicators, domestic company excellence cases selected by the Korea ESG Standards Institute were additionally reviewed. This confirmed that ESG management adoption can be sufficiently promoted even in Korea’s political and economic environment. Third, in order to understand the practical problems SMEs face when adopting ESG management, cases appropriate for solving the difficulties of SME ESG management adoption derived through prior research were selected. In particular, focusing on the impact of parent company ESG management on SMEs from an ecosystem perspective, the study concentrated on deriving challenges through supply chain-centered ESG activities of global companies.

The data used in the case study were collected based on sustainability management reports, ESG performance reports, and disclosure data officially published by each company. These data sources are highly credible and ensure the reliability of the case analysis. Individual company analysis proceeded in the following five stages: first, general overview of the company; second, background of ESG management adoption; third, specific ESG management adoption action plans; fourth, effects of adoption; and fifth, post-adoption management—through which key success factors and implications throughout the entire process of each company’s ESG management adoption were derived.

Furthermore, the subjects of analysis were composed across various industry sectors, with cases selected to avoid bias toward specific industries or regions. Through this, global cases and Korean contexts were compared and analyzed to derive the practical problems faced by SMEs and their solutions. The analysis results were used to derive policy support, cooperation with the private sector, and internal capacity-building measures for SMEs to successfully adopt ESG management. In particular, the study systematically analyzed the gaps between SMEs and ESG leader companies and proposed customized strategies to supplement them. This research method focused on presenting specific and feasible strategies that enable SMEs to practically implement ESG management. This study serves as a bridge connecting theory and practice and is meaningful in providing a practical roadmap for SME ESG management adoption.

2. Literature Review and Theoretical Background

2.1. Definition and Importance of ESG Management

ESG is a concept that combines three elements—Environment, Social, and Governance—and refers to the non-financial factors that should be primarily addressed when a company engages in management that considers long-term sustainability and social responsibility. Each element includes specific management items that companies should practice and is defined as follows.

First, Environment minimizes the impact of corporate management activities on the natural environment and emphasizes carbon emission reduction, increased energy efficiency, and resource recycling to achieve sustainable operations. Key management items in the environmental element include greenhouse gas emission management, transition to renewable energy, resource conservation, and waste disposal. In particular, environmental management goals such as achieving carbon neutrality and developing eco-friendly technologies require corporations to address global environmental issues such as climate change.

Second, Social encompasses aspects that ensure companies maintain healthy relationships with workers, customers, and local communities and have a positive social impact. Key management items include human rights protection, worker safety and welfare, promoting diversity and inclusion, and customer protection. The social element goes beyond mere regulatory compliance, aiming for companies to be responsible employers that create safe and fair work environments and maintain symbiotic relationships with partners and local communities.

Third, Governance includes elements such as corporate management transparency, board composition and operation, and ethical management, focusing on building trustworthiness through guaranteeing shareholder rights and improving management transparency. Key management items include securing independence and diversity of board composition, building internal control systems, and complying with ethics regulations, through which trust with stakeholders can be maintained and corruption prevented.

ESG (Environmental, Social, and Governance) has established itself as an essential management paradigm in the global business environment as a non-financial element evaluating corporate sustainability and social responsibility. Corporate ESG activities aim beyond mere profit to environmental protection, social contribution, and transparent governance, which guarantees long-term value creation and sustainability for corporations. According to Freeman's (1984) stakeholder theory, sustainable management is possible when a company maximizes the value of various stakeholders, not just shareholder interests. Building on this, ESG management has become a key element that satisfies the demands of various stakeholders including investors, consumers, and governments.

In particular, in global financial markets, ESG management is becoming an important criterion for investment decision-making. According to Kim (2020), major public funds including the National Pension Service are strengthening investment strategies based on ESG, and today a company's ESG rating has an important impact on capital raising and corporate value [3]. Furthermore, according to Choi's (2022) research, as the credibility of ESG reports (third-party external verification variables and ESG disclosure quality) increases, inefficient investment decreases, which means that excellent quality of ESG disclosure information enables more efficient investment through reduction of information asymmetry [4]. In other words, the results of adopting ESG management show that it plays an important role in companies building favorable relationships with stakeholders beyond simply pursuing environmental and ethical values.

2.2. Review of ESG Adoption Status by Country

The adoption and diffusion of ESG management is proceeding in various ways around the world. According to Kim (2023), recent overseas discussions on ESG disclosure have deepened beyond merely discussing the necessity, focusing on specific directions regarding disclosure media, standards, and how to ensure the accuracy of information [5].

The European Union mandated corporate ESG information disclosure through the Non-Financial Reporting Directive (NFRD) in 2014. This directive required companies above a certain size to disclose information related to environment, social, and governance. Subsequently, the Corporate Sustainability Reporting Directive (CSRD), effective from 2023, replaced the NFRD and greatly expanded the scope of disclosure to include EU-listed and unlisted large corporations, listed SMEs, and non-EU companies listed in EU markets. In addition, the CSRD requires disclosure based on the European Sustainability Reporting Standards (ESRS) and mandates third-party verification of disclosed information. The introduction of CSRD has greatly strengthened the transparency and credibility of ESG information and promoted responsible management by companies.

In the United States, the Securities and Exchange Commission (SEC) proposed in 2022 to mandate climate-related information disclosure, expanding interest in ESG disclosure. This proposal requires disclosure of information related to corporate climate change risks, including greenhouse gas emission data, and includes Scope 1, 2, and 3 emission data. It also mandates third-party verification for some items to ensure information reliability. These measures are progressing in the direction of providing transparent information to investors and emphasizing corporate environmental responsibility.

Japan maintains a voluntary approach to ESG disclosure. Japanese companies adopt global standards (GRI, SASB, etc.) to secure international credibility, and the government solicits opinions on ESG disclosure standards through expert advisory committees. Japan's approach respects corporate autonomy over regulation and reflects the intention to strengthen international competitiveness through global standards.

The United Kingdom regulates ESG disclosure based on the Companies Act, and listed companies comply with climate-related disclosure obligations through exchange regulations. The Financial Conduct Authority (FCA) revised the best practices in listing regulations to expand ESG information disclosure and requires third-party verification to strengthen the accuracy of disclosed information. These measures are evaluated as important steps to strengthen corporate environmental and social responsibility and promote investor protection.

South Korea is gradually advancing the legalization of ESG disclosure. The Financial Services Commission plans to mandate ESG disclosure for KOSPI-listed companies with assets of 2 trillion won or more from 2025, and to expand to all KOSPI-listed companies by 2030. In addition, the Korea Accounting Standards Board has announced a draft disclosure standard conforming to international sustainability standards (ISSB) to strengthen the global competitiveness of domestic companies. Korea's efforts contribute to establishing an ESG disclosure framework and helping companies secure international trust.

Table 1. ESG-Related Regulations by Country/Region. Source: Kim (2023), "Trends in Foreign Institutional Reform on ESG Disclosure and Implications."

Country/Region	Key Regulation/Policy	Key Features	Implications
European Union	CSRD (effective 2023)	Expanded disclosure scope, adoption of ESRS standards, mandatory third-party verification	Enhanced ESG information transparency, strengthened international corporate responsibility
United States	SEC proposal for mandatory climate-related disclosures	Disclosure of greenhouse gas data, third-party verification for some items	Investor protection and securing ESG disclosure credibility
Japan	Voluntary ESG disclosure	Adoption of global standards (GRI, SASB), expert advisory committees	ESG disclosure based on corporate autonomy and securing international competitiveness
United Kingdom	Companies Act-based ESG disclosure	Climate disclosure obligations under listing rules, enhanced third-party verification	Strengthening corporate environmental and social responsibility, promoting investor trust

Country/Region	Key Regulation/Policy	Key Features	Implications
South Korea	ESG disclosure mandate planned from 2025	Phased ESG disclosure mandate, alignment with international standards	Strengthening global competitiveness and establishing domestic ESG disclosure framework

As can be seen from the status of ESG disclosure adoption in each country, global efforts to strengthen the consistency of disclosure standards and the reliability of information are common. Korea should refer to these trends and strengthen the policy foundation to promote ESG management adoption among SMEs.

2.3. ESG Management Performance and Implications for SMEs

Research on the impact of ESG management on corporate performance is diverse. According to Choi (2024), companies with high-quality third-party verification and disclosure quality of ESG reports showed a tendency for increased investment efficiency and decreased over-investment [6]. This suggests that the credibility and transparency of ESG disclosure can increase a company's investment appeal and elicit positive responses from foreign investors. In addition, the research of Yoon and Kim (2022) analyzed that the higher the level of ESG management, the more the foreign equity ratio increases, and this effect is further strengthened through policy support such as tax benefits [7].

Kim (2024) also mentioned that when SMEs adopt ESG management, the possibility of fundraising increases and it can help attract excellent talent and enhance customer loyalty, arguing for the necessity of SME ESG management adoption. In particular, he emphasized that through ESG management, SMEs can not only comply with regulations but also secure corporate competitiveness and increase long-term viability. He also stated that when SMEs achieve sustainable management, they can secure the trust of investors and consumers, which can lead to long-term expansion of market share and increase in brand value [8].

However, he emphasized that considering limited resources compared to large corporations, it is necessary to establish differentiated strategies such as securing external support and efficiently distributing resources. As an example, he argued that SMEs can utilize their regional strengths and networks to employ customized ESG strategies that are difficult for large corporations to implement. He also pointed out that in the process of ESG management adoption, rather than short-term cost reduction, it is necessary to establish strategies that consider the limitations of resources and capabilities, focusing on long-term operational efficiency improvement and stakeholder trust enhancement. In this process, government financial support and tax benefits play a role in helping SMEs lower initial adoption costs and effectively allocate resources [9].

Yoon (2024) also states that ESG management for SMEs, unlike large corporations, is realized through close relationships with external stakeholders, especially the local community and collaborative networks within the production supply chain [10]. This suggests that through collaborative networks, SMEs can overcome resource limitations and secure competitiveness in various collaborative projects or public procurement projects.

In summary, SMEs can enjoy the same effect of improving corporate competitiveness through ESG management as large corporations, but in practice it is difficult to achieve sufficient results with the efforts of a single company alone due to insufficient corporate capabilities and resources. To overcome these limitations, it is essential to establish cooperative networks with various stakeholders such as the local community, large corporations, and other SMEs, and to secure appropriate support from third parties such as the government.

2.4. Policy Implications for SME ESG Management Adoption

As discussed above, to promote ESG management for SMEs, it is necessary to promote the establishment of cooperative networks among SMEs and various stakeholders, to intensively support various resources in the early stages where enormous costs are invested, and to support technology transfer and human resource development necessary for ESG management. These elements act complementarily, and SME ESG management adoption can have practical effectiveness when the government and private sector cooperate to systematically support them.

For example, Jeong (2024) proposed expansion of policy finance, provision of information services, and professional consulting support for the activation of ESG management for SMEs, emphasizing that this can solve the problem of insufficient funds in the early stages. This support goes beyond simple provision of funds, enabling SMEs to build a sustainable management structure by combining technical advice and practical support in the process of ESG management adoption [11].

On the other hand, regarding the establishment of cooperative networks and mutual growth models, Kong (2023) states that in the logistics field in particular, SMEs operate in direct and indirect connection with large corporations, and considering this, a solidarity network between large corporations and SMEs is required to create an ESG ecosystem. He also argued that an ESG ecosystem can be created based on connections that strengthen the cooperative framework with local governments and related organizations [12]. From this perspective, the strategy of indirectly utilizing the resources and expertise of large corporations can be said to contribute to simultaneously improving the productivity and environmental sustainability of SMEs and elevating the ESG management level of the entire supply chain.

Finally, as an example of capacity building for SME ESG management, Jeong (2024) emphasized the importance of sharing success cases and developing customized education programs to spread social awareness of ESG management and enhance practical capability. These programs play a central role in helping SMEs overcome resource shortages and lack of expertise, and in spreading the importance of ESG management to all members of the company [13].

In conclusion, for SMEs to successfully adopt ESG management, three elements must be satisfied: reducing the burden of initial costs, building cooperative networks, and preparing capacity-building education programs. When these policy supports are provided in an integrated manner, SMEs will be able to achieve sustainable management and strengthen their competitiveness in domestic and foreign markets.

3. Case Analysis

Through prior research, it was confirmed that ESG management is an essential element for securing corporate sustainability and competitiveness, and this is no exception for SMEs. However, in situations where SMEs have limited resources and capabilities, they face difficulties in adopting ESG, and to overcome this, establishment of cooperative networks, securing appropriate support from outside, and human resource development are needed. Accordingly, this study aims to analyze cases of companies that successfully adopted ESG management by effectively utilizing these factors among globally leading ESG management companies selected based on reliable international indicators.

In this study, MSCI ESG Ratings, EcoVadis ratings, and evaluation grades from the Korea ESG Standards Institute were used as major reference indicators to analyze global ESG management success cases. MSCI ESG Ratings is a global indicator that comprehensively evaluates corporate sustainability from multiple angles, and companies showing excellent performance in all three axes of Environment, Social, and Governance are considered ESG leaders at AA grade or above. EcoVadis focuses on evaluating sustainability within the supply chain, selecting cases with Gold grade or above as excellent cases. The Korea ESG Standards Institute’s grades analyze the sustainable management system of target companies in accordance with environment, social, and governance, and companies with Grade A or above are considered excellent companies.

Table 2. Comparison of Major ESG Management Evaluation Indicators. Source: Each institution’s indicator description webpage (MSCI Inc., “MSCI ESG Ratings Methodology”, etc.)

Evaluation Index	Features & Strengths	Key Evaluation Criteria	Rating System
MSCI ESG Ratings	Targeting global large corporations, specialized in assessing investment risks and opportunities	Environment, Social, Governance	AAA ~ CCC
EcoVadis Ratings	Emphasis on supply chain	Environment, Labor &	Platinum, Gold, Silver,

Evaluation Index	Features & Strengths	Key Evaluation Criteria	Rating System
	sustainability, specialized in evaluating collaboration potential between multinationals and SMEs	Human Rights, Business Ethics, Sustainable Procurement	Bronze
KCGS Ratings	Korea-focused, reflecting domestic environment and regulatory characteristics, emphasizing connection between policy and corporate management	Environment, Social, Governance	S, A+, A, B+, B, C

Although it would be ideal to select SME cases considering the purpose of the research, the practical limitations that it is difficult to secure reliable disclosure materials (e.g., sustainability management reports) for SMEs and that cases awarded excellent grades by each indicator are limited were considered. Therefore, in this study, cases considered as ESG leaders by each indicator, regardless of company size, were selected for analysis.

Although there are differences between SMEs and large corporations in ESG management conditions and implementation strategies, the implications that SMEs can gain from excellent cases of large corporations are clear. As a representative example, Kong (2024) argued that for the spread of ESG management performance of SMEs, it is necessary to evaluate ESG management performance, select and award excellent cases, and introduce an SME ESG mentor-mentee program by designating the selected excellent companies, including large corporations, as mentors [14]. This shows that for SMEs that have not yet adopted various ESG management excellence cases due to practical constraints, large corporation cases serve as reference models.

3.1. Global ESG Management Adoption Excellence Cases: MSCI

(1) Vestas Wind Systems (Denmark)

Vestas Wind Systems is a Danish wind turbine manufacturer that has been receiving the highest rating of AAA in MSCI ESG Ratings since February 2021. The company operates in 82 countries worldwide, has installed about 177GW of wind power generation capacity, and prevents approximately 2.1 billion tons of CO_2 emissions annually. Major customers consist of power companies, energy developers, and independent power producers, and the company provides services specialized in the design, construction, and maintenance of onshore and offshore wind power projects for these companies [15].

The reasons for selecting this company as a case study are as follows. The company met all three factors for successful SME ESG management identified in prior research: reduction of initial cost burden utilizing external support, establishment of cooperative networks, and preparation of capacity-building education programs. First, it secured funds for research and development and innovation activities by entering into a €475 million green loan with the European Investment Bank (EIB). Second, it developed a sustainability data platform aimed at reducing CO_2 emissions in cooperation with major suppliers, with 104 suppliers providing emission data through this platform as of 2023. Third, internally, it strengthened activities to spread employee education and awareness about sustainability, and externally, it conducted sustainability workshops for supply chain partners to improve ESG management capabilities. Therefore, Vestas Wind Systems was analyzed as a case that provides practical and important implications for SME ESG management adoption strategies [16].

Vestas adopted ESG management amid the necessity of sustainable energy transition and changes in the global regulatory environment. In particular, policy changes such as the EU Taxonomy Regulation and Carbon Border Adjustment Mechanism (CBAM) emphasize the necessity of carbon emission reduction and transparent environmental reporting for companies. Against this background, Vestas set company-wide ESG management goals and aimed to reduce carbon emissions not only in its own operations but throughout the supply chain. The company also adopted circular economy principles and set optimizing resource use and reducing waste as core strategies [17].

As specific action plans, Vestas is targeting to neutralize all greenhouse gas emissions from its own operations

(Scope 1 and Scope 2) by 2030 and reduce supply chain emissions (Scope 3) by 45%. To this end, it adopted sustainable materials such as low-carbon steel and recyclable wooden towers in cooperation with major suppliers. In 2023, it operated about 465 hybrid and electric vehicles and successfully conducted a conversion project to offshore service vessels using renewable fuel [18].

In addition, Vestas developed blade recycling technology to realize waste management and circular economy principles. In 2023, it successfully completed a pilot project to recycle a total of 188 blades and manufacture new blades using recycled materials. Together with this, it has set and is implementing the goal of recycling or converting to energy 95% of all waste generated in the turbine manufacturing process [19].

The effects of ESG management adoption appeared in various ways. The reduction in carbon emissions from its own operations and supply chains has been an important factor in gaining trust from customers and investors. In particular, the use of renewable materials and carbon emission reduction technology contributed to reducing turbine production costs, which became the basis for providing more sustainable products to customers. In addition, by strengthening cooperation with local communities, social value was created by providing education, employment, and technical support to approximately 9,769 beneficiaries [20].

Vestas's case shows that ESG management can simultaneously strengthen a company's sustainability and competitiveness. The proactive response to regulatory changes and the efforts to build a sustainable future through innovative technology and cooperation are evaluated as important implementation measures that can serve as a model for other companies.

(2) Ball Corporation (USA)

Ball Corporation is a US-headquartered metal packaging container manufacturer that focuses on providing sustainable packaging solutions utilizing recycling technology, and achieved the highest rating of AAA in MSCI ESG Ratings in September 2024. The company has adopted sustainability as a core management strategy, providing packaging solutions based on circular economy principles, operating 66 manufacturing facilities worldwide and employing approximately 21,500 employees. According to the 2023 Sustainability Management Report, Ball reduces approximately 33,265 tons of greenhouse gas emissions annually and is strengthening sustainability through cooperation with global customers [21].

This company was selected as a case that satisfies two of the three factors for ESG management success presented in prior research. First, Ball Corporation is evaluated as a case of reducing initial cost burden through public policy and government support. The company maximized operational efficiency by receiving support for policies to increase aluminum recycling rates and promote circular economy in cooperation with the European Union (EU) and regional governments. Ball also reduced initial operating costs through grants for expanding recycling programs in the United States, achieving carbon emission reduction targets. Second, in terms of building cooperative networks, Ball closely cooperated with numerous supply chain partners to introduce low-carbon production methods and secure sustainable raw materials. In particular, by cooperating with Novelis Inc. to establish low-carbon recycling and rolling mill facilities, it secured the stability of aluminum supply and strengthened the circular economy model for waste reduction [22].

The main background for Ball Corporation's full-scale ESG management adoption was the strengthening of global environmental regulations and increasing consumer and investor demands for sustainable products. In particular, regulations such as the EU's Packaging and Packaging Waste Directive require increased recycling rates and circular economy realization, which served as an opportunity for Ball to strengthen sustainability. In addition, as major customers set carbon neutrality goals, Ball adjusted its management strategy toward increasing the circularity of packaging products and strengthening environmental responsibility [23].

As specific ESG management action plans, Ball is prioritizing the increase of aluminum can recycling rates. To this end, it purchases only raw materials certified by the Aluminium Stewardship Initiative (ASI) and actively utilizes recycled content in the production process. In 2023, it maintained an average aluminum can recycling rate of over 70%, significantly reducing Scope 3 greenhouse gas emissions. In addition, it optimized raw material use through product lightweighting and provided cost-effective sustainable solutions to global customers [24].

Ball introduced renewable fuel and eco-friendly vehicles to reduce carbon emissions from its supply chain. In the US and European markets, it deployed vehicles using Hydrotreated Vegetable Oil (HVO) as fuel in the supply chain, reducing approximately 4,000 tons of carbon emissions annually. At the same time, it introduced renewable power to production facilities to improve energy efficiency and is using renewable energy in 80% of global production facilities as of 2023. This brought both carbon emission reduction and energy cost savings [25].

Efforts to realize waste management and circular economy principles are also notable. Ball successfully conducted a pilot project to decompose post-use recovered aluminum cans and convert them into recyclable forms using new chemical technology. Through this, it increased the ratio of recycled aluminum used as raw material again and introduced a new process to convert waste into energy, recycling or converting to energy 95% of waste generated in the production process [26].

The effects of Ball Corporation's ESG management adoption appeared in environmental, economic, and social aspects. Environmentally, the increase in recycled aluminum use ratio and reduction in carbon emissions were notable, greatly contributing to supporting the sustainability goals of customer companies. Economically, it succeeded in reducing product production costs through lightweighting and recycling technology, which became an important factor in Ball maintaining market competitiveness. Socially, it created social value by providing education and technical support to approximately 9,769 beneficiaries as of 2023 through cooperation with local communities [27].

Ball Corporation's case is evaluated as a representative example of achieving successful results by making circular economy and sustainability the core strategy of the company. In particular, it proved that ESG management can make a practical contribution to strengthening corporate competitiveness by simultaneously achieving environmental and economic goals through aluminum recycling and lightweighting technology. Such cases can be utilized as important benchmarking material for other companies seeking to adopt sustainable management [28].

(3) Orsted A/S (Denmark)

Orsted A/S is a Danish renewable energy company that focuses on offshore wind power generation and provides sustainable energy solutions, and has been receiving the highest rating of AAA from MSCI ESG Ratings since 2020. Orsted has secured approximately 27.8GW of renewable energy capacity in 15 countries worldwide, which is enough to supply electricity to approximately 30 million households. Major customers are governments, power companies, and large-scale industries, and it has established itself as a leader in a market with steadily increasing demand for renewable energy solutions. The company has placed sustainability at the center of its business strategy and is leading global energy transition [29].

This company was selected as a case that satisfies two of the three factors for ESG management success presented in prior research. First, Orsted is a representative case that benefited from public policy and government support in terms of reducing initial cost burden. In particular, it reduced the initial capital burden and increased project feasibility through support for renewable energy projects from the European Union (EU) and the Danish government. This is an important case that can be referenced by SMEs in alleviating initial cost burden through cooperation with public institutions. Second, in terms of building cooperative networks, Orsted laid the foundation for sustainable energy transition through cooperation with global supply chain partners. In particular, it further solidified cooperative relationships with related partners by developing a platform that strengthens transparency and sustainability within the supply chain. This cooperative approach provides important insights for SMEs in adopting ESG management [30].

The main background for Orsted's full-scale ESG management adoption was the international response to climate change and regulatory requirements such as the European Union's Corporate Sustainability Reporting Directive (CSRD) and Taxonomy Regulation. These regulations require companies to strengthen transparency and sustainability, and Orsted set strategic goals across environment, social, and governance to proactively comply with them. The company aims to accelerate decarbonization and lead global energy transition through renewable energy. It also promises responsible management to investors and stakeholders through sustainability goals [31].

As specific ESG action plans, Orsted has established a plan to expand offshore wind capacity to 35~38GW by 2030. This project includes major projects such as Hornsea 3 in the UK and Greater Changhua in Taiwan, reflecting the goal of positioning itself as the global leader in offshore wind power generation. Onshore wind and solar projects are also set as major growth drivers, with investments being expanded particularly in the US and European markets. In addition, Orsted continues to check ecological impacts on all new projects to protect biodiversity and restore or preserve ecosystems through this [32].

In addition, the company adopted a zero-waste policy to realize waste reduction and circular economy. In 2023, 90% of waste generated in operations was recycled or converted to energy, with the goal of 100% recycling set by 2030. Furthermore, to reduce greenhouse gas emissions, coal-based power production was completely discontinued from 2024, and power production optimization was introduced to reduce Scope 1 and Scope 2 emissions [33].

The effects of ESG management adoption appeared clearly. Orsted achieved a total EBITDA of 24 billion Danish kroner in 2023, recording stable financial performance. In addition, employee satisfaction was measured at 76 points, which is a high level corresponding to the top 25% of the industry. It succeeded in improving safety culture by lowering the accident rate (TRIR) to 2.8, and these achievements contributed to Orsted being established as a trusted company in the renewable energy market. In terms of social value creation, it had a positive impact through job creation and technical support in cooperation with local communities [34].

Orsted's case shows that a business model based on renewable energy can simultaneously achieve sustainability and profitability. In particular, the approach of proactively responding to global regulatory changes and comprehensively managing biodiversity and greenhouse gas reduction can be used as valuable benchmarking material for other companies. Orsted serves as a model case for ESG management, providing actionable measures for a sustainable future.

(4) First Solar Inc. (USA)

First Solar Inc. is a global renewable energy company headquartered in Tempe, Arizona, USA, established in 1999, and is the world's first company to commercialize large-scale thin-film solar modules. The company manufactures high-efficiency solar modules using unique CdTe (cadmium telluride) technology, and these technologies are evaluated to have significantly lower energy intensity and carbon footprint compared to traditional crystalline silicon-based modules. As of 2023, First Solar has major manufacturing facilities in the US, Malaysia, Vietnam, and India, achieving an annual production capacity of approximately 16.6GW. Major customers are energy developers and power companies that operate large-scale solar power plants, participating in various projects to accelerate renewable energy transition [35].

First Solar Inc. is a global company leading sustainable solar technology, and is evaluated as a case that satisfies two of the three prerequisites for ESG management adoption: reducing initial cost burden utilizing external support and building cooperative networks. First, First Solar succeeded in alleviating the initial cost burden through cooperation with the government. In particular, it reduced initial costs by receiving support from the US Inflation Reduction Act (IRA) so that solar module manufacturers and project developers can receive tax benefits. It also strengthened local production and improved market access by utilizing India's Production Linked Incentive (PLI) system. Second, in terms of building cooperative networks, First Solar improved sustainable product development and resource efficiency through cooperation with global supply chain partners. In particular, it established a circular economy model that recovers more than 95% of materials from used solar modules through recycling processes and recycles them for manufacturing new products. Such an approach can be an effective reference case for SMEs implementing ESG management [36].

The main background for ESG management adoption was the response to global energy transition and climate crisis. As reducing dependence on fossil fuels and transitioning to renewable energy is required worldwide, First Solar made sustainable technology development and environmental responsibility the core strategy of the company. In particular, according to the 2024 Sustainability Report, First Solar joined the RE100 initiative and set the goal of using 100% renewable energy in all global operations by 2028. In addition, as demands for sustainability from investors and customers increase, various efforts to reduce carbon emissions and maximize resource efficiency are being combined [37].

First Solar is implementing various action plans to achieve ESG management goals. First, it achieved a carbon footprint approximately 2.5 times lower than traditional crystalline silicon-based modules in the production process of solar modules based on CdTe technology. This technological advantage contributed to minimizing energy consumption in the manufacturing process and reducing overall environmental impact. Second, First Solar operates a global module recycling program to strengthen waste management, recycling approximately 90% of module materials as of 2023. This is evaluated as a representative case of realizing circular economy by putting recycled resources back into the production process. Third, to improve energy efficiency, it introduced a high-efficiency energy management system to new manufacturing facilities, achieving approximately 12% energy savings compared to 2022 [38].

The effects of ESG management adoption appeared in financial and non-financial performance. First Solar recorded total sales of $3.7 billion in 2023, proving the commercial success of sustainable solar technology. Scope 1 and Scope 2 greenhouse gas emissions decreased by approximately 10% compared to 2022, consistent with the company's Science Based Targets initiative (SBTi). In addition, new project contract volume expanded to over 15GW due to increased demand for sustainable solar modules, further strengthening the company's sustainable growth potential. Socially, First Solar employs approximately 8,000 employees and creates positive impacts by operating education and technical support programs through cooperation with local communities [39].

First Solar's case is evaluated as a representative success case that simultaneously achieved sustainability and profitability based on CdTe technology. In particular, technological innovation and the circular economy approach are leading to economic performance beyond environmental responsibility, which can be used as valuable benchmarking material for global renewable energy companies. First Solar demonstrates an example of responding to climate crisis and energy transition through ESG management, providing valuable implications for other companies in establishing management strategies centered on sustainability.

Table 3. Summary of Major Company Cases Analyzed through MSCI Ratings.

Company	Company Overview	ESG Management Features	Implications
Vestas Wind Systems	Global wind turbine manufacturer and sustainable energy solution provider	Financial support via government green loans, capacity-building training programs	Government and public institution support reduces initial costs, increasing ESG adoption feasibility
Ball Corporation	Global aluminum packaging solution provider	Initial cost reduction via public policy and government support, collaborative network with multiple supply chain partners	Building recycling and circular economy models improves operational efficiency and strengthens ESG goal achievement
Orsted A/S	Leading company in renewable energy projects and solutions	Utilization of public policy and government support, sustainability strengthened through collaboration with global supply chain partners	Strategic direction to reduce initial costs and strengthen sustainability through public support and collaboration
First Solar Inc.	Specializing in sustainable solar technology development and manufacturing	Initial cost burden reduction through government cooperation, circular economy model established through recycling processes	Contributes to improving resource efficiency through circular economy and sustainable resource utilization

3.2. Global ESG Management Adoption Excellence Cases: EcoVadis

(1) Milliken & Company (USA)

Milliken & Company is a global manufacturer headquartered in Spartanburg, South Carolina, USA, producing specialty chemicals, high-performance materials, textiles, and flooring. The company is committed to environmental protection and social responsibility through sustainable innovation, and has been recognized for excellence in sustainability by receiving EcoVadis' Gold rating for three consecutive years. Milliken's sustainability management was adopted in response to strengthening global environmental regulations and increasing stakeholder demands. The intensification of climate change and resource depletion is strengthening corporate responsibility, and Milliken established an ESG strategy to actively address this [40].

Milliken & Company operates in various industrial sectors and is evaluated as a representative case of satisfying collaborative network building and capacity-building training program preparation among the prerequisites for ESG management adoption through sustainability and innovation. First, Milliken shows excellent performance in the aspect of building cooperative networks. The company has joined international cooperative bodies such as the UN Global Compact to strengthen cooperative efforts for sustainability, and in 2023 cooperated with various companies and institutions to develop plastic waste management solutions. Through this, it achieved sustainability goals based on circular economy promotion and cooperation with global partners. Second, Milliken improved its practical capabilities for sustainability through internal capacity-building training programs. In 2023, it held an internal sustainability summit attended by more than 500 executives and employees to provide training on ESG strategies and goals. In addition, it provided employees with various learning opportunities related to sustainability through Milliken University's global education portal. These efforts can serve as practical reference cases for SMEs in laying the foundation for ESG management adoption through internal capacity building [41].

The company is currently covering more than 50% of power used with renewable energy to improve energy consumption efficiency, with plans to expand this to 75% by 2025. To this end, it is continuously promoting expansion of solar and wind power projects and process improvements to improve energy efficiency. In addition, the company is effectively managing waste according to circular economy principles. It operates a program to recycle waste fabric generated in the production process into fibers, reducing more than 10,000 tons of waste annually [42].

Beyond this, it is focusing on sustainable product development. It evaluates environmental impacts from the early stages of product development and has launched innovative products such as recyclable carpets and water-saving textile manufacturing technology to the market. These products can reduce carbon emissions by more than 40% compared to existing fossil fuel-based materials. The company has set the goal of reducing Scope 1 and Scope 2 greenhouse gas emissions by 50.4% compared to 2018 by 2030, and has already achieved a 43% reduction as of 2023 [43].

Milliken's sustainability management has been further strengthened through employee participation and education. All employees participate in annual sustainability education programs, through which they understand the company's goals and strategies and contribute to achieving environmental goals. This approach plays an important role in spreading ESG goals throughout the organization [44].

Through this sustainability management, it has gained high trust from customers and stakeholders and maintained EcoVadis Gold rating for three consecutive years. The company publishes annual sustainability reports to transparently disclose performance and clearly sets future goals and plans. These efforts have had a positive impact on corporate image and sales growth, and Milliken's case is positioning itself as a useful benchmark presenting the importance and practice of sustainability management to other companies.

(2) Mettler-Toledo (USA)

Mettler-Toledo is a global leading company in precision measurement equipment and technical services, providing products and services in various fields including laboratories, manufacturing, food, and chemical industries. The company has established and is implementing an ESG strategy aimed at environmental protection, social responsibility, and excellent governance, centered on its GreenMT program. Mettler-Toledo operates businesses in approximately 140 countries worldwide and has proven excellence in the sustainability field by achieving EcoVadis Gold rating [45].

Mettler-Toledo is a global leading company in precision instruments and services, and is evaluated as a case that satisfies two of the prerequisites for ESG management adoption: building cooperative networks and reducing initial cost burden. First, in terms of building cooperative networks, Mettler-Toledo built a responsible sourcing framework through cooperation with supply chain partners. Through this, it strengthened sustainable material procurement through close cooperation with major suppliers and achieved ESG goals within the supply chain. In particular, in 2022, ESG auditing and goal setting were conducted through collaboration with strategic suppliers, further strengthening supply chain sustainability. Second, Mettler-Toledo implemented projects to increase sustainable energy use and resource efficiency to reduce initial cost burden. In 2022, it achieved operating cost reduction by using 100% renewable electricity in all manufacturing facilities and succeeded in reducing greenhouse gas emissions [46].

The background for Mettler-Toledo's introduction of sustainability management was strengthening environmental regulations and customer demands for sustainability. Climate change and resource depletion affected all aspects of corporate operations, and accordingly, Mettler-Toledo strengthened ESG strategy by setting greenhouse gas reduction targets approved by the Science Based Targets initiative (SBTi). In particular, requests from customer companies requiring strengthened sustainability within the supply chain became an opportunity to integrate environmental responsibility throughout the company's overall strategy [47].

Against this background, various efforts are being made through the GreenMT program to reduce energy consumption and minimize carbon emissions. In major manufacturing facilities, solar power generation facilities have been installed and 100% renewable electricity is used globally. In vehicle operations, electric vehicles and low-emission vehicles have been introduced to reduce carbon emissions in the transportation process, and by introducing raw materials utilizing renewable energy in cooperation with suppliers, the environmental impact generated within the supply chain was minimized [48].

The company's ESG strategy had positive effects on both corporate performance and environmental responsibility. Greenhouse gas emissions corresponding to Scope 1 and Scope 2 decreased by 54% compared to 2018, and the company successfully achieved carbon neutrality. In addition, through waste management programs, the proportion of waste sent to landfills was lowered to 9% or less, showing the company's efforts to realize a circular economy model. These achievements were transparently disclosed in Mettler-Toledo's sustainability report, through which the company is strengthening trust with stakeholders [49].

In addition, reports that evaluate and transparently disclose ESG performance annually are published to achieve sustainability goals. These reports clearly present the climate change risks the company faces and the status of ESG goal achievement, and include future plans and performance improvement strategies. Such reports are being utilized as important tools for measuring progress toward ESG goal achievement and strengthening cooperation with stakeholders.

Mettler-Toledo's case proves that ESG strategy can simultaneously improve environmental responsibility and corporate performance. This provides other companies with specific approaches and success cases for achieving sustainability goals, practically demonstrating the importance of ESG management.

(3) Johnson Controls (Ireland)

Johnson Controls is currently a global company headquartered in Cork, Ireland, specializing in energy efficiency improvement and sustainable building technology development. The company is widely known worldwide in the field of building automation and smart building solutions, and has sustainability as a core element of management. Through these efforts, it was recognized as a company in the top 1% worldwide in the ESG field by receiving EcoVadis Platinum rating in 2023 [50].

Johnson Controls is a global leading company providing smart building and sustainable energy solutions, and is evaluated as a case that satisfies two of the prerequisites for ESG management adoption: reducing initial cost burden and building cooperative networks. First, in terms of reducing initial cost burden, Johnson Controls secured financial support through cooperation with public institutions and private partners. In particular, it secured approximately $15.7 million in investment through the US Green and Inclusive Community Buildings program to perform projects that reduce carbon emissions and improve energy efficiency. This approach becomes a case worth referencing for SMEs alleviating initial cost burden and achieving sustainable management. Second, in terms of building cooperative networks, Johnson Controls strengthened sustainable material supply and circular economy through cooperation with global supply chain partners. For example, through circular aluminum and steel programs, it closely cooperated with major suppliers to build systems that minimize material waste in the production process and utilize recycled materials [51].

The background for ESG management adoption was the need to respond to the strengthening of global environmental regulations and climate change. The building sector is a major source accounting for 40% of global energy consumption and 30% of carbon emissions, and Johnson Controls sought to contribute to customer companies and the entire industry through providing solutions for this. In addition, sustainability demands from global customer companies served as a strategic focus for the company, strengthening the necessity of ESG management [52].

Johnson Controls is realizing environmental responsibility through various ESG-related action plans. The company focuses on reducing energy consumption and reducing carbon emissions through smart building technology. The innovative building management system OpenBlue provides real-time energy data to customers, supporting them to maximize operational efficiency and minimize carbon emissions. In addition, through energy-efficient products such as YORK® YZV heat pumps, it contributes to reducing energy consumption by more than 30% compared to existing heating systems [53].

The company succeeded in reducing Scope 1 and Scope 2 greenhouse gas emissions by 55% compared to 2017 to reduce its own carbon emissions, and established a specific roadmap to achieve net-zero by 2040. To this end, it is implementing practical strategies such as expanding renewable energy use in manufacturing plants, transitioning to electric vehicles, and reducing refrigerant losses [54].

Sustainability efforts are also contributing to achieving environmental goals of customer companies. For example, Alabama Children's Hospital, which introduced the OpenBlue solution, achieved the performance of saving $450,000 in annual energy costs and reducing natural gas use by 69%. These cases show that Johnson Controls' technology can simultaneously create real environmental and economic impacts.

Table 4. Summary of Major Company Cases Analyzed through EcoVadis Ratings.

Company	Company Overview	ESG Management Features	Implications
Milliken & Company	Producing specialty chemicals, high-performance materials, flooring, pursuing sustainability and innovation	Collaborative network building, capacity-building training programs	Provides ways to effectively adopt ESG management utilizing networks with global partnerships
Mettler-Toledo	Global leader in precision instruments and services	Initial cost reduction through external support, successful collaborative network building	Successfully reduces initial cost burden and improves ESG management performance through sustainable energy and resource efficiency maximization
Johnson Controls	Smart building and sustainable energy solution provider	Initial cost reduction through external support, successful collaborative network building	Realizes sustainability through circular economy and reduces initial costs through public support

3.3. Domestic ESG Management Adoption Excellence Cases: Korea ESG Standards Institute (KCGS)

(1) Pulmuone (Republic of Korea)

Pulmuone is a representative Korean food company established in 1984, producing various food products including tofu, vegetables, and frozen foods. The company has grown based on the vision of leading a "healthy food culture," and has environmental protection, support for sustainable agriculture, and promotion of consumer health as core values. Pulmuone has a strong market share domestically and internationally, and is also actively operating in global markets such as Japan, the US, and China. As of 2023, it recorded sales of over 1 trillion won, strengthening corporate competitiveness through sustainable management [55]. This sustainable management drove the company to achieve Grade A for two consecutive years in the Korea ESG Standards

Institute's evaluation in 2024.

Pulmuone is a sustainable food company representing Korea, and is evaluated as a representative case of satisfying collaborative network building and capacity-building education program preparation among the prerequisites for ESG management adoption. First, Pulmuone shows excellent performance in the aspect of building cooperative networks. In 2023, Pulmuone conducted regular ESG evaluations on its own and 221 partner companies and improved food safety and sustainability through this. In addition, it expanded the development and application of eco-friendly packaging materials promoting circular economy together with partners in the global supply chain, reducing plastic use by 182.7 tons. This cooperative network provides important implications for SMEs to effectively achieve ESG goals through cooperation with global supply chains. Second, Pulmuone improved practical capabilities for sustainability through internal capacity-building training programs. In 2023, it held a food quality safety conference on the topic of food quality/safety strengthening for about 200 quality management personnel from its own company and partner companies. This conference contributed to sharing ESG management goals and strengthening the capabilities of partners in the supply chain through related education and case studies [56].

The background for Pulmuone's ESG management adoption was the change in global environmental regulations and consumer demands. The food industry is evaluated as having a large environmental impact such as plastic use and greenhouse gas emissions. Accordingly, Pulmuone integrated environmental responsibility as an essential element of corporate management and built a sustainable business model through eco-friendly product development and production process improvement. In addition, ESG management served as an important foundation for strengthening brand image and expanding global market. As consumer interest in sustainable products increases, this has given Pulmuone the necessity to make sustainability a core strategy [57].

Pulmuone's ESG management is being realized through specific action plans. The company has expanded the use of renewable energy to reduce greenhouse gas emissions and introduced various technologies to improve the efficiency of the production process. It installed solar panels in major production facilities and built a system to monitor energy consumption by process in real time. Through these efforts, Scope 1 and Scope 2 emissions were reduced by more than 20% from 2018 to 2023, and the goal of 50% reduction by 2030 was set. This is part of Pulmuone's long-term strategy toward carbon neutrality [58].

Efforts to resolve packaging issues are also notable. Pulmuone is reducing plastic use and expanding the introduction of recyclable eco-friendly packaging materials. In particular, it was designed using innovative packaging technology such as water-based labels to make it easy for consumers to separate and dispose. These packaging innovations reduce plastic waste while providing a positive image to consumers. The company has set the goal of reducing plastic use by 50% by 2030 and continues to invest and research in packaging improvement [59].

The company is also active in supporting sustainable agriculture. It cooperated with local farms to reduce the use of chemical fertilizers and pesticides and introduced eco-friendly agricultural technology. Contract farms are provided with eco-friendly certification programs and technical support is given to minimize environmental impacts from the agricultural process. Through this, Pulmuone has strengthened the sustainability of local agriculture and built a high-quality raw material supply chain [60].

Various social contribution activities are also being developed to realize social responsibility. A representative program is 'Children's Right Food Education.' This program educates the next generation about the importance of healthy eating habits, with more than 10,000 children participating annually. In addition, social value is being created through donations and volunteer activities for vulnerable groups in local communities [61].

In terms of governance, Pulmuone has strengthened transparent management principles. The company has included ESG goals in management evaluation standards and regularly publishes sustainability reports to transparently disclose ESG performance. Through these efforts, it has gained high trust from investors and stakeholders, and ESG management has been integrated into the decision-making process throughout the company [62].

Pulmuone's ESG management is not only realizing environmental responsibility and social values but also having a positive impact on the company's financial performance. The proportion of eco-friendly product line sales is continuously increasing, and improvement in ESG evaluation grades has contributed to strengthening competitiveness in global markets. Pulmuone's case is evaluated as a successful model showing that ESG management can simultaneously strengthen a company's sustainability and competitiveness.

(2) Hanssem (Republic of Korea)

Hanssem is a representative Korean home remodeling and home furnishing company established in 1970, operating in various business fields related to residential environment improvement such as kitchens, bathrooms, and windows. The company aims to improve customers' quality of life by providing sustainable living spaces. Sales in 2023 were approximately 1.9669 trillion won, and it is pursuing sustainable growth through balanced ESG management in environmental, social, and governance aspects [63]. Thanks to these efforts, Hanssem received Grade A in the Korea ESG Standards Institute's evaluation results in 2024.

Hanssem is a representative home remodeling and furniture manufacturing company of South Korea, and is evaluated as a representative case of satisfying reducing initial cost burden utilizing external support and building cooperative networks among the prerequisites for ESG management adoption. First, Hanssem made efforts to increase sustainable energy use and resource efficiency to reduce initial cost burden. In 2023, it constructed solar power generation facilities to utilize renewable energy and invested to improve the efficiency of manufacturing facilities. Second, in terms of building cooperative networks, Hanssem implemented various programs for mutual growth with partners. Hanssem established partner behavior codes and received pledges from all partners to comply with them. In addition, ESG evaluations were conducted to support sustainable supply chain management for partners, and improvement directions were presented based on these. This cooperative network building can provide practical help for SMEs to strengthen sustainability within the supply chain and effectively achieve ESG goals [64].

The background for Hanssem's ESG management adoption originated from the need to respond to environmental issues such as climate change and resource depletion spreading worldwide and demands for strengthening corporate social responsibility. By actively accepting international ESG frameworks through joining the UN Global Compact, participating in the Carbon Disclosure Project, and declaring support for TCFD, it is clearly expressing its will to achieve sustainable growth based on these efforts. Together with this, as an internal consensus was formed that ESG management is essential for strengthening corporate sustainability, it was placed at the center of corporate strategy [65].

Hanssem is implementing specific action plans to realize environmental protection, social responsibility, and transparent governance. In the environmental sector, it has established a RE100 roadmap to achieve carbon neutrality by 2050, and is gradually expanding the proportion of renewable energy use by installing solar power generation facilities at Factory 1. In the manufacturing process, eco-certified materials are preferentially used from the raw material procurement stage, and a system was established to process waste generated in the production process in recyclable forms. In addition, it is investing in technology development to improve energy efficiency and minimize waste of resources from the product design stage. These efforts contribute to reducing carbon emissions throughout the entire process and maximizing resource efficiency [66].

In the social sector, it has established behavior codes for co-growth with partners and newly established items to evaluate partner sustainability. Through this, partners are encouraged to participate in sustainability efforts, and education programs and support systems are prepared for this. Together with this, internally, work environment improvement and employee welfare are being strengthened, and in particular, fostering female talent and expanding inclusivity in various job categories are being expanded. These efforts contribute to increasing internal satisfaction while strengthening relationships with partners [67].

In terms of governance, an ESG committee has been established to systematically manage ESG management strategies. A dedicated body for implementing ESG strategy was newly established under the board of directors, and ESG elements are reflected in the major decision-making process throughout the company. Sustainability reports are regularly published to strengthen communication with stakeholders, transparently sharing progress related to ESG goal achievement through this [68].

After adopting ESG management, Hanssem received high evaluations in international ESG evaluation indices and strengthened consumer and investor trust. In 2023, it received the grand prize at the co-growth merit award hosted by the Ministry of SMEs and Startups, and ESG management has become an important factor in improving corporate competitiveness. These achievements had a positive impact on financial performance while realizing environmental responsibility and social values.

Hanssem publishes sustainability reports annually to transparently disclose ESG activity performance and plans, building trust with stakeholders through this. It plans to continue to pursue carbon neutrality achievement, partner support, and governance transparency strengthening. These cases are evaluated as important benchmarking cases for Korean companies showing ESG management adoption and effective implementation strategies.

Table 5. Summary of Major Company Cases Analyzed through Korea ESG Standards Institute (KCGS).

Company	Company Overview	ESG Management Features	Implications
Pulmuone	A representative sustainable food company of Korea	Collaborative network building, capacity-building training programs	Achieves ESG goals through cooperation with global supply chain, and expands ESG adoption potential through education and capacity strengthening
Hanssem	A representative home remodeling and furniture manufacturing company of South Korea	Initial cost burden reduction using external support, collaborative network building	Alleviates initial cost burden and achieves ESG goals through public support and collaboration, strengthening supply chain sustainability

4. Strategic Suggestions

The common feature of ESG management adoption excellence case companies derived from case studies is that ESG management takes effective root when policy support and corporate self-efforts act complementarily. Through this, this study seeks to propose two aspects to support SMEs with relatively limited resources and capabilities to stably adopt ESG management. First, derive measures to improve ESG management performance through SME-level efforts. Second, explore measures to create SME ESG management environment through policy support in addition to corporate self-efforts described above.

Based on this, in this chapter, an integrated strategy for SME ESG management adoption and successful implementation is presented in two dimensions: ‘1. SME Management Strategy for ESG Management Performance Improvement’ and ‘2. Policy Approaches to Promote ESG Management.’

4.1. SME Management Strategy for ESG Management Performance Improvement

The most important thing in adopting ESG management is seeking cooperation from outside. However, cooperation and support are not given without consideration, and can only be obtained when companies have voluntarily made efforts to build developmental relationships with various stakeholders. Furthermore, meaningful support from various stakeholders can only be obtained when the attitude of reliably and continuously communicating the results of such efforts is continuously observed. Considering this, action plans for improving SME ESG management performance can be presented as follows.

- Building a Sustainable Supply Chain: Case companies included in the case study succeeded in achieving ESG goals through cooperation with supply chain partners. These cases show that SMEs can also realize ESG goals through partnerships with partners within the supply chain. To this end, SMEs must clearly establish ESG standards within the supply chain and provide funding and technology sharing to enable partners to comply with these. Mettler-Toledo increased the proportion of renewable raw material use through cooperation with major supply chain partners and introduced a manufacturing process that minimizes waste. This approach not only pursues environmental performance within the company but also strengthens the sustainability of the entire supply chain through interaction with partners. In particular, sustainability-related provisions were added to contracts to formalize cooperation with partners, and regular performance evaluations were conducted. Through this, ESG goals could be systematically realized throughout the supply chain. Pulmuone promoted joint projects with partners to reduce the carbon footprint generated in the agricultural production process. This project applied eco-friendly farming methods and carbon reduction technology, greatly reducing the environmental impact throughout the supply chain. Pulmuone provided technical support to partners to achieve environmental goals and shared sustainable agricultural practices through education programs.

- Strengthening Transparency and Credibility: Transparency and data reliability are essential to gain trust in ESG management performance. SMEs also need to build an ESG data management system by referring to the preceding cases. Meanwhile, the government and private sector must provide digital ESG management tools to enable SMEs to efficiently collect and manage data. By having data verified through cooperation with external specialized institutions and disclosing this, SMEs can secure trust from investors and consumers regarding ESG management performance. This will help SMEs to objectively prove ESG performance and strengthen competitiveness in the market. As an example, Milliken & Company gained high trust from stakeholders through systematic management and reporting of ESG data. In particular, it monitored ESG performance in real time using digital platforms to ensure data accuracy and regularly reported verified data. Milliken worked with external certification bodies to have data verified to improve the reliability of ESG data. This enabled the company's report to have objectivity and reliability and contributed to strengthening trust with investors and customers. Furthermore, internally, data management processes were standardized and dedicated teams were organized in each department to collect and analyze ESG-related data. This improved the efficiency of data management and laid the foundation for sustainable operations.
- Continuous Innovation and Technology Utilization: Continuous innovation and technology utilization are important to maintain and strengthen ESG management performance in the long term. SMEs can continuously strengthen ESG performance through financial support and technology transfer from the government and private sector. For example, they can introduce smart sensors and data analysis technology to improve energy efficiency, or apply recycling technology for waste management. However, as described above, this positive support is only possible when SMEs themselves have the confidence to achieve sufficient results, so it should be pursued after first achieving continuous supply chain building and transparency and credibility strengthening. Johnson Controls succeeded in optimizing energy consumption and reducing carbon emissions through smart building solutions (OpenBlue). This solution analyzed building operation data in real time to optimize energy consumption patterns and prevented unnecessary energy waste. In addition, OpenBlue provided an intuitive interface that users can easily access, providing practical help for companies to manage ESG goals and improve performance. Hanssem utilized eco-friendly materials in the product development process and introduced energy-saving technology in the production process. In this process, sustainable design principles were applied to extend product life and minimize waste generation. In addition, a dedicated team was organized for ESG innovation in the research and development (R&D) department to be in charge of sustainable technology development. Through this, Hanssem succeeded in achieving ESG goals while maintaining competitiveness.

4.2. Policy Approaches to Promote SME ESG Management

Meanwhile, in this section, based on the implications derived through the preceding case studies, policy and social approaches are presented to enable Korean SMEs to adopt ESG management.

(1) Strengthening Financial and Policy Support

ESG management excellence case companies analyzed in the case study had the common feature of effectively utilizing government support to build the foundation for ESG management. Milliken & Company utilized financial support and tax benefits from the government to expand the use of renewable energy by more than 50%. The company was able to reduce initial introduction costs by procuring funds needed to promote solar and wind power projects from the government's green energy support program. These cases suggest that SMEs can also alleviate initial investment burdens through similar support programs.

Mettler-Toledo's GreenMT program is an exemplary case realized through cooperation with the government, and this company received support needed to introduce the latest technology related to environmental management. In particular, it was able to successfully achieve environmental goals through government technical consulting and financial support in the process of renewable energy transition. This emphasizes that technical consulting services and education programs provided by the government are important for SMEs to strengthen the technical capabilities needed for ESG management.

In addition, Johnson Controls achieved ESG goals by applying smart building solutions (OpenBlue) through collaboration with public institutions. In this process, it utilized incentives that allowed it to gain advantages in the public procurement market. The government can build an evaluation system that allows SMEs to receive recognition for ESG performance when participating in the public procurement market and grant bonus points to ESG-certified companies. This provides an opportunity for SMEs to convert ESG management into practical competitiveness.

Finally, in terms of data management, government-led digital platform construction is needed to support the preparation and disclosure of ESG reports. Milliken & Company strengthened trust with stakeholders through systematic management and transparent reporting of ESG data. The government can improve the effectiveness of ESG management by providing a centralized digital ESG platform that allows SMEs to simplify the data collection and analysis process.

These specific support measures will be an important foundation for SMEs to adopt ESG management and improve sustainability even with limited resources.

(2) Promoting Private Sector Cooperation

For SMEs to successfully adopt ESG management, cooperation with the private sector as well as government support is essential. Along with companies included in the case study, cases of various other companies show that the private sector acts as an important partner in promoting ESG management.

For example, Johnson Controls achieved technological innovation through cooperation with private technology companies in the process of spreading smart building solutions (OpenBlue). In particular, through this cooperation, data analysis and management technology was improved to maximize energy savings and operational efficiency. This shows that innovative technology provided by the private sector can be a key element in the process of ESG management adoption.

Meanwhile, Pulmuone launched sustainable products combining healthy eating and environmental protection and contributed to reducing the carbon footprint of agricultural production through joint projects with partners. This shows that in the food industry as well, cooperation with the private sector can practically contribute to achieving sustainability goals. Hanssem utilized eco-friendly materials from the early stages of product development, cooperating with suppliers using eco-friendly materials to reduce carbon emissions and realized a sustainable furniture production model. This cooperation suggests that cooperation with private partners in the manufacturing sector is also essential for SMEs to achieve ESG goals.

However, it is not easy for SMEs with clear resource limitations to spontaneously build such large-scale networks. Therefore, to supplement this, the government must strengthen its role as an intermediary promoting cooperation between SMEs and the private sector and prepare policies that provide incentives for cooperative projects. Such cooperation will be an important foundation for SMEs to overcome resource and capability limitations and effectively adopt ESG management.

(3) Education Support for Improving ESG Capabilities

The success of ESG management adoption largely depends on the awareness and capabilities of internal and external stakeholders. For SMEs to effectively adopt ESG management, it is essential to improve members' awareness and cultivate specialized personnel who can practice it. Therefore, the government must also step forward in support for strengthening the capabilities of SME members along with financial support.

First, education programs that teach the importance of ESG management and how to implement it, referring to excellent company cases, should be operated for SME executives and employees. For example, Milliken & Company provided training on ESG strategies and goals to more than 500 executives and employees through an internal sustainability summit. Through this, employees came to understand the value of ESG management and were equipped with the capabilities to apply it in practice. These cases become important reference materials for SMEs to prepare the essential foundation for achieving ESG goals on their own.

Second, customized ESG consulting services tailored to industrial characteristics should be provided. Hanssem conducted ESG evaluations for partners and presented improvement directions based on these, strengthening sustainability within the supply chain. This customized approach can provide practical help for SMEs to establish and implement ESG management strategies that fit their industrial context.

Third, regional-based ESG education hubs should be established to support SMEs in developing ESG management capabilities tailored to regional characteristics. Through this, a foundation can be laid for education and consulting to not simply end as one-time events but to take root as a sustainable management culture.

SMEs need to refer to the education and awareness enhancement methods shown in these cases to successfully promote ESG management adoption. The government and private sector should jointly design ESG education programs for SMEs and support capability development to implement them. At the same time, within companies, ESG leadership must be built based on this education, and ESG goals should be integrated into organizational culture through company-wide education and training. When these efforts are combined, SMEs will be able to derive practical effects of ESG management even with limited resources.

5. Conclusions and Implications

5.1. Summary

This study explored strategic measures for SMEs to effectively adopt ESG management and create sustainable performance based on global ESG management success cases. The study focused on presenting practical directions that enable SMEs to secure long-term competitiveness and strengthen sustainability through ESG management. The strengthening of global environmental regulations and increasing demands from stakeholders have made ESG management an essential management strategy rather than a choice. This study proposed measures for SMEs to overcome the limitations of resources and capabilities they face in this trend.

Companies included in the case study effectively utilized the support of the government and private sector in the process of ESG management adoption and performance creation. Milliken & Company improved sustainability through renewable energy transition and data transparency; Mettler-Toledo strengthened supply chain sustainability through the GreenMT program; Johnson Controls realized ESG goals through smart building solutions through technological innovation. These cases provide executable benchmarks for SMEs and show that ESG management lays the foundation for simultaneously achieving economic performance and social responsibility beyond environmental responsibility.

Strategic measures for SMEs include building sustainable supply chains, strengthening data transparency and reliability, and continuous innovation and technology utilization. These measures help SMEs overcome resource shortages and technological capability limitations through government and private sector support to successfully adopt ESG management. In particular, each strategic approach derived from case studies provides practical and specific implementation guidelines that can enable SMEs to continuously create performance even after ESG management adoption.

In conclusion, ESG management is an essential strategy that strengthens corporate sustainability and competitiveness in the long term beyond short-term cost burdens. This study provided a strategic roadmap that enables SMEs to continuously improve performance beyond the initial adoption stage of ESG management. The roadmap shows that ESG management can contribute to forming core corporate values beyond mere regulatory compliance.

5.2. Research Limitations and Future Research Directions

This study presented various strategies for ESG management adoption and performance improvement but has several limitations. First, this study selected a limited number of global ESG success cases as subjects for analysis. This may not sufficiently reflect the specificity of certain industries and regions. Therefore, there may be difficulties in generalizing the research results to all industries and regions. In addition, this study mainly dealt with large corporation-centered cases and showed limitations in specifically presenting strategies specialized for SMEs with limited resources and capabilities. In this regard, it is necessary to additionally explore unique challenges faced by SMEs and customized approaches to overcome them.

The absence of quantitative analysis can also be pointed out as a limitation of this study. This study mainly discussed the relationship between ESG management adoption and performance through a qualitative approach. However, if research that quantitatively verifies the impact of ESG management on financial and non-financial corporate performance is conducted in parallel, the practical effects of ESG management can be more clearly proven. Through this, companies will be able to more convincingly understand the importance and potential value of ESG management and reflect it in management strategies.

Future research should comprehensively analyze ESG success cases from various industries and regions to overcome these limitations and explore customized measures for SMEs in depth. In particular, research that specifically elaborates on policy support measures and cooperation models that enable SMEs to overcome resource shortage issues through cooperation with the government and private sector is needed. Furthermore, research that continuously quantifies the impact of ESG management adoption on corporate performance and demonstrates the practical value of ESG management should be conducted.

This study can be utilized as basic material for SMEs to successfully adopt ESG management and achieve sustainable development. Follow-up research based on this is expected to contribute to the spread of ESG management and strengthening of sustainability.

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