Exploring and Assessing Construction Companies' ESG Performance in Sustainability

Xue Lei [1], Kunjian Zhao[2]

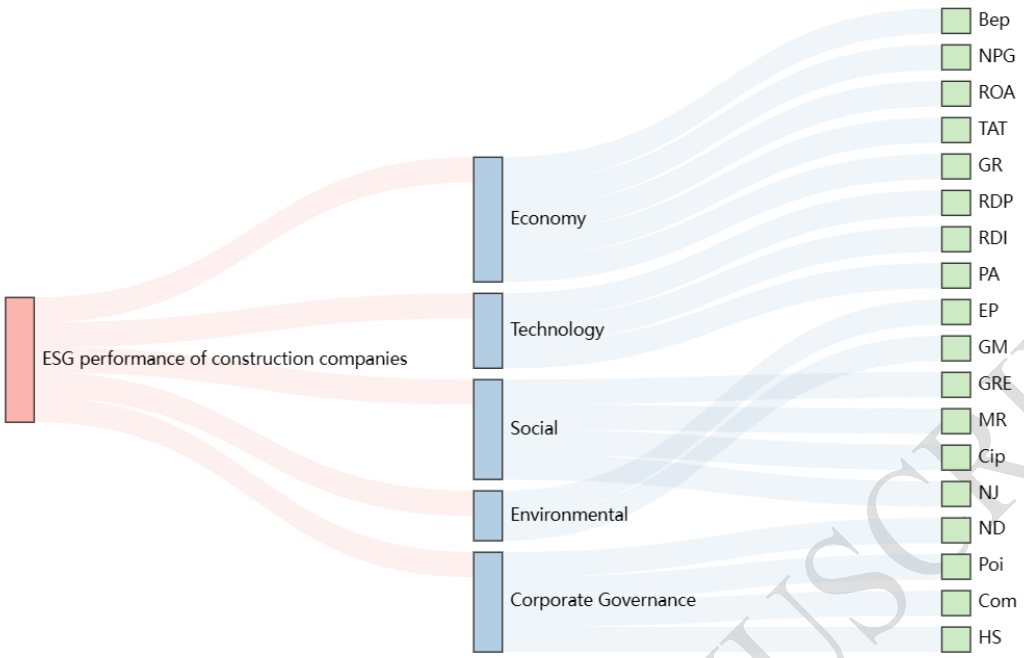
[1] School of Management, Shanghai University, Shanghai 200444, China

[2] School of Management, Wuhan University of Technology, Wuhan 430070, China

[*]Corresponding author: Xue Lei

E-mail: leixue@stu.shmtu.edu.cn

Graphical abstract



ABSTRACT

This study delves into exploring and assessing ESG (Economic, Social, and Governance) performance in construction companies, utilizing China State Construction Group Corporation as a prominent example. The research aims to provide insights into sustainable practices within the construction industry. Employing a comprehensive framework, the study evaluates the economic, technological, environmental, social, and corporate governance aspects of ESG performance. The findings shed light on the specific influence of corporate governance and technology on the overall ESG performance. The China State Construction Group Corporation case study exemplifies notable advancements in these areas. The study concludes with valuable implications and recommendations for fostering enhanced ESG practices in the broader context of construction companies.

Keywords: ESG performance, Comprehensive framework, Sustainable practices, Construction Companies, Implications

1. Introduction

A sustainable development strategy is an essential guideline for China's high-quality development and an important national policy for promoting economic and social development. The construction industry is an essential pillar of the national economy and is crucial to economic growth and high-quality social development (Sun & Liu, 2022; Tao, 2023). However, the construction industry faces many challenges, such as financial risks and financing difficulties caused by market changes and adverse environmental impacts caused by the construction industry as a significant carbon emitter (Zhao et al., 2023). Therefore, while pursuing the maximization of benefits, construction enterprises should also assume responsibility for society and the environment.

ESG performance evaluation is a crucial tool for evaluating the sustainable development of enterprises, which incorporates non-financial factors such as environmental, social, and governance factors into business decision-making to promote enterprises to maximize social benefits. This evaluation method has become the core index to measure the sustainable development ability of enterprises. However, due to the late start of ESG performance evaluation research, the imperfect evaluation system, the lack of diversity of evaluation methods, and the lack of unified ESG evaluation standards in the construction industry, it is urgent to adopt a scientific and reasonable ESG performance evaluation model. At the same time, China's State-owned Assets Supervision and Administration Commission also requires central management enterprises to establish and improve the ESG evaluation system, highlighting the urgency of building an ESG evaluation system in the construction industry.

So, how should ESG be constructed and evaluated for construction companies? Based on this, the ESG performance evaluation system of construction enterprises is constructed to provide support for construction enterprises to achieve sustainable development goals. This study selected China State Construction Group Co., Ltd. as the sample enterprise, collected relevant ESG index data, used the entropy weight method to determine the weight of each evaluation index, and used the TOPSIS model to evaluate and analyze sample ESG performance, and finally, put forward relevant suggestions.

In the context of this study, the marginal contributions are primarily manifested in several aspects: Firstly, by innovatively employing the entropy weight method and TOPSIS model, an ESG performance evaluation model is constructed, providing a scientifically rational approach for construction enterprises to achieve sustainable development goals. Secondly, by selecting China State Construction Group Co., Ltd. as a sample enterprise within a practical context, the proposed ESG performance evaluation model is concretely applied, offering readers a feasible operational framework, and simultaneously providing valuable insights for other construction enterprises. Lastly, through an in-depth assessment and analysis of the ESG performance of the sample enterprise, this study puts forward specific recommendations, offering clear guidelines for construction enterprises to enhance their ESG performance. In summary, this research not only lays the methodological foundation for constructing a scientifically rational ESG performance evaluation system for construction enterprises but also, through empirical case studies, provides beneficial guidance for practical implementation, with the potential to positively impact the sustainable development of the construction industry.

2. Literature review

Performance evaluation is essential for improving efficiency and sustainability in the construction industry. Kazaz et al. (2023) optimized flocculant dosage to enhance stormwater treatment and minimize environmental impacts of construction (Kazaz et al., 2023). Hernández et al. (2023) used life cycle assessment to evaluate sustainability metrics of modern construction methods, showing reductions in carbon emissions and waste (Hernández et al., 2023). Li et al. (2023) identified key factors influencing enterprises' greenwashing behaviors under multi-agent interactions in China's construction industry (X. W. Li et al., 2023). Wang et al. (2023) evaluated green renovation methods for multi-story houses in severe cold climates of China using the entropy-TOPSIS method (Wang et al., 2023).

Zhang et al. (2023) assessed carbon emission efficiency in China's construction industry using the super-efficient SBM model, finding regional disparities and technical progress as main drivers (Zhang et al., 2023). Xu et al. (2023) evaluated regional differences in construction safety performance in China using three-stage DEA analysis to enhance sustainable safety practices (Xu et al., 2023). Bajpai et al. (2023) identified critical digitalization risks in Indian construction using Fuzzy DANP and Grey TOPSIS for project management (Bajpai et al., 2023). Lux et al. (2023) proposed using deep learning networks to estimate composition of recycled aggregates for sustainability monitoring in construction (Lux et al., 2023).

Owolabi et al. (2023) experimentally evaluated vibration properties of a timber-steel composite floor system for serviceability assessment (Owolabi et al., 2023). Guo et al. (2023) developed an integrated framework using SEM to evaluate post-COVID construction project performance in China (Guo et al., 2023). Son & Khoi (2023) optimized construction management for cost, time, quality and safety using the AOSMA algorithm (Son & Khoi, 2023). Negash et al. (2023) developed a hierarchical framework using FISM and BWM to assess waste management strategy effectiveness in Somaliland construction (Negash et al., 2023).

Li et al. (2023) examined how technology recombination impacts construction firm performance in China using text mining and panel data analysis (K. J. Li et al., 2023). Abdellatif et al. (2023) conducted a scientometric review of self-healing cementitious composites for sustainable construction applications (Abdellatif et al., 2023). Ye et al. (2023) evaluated parcel-level rural industrial land use performance in China using the smart shrinkage concept and optimization strategies (Ye et al., 2023). Kazaz et al. (2023) provided flocculant selection and dosage guidance for stormwater treatment in construction (Kazaz et al., 2023).

Overall, the literature highlights the need for standardized sustainability metrics, regional safety assessments, optimized technologies like AI and robotics, circular economy practices, and integrated performance frameworks to improve construction efficiency. However, ESG performance evaluation has been less frequently addressed. ESG evaluation can help enterprises identify and prevent risks in sustainable development, provide a basis for strategic decision-making, and guide enterprises to achieve more sustainable growth and enhance market competitiveness. It is an essential means to assess enterprise risks and a reference for stakeholders to make investment decisions.

ESG performance evaluation is a method to measure the impact and contribution of enterprises in the three aspects of environment, society, and governance, which plays an essential role in promoting the long-term development of enterprises and fulfilling their social responsibilities (Jin & Lei, 2023; Li et al., 2021; Li, 2023). However, different industries and fields may require different ESG performance evaluation indicators and methods, so they need to be selected and improved according to specific circumstances. Sun et al. (2019) established a sustainable development evaluation index system suitable for power enterprises by referring to sustainable development goals and ESG evaluation indexes of listed companies (Sun et al., 2019). Osorio-Tejada et al. (2022) Select and construct the social performance evaluation of transport services based on the needs of stakeholders (Osorio-Tejada et al., 2022). Chen (2022) took SF Holdings as an example to establish an ESG evaluation index system suitable for the express delivery industry (Chen et al., 2022). Hou et al. (2022) proposed an ESG performance evaluation framework for the construction industry that includes four aspects: economy, society, technology, and environment (Hou & Yu, 2022). Based on the index system and evaluation method of Hou et al. (2022), this paper expands the index system to five aspects to improve the ESG performance evaluation scheme of construction enterprises.

3. Indicator system

In this paper, based on the four-dimensional index system constructed by Hou et al. (2022), the corporate governance dimension is added to make the evaluation system complete and more comprehensive [10]. Evaluating the ESG performance of construction enterprises aims to provide reference and support for them to realize sustainable development.

3.1. Economic dimension

Construction enterprises must have strong profitability to realize sustainable development. Evaluating the profitability of an enterprise is of great significance to the ESG performance of construction enterprises. On the one hand, good profitability can provide financial support for the subsequent development of the enterprise and can effectively cope with systematic risks brought by market changes; on the other hand, excellent profitability can improve the enterprise's competitiveness in the market. Therefore, this paper selects five indicators in the economic dimension to assess the ESG performance of construction enterprises, which comprehensively reflect the profitability and financial status of enterprises and provide an essential basis for evaluating their ESG performance. The specific indicators and their meanings are shown in **Table 1**.

Table 1. Indicator system

Dimension	Indicator	Indicator Name
Economic	Bep	Basic earnings per share
	NPG	Net Profit Growth Rate
	ROA	Return on Assets
	TAT	Total Asset Turnover Ratio
	GR	Gearing Ratio
Technology	RDP	Number of R&D personnel
	RDI	Amount of R&D investment
	PA	Patent Authorization
Environmental	EP	Coverage of environmental protection training
	GM	Proportion of green bulk material purchases
Social	GRE	Growth rate of the number of active employees
	MR	Mortality rate of 100-million-yuan output value
	Cip	Capital invested in production safety
	NJ	Number of jobs for migrant workers
Corporate Governance	ND	Number of Directors
	Poi	Proportion of independent directors
	Com	Whether the chairman and general manager are combined
	HS	Proportion of shares held by the largest shareholder

3.2. Technology dimension

Technological innovation is critical for construction companies to gain advantages in the fierce market competition. It can significantly enhance the company's core competitiveness and enable updating production equipment and the continuous optimization of construction technology to improve construction efficiency and reduce operational expenses. Therefore, this paper selects three indicators in the technology dimension to assess the ESG performance of construction enterprises, which comprehensively reflect the enterprise's technological innovation and application capabilities and provide essential references to enhance their ESG performance. Table 1 lists the technology dimension indicators and their meanings in detail.

3.3. Environmental dimension

The environment is the material basis for human survival and development, and while pursuing economic benefits, construction enterprises should also pay attention to protecting the environment. The fulfillment of environmental responsibility by the enterprise indicates that it integrates the concept of environmental protection into its operation, which is very important for promoting the sustainable development of the environment. Two indicators are selected in the environmental dimension to assess the ESG performance of construction enterprises. These comprehensively reflect the level of enterprises' cultivation of employees' environmental awareness and establishment of environmental protection concepts and provide an essential basis for assessing their environmental performance. The specific environmental dimension indicators and their meanings are shown in Table 1.

3.4. Social dimension

Enterprises should not only consider their interests in development but also pay attention to the needs of social stakeholders and assume corresponding social responsibilities. Construction enterprises play an essential role in social development, and they can provide impetus for social progress by building infrastructure and creating employment. In order to assess the ESG performance of construction enterprises, this paper selects four indicators in the social dimension to comprehensively reflect the level of enterprises' fulfillment of social responsibility, which provides an essential basis for assessing the social performance of enterprises and the specific social dimension indicators and their meanings are shown in Table 1.

3.5. Corporate Governance Dimension

Corporate governance is an essential factor in guaranteeing the sustainable development of enterprises. Construction enterprises should establish a scientific and reasonable corporate governance structure, improve internal control and risk prevention mechanisms, and safeguard the legitimate rights and interests of the company, shareholders, and other stakeholders (Fan & Chu, 2019; Jin et al., 2023; Jin et al., 2020; Ma & Cui, 2023; Shi et al., 2023). In this paper, four indicators are selected in the corporate governance dimension to assess the performance of enterprises in corporate governance and risk control, to provide an essential basis for assessing the level of corporate governance, and to comprehensively reflect the contribution of construction enterprises in terms of responsibility, transparency, and compliance. The specific corporate governance dimension indicators and their meanings are shown in Table 1.

To summarize, this paper selects 18 evaluation indicators from the five dimensions to construct construction enterprises' ESG performance evaluation index system (as shown in **Table 2**).

Table 2. Evaluation indicator system

Goal Layer	standardized layer	Indicator Layer	Indicator Properties	Indicator Symbol
ESG performance of construction companies	Economic	Bep	positive	C1
		NPG	positive	C2
		ROA	positive	C3
		TAT	positive	C4
		GR	negative	C5
	Technology	RDP	positive	C6
		RDI	positive	C7
		PA	positive	C8
	Environmental	EP	positive	C9
		GM	positive	C10
		GRE	positive	C11
	Social	MR	negative	C12
		Cip	positive	C13
		NJ	positive	C14
	Corporate Governance	ND	positive	C15
		Poi	positive	C16
		Com	positive	C17
		HS	positive	C18

4. Evaluation model

In this paper, the entropy weight method is used to construct the index weights of construction companies' environmental, social, and governance (ESG) performance. The matrix consists of m assessment objects and n assessment indicators. In order to reduce the influence of indicator units, it is necessary to normalize the raw data. In addition, it is essential to invert the negative indicators, while the positive indicators can be normalized using the following formula:

$$y_{ij} = \frac{x_{ij} - x_{jmin}}{x_{jmax} - x_{j\mathrm{min}}} \quad (1)$$

The reverse processing formula for negative indicators is as follows:

$$y_{ij} = \frac{x_{jmax} - x_{ij}}{x_{jmax} - x_{j\min}} \tag{2}$$

Next, the weight of each object on each indicator is calculated with the following formula:

$$P_{ij} = \frac{y_{ij}}{\sum_{i=1}^{m} y_{ij}} \tag{3}$$

Where P_{ij} denotes the weight of the ith object on the jth indicator.

Then, to calculate the information entropy of each indicator, the formula is as follows:

$$k = \frac{1}{lnm} \tag{4}$$

$$e_j = -k \sum_{i=1}^{m} P_{ij} \, ln(P_{ij}) \tag{5}$$

Where e_j denotes the information entropy of the jth indicator, and k is a constant that satisfies $0 \leq e_j \leq 1$.

Next, the coefficient of variation of each indicator is to be calculated with the following formula:

$$g_j = 1 - e_j \tag{6}$$

Where g_j denotes the coefficient of variation of the jth indicator.

Finally, to calculate the weight of each indicator, the formula is as follows:

$$w_j = \frac{g_j}{\sum_{j=1}^{n} g_j} (0 < w_j < 1) \tag{7}$$

where w_j denotes the weight of the jth indicator.

In this study, the Approximate Ideal Solution Ranking Method (TOPSIS) is used to assess the performance of construction companies in terms of environmental, social, and governance (ESG). It is a comprehensive distance assessment tool based on the proximity of the assessment object to the ideal target. The primary strategy is to set up positive and negative ideal solutions, calculate the interval between each sample and these two ideal solutions to obtain their relative proximity to the ideal solution, and then rank the performance of all the assessed objects. The detailed steps are as follows: construct the weighted norm matrix, and the attributes are vector normalized, i.e., each column element is divided by the number of norms of the current column vector.

$$z_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{n} x_{ij}^2}} \tag{8}$$

Where z_{ij} denotes the normalized value of the ith object on the jth indicator.

Then, the proximity between each metric and the positive and negative ideal solutions is calculated with the following formula:

$$D_i^+ = \sqrt{\sum_{j=1}^{n} w_j \cdot \left(z_j^+ - z_{ij}\right)^2} \tag{9}$$

$$D_i^- = \sqrt{\sum_{j=1}^{n} w_j \cdot \left(z_j^- - z_{ij}\right)^2} \tag{10}$$

Finally, the closeness of each evaluation object to the optimal program is calculated with the following formula:

$$C_i = \frac{D_i^-}{D_i^+ + D_i^-} \tag{11}$$

Where the value of C_i ranges from [0, 1], the closer to 1, means the higher the rating of the sample.

5. Case studies

5.1. Data sources

The China State Construction Group Corporation (CSCGC) case study discusses its practice and effectiveness in ESG. The company is a leading building construction and real estate development enterprise in China, and its sustainable development strategy is relevant to the same industry. Data from the company's 2017-2021 annual report, sustainability report, and the Cathay Pacific database are used to comprehensively analyze the ESG performance of state-owned construction companies. Indicators are selected based on data availability, continuity, and adequacy; thus, the company's ESG level is assessed.

5.2. ESG Performance Evaluation

The weight of each evaluation index on corporate ESG performance is calculated according to equations (1)-(7) and listed in **Table 3**. The calculation results show that the corporate governance dimension has the highest weight, amounting to 41.283%, which indicates that the level of corporate governance significantly impacts the ESG performance of construction enterprises. Corporate governance can encourage enterprises to improve the internal control mechanism, optimize the decision-making process, strengthen risk prevention and control, and then realize the sustainable development of enterprises. In contrast, the weights of the four dimensions of economy, technology, environment, and society are lower, 18.392%, 19.525%, 4.725%, and 16.074%, respectively, but this does not mean that business management, technological innovation, environmental performance, and social responsibility are irrelevant to the enhancement of corporate ESG performance. The degree of influence of each indicator on ESG performance can be seen in **Figure 1**, in which Com and ND occupy a high proportion of corporate governance. At the same time, the technology level RDP and PA embodied in the number of R&D personnel and the number of patents obtained also rank high, which indicates that technological innovation and corporate governance are the key factors influencing the ESG performance of enterprises. In addition, the value of GM information entropy is zero, which indicates that the case enterprise insists on green procurement every year, which its annual report can confirm. In summary, the key to improving the ESG performance of construction firms lies in maintaining the momentum of technological innovation and continuously optimizing corporate governance.

Table 3. Evaluation indicator weights

Dimension	Indicator	Information Entropy	Information Utility Value	Weight (%)	
Economy	Bep	0.798	0.202	3.755	18.392
	NPG	0.807	0.193	3.579	
	ROA	0.837	0.163	3.039	
	TAT	0.780	0.220	4.097	
	GR	0.789	0.211	3.922	
Technology	RDP	0.595	0.405	7.536	19.525
	RDI	0.734	0.266	4.946	
	PA	0.621	0.379	7.043	
Environmental	EP	0.746	0.254	4.725	4.725
	GM	1.000	0.000	0.000	

Social	GRE	0.788	0.212	3.935	16.074
	MR	0.806	0.194	3.607	
	Cip	0.768	0.232	4.314	
	NJ	0.773	0.227	4.218	
Corporate Governance	ND	0.013	0.987	18.339	41.283
	Poi	0.863	0.137	2.553	
	Com	0.003	0.997	18.541	
	HS	0.900	0.100	1.850	

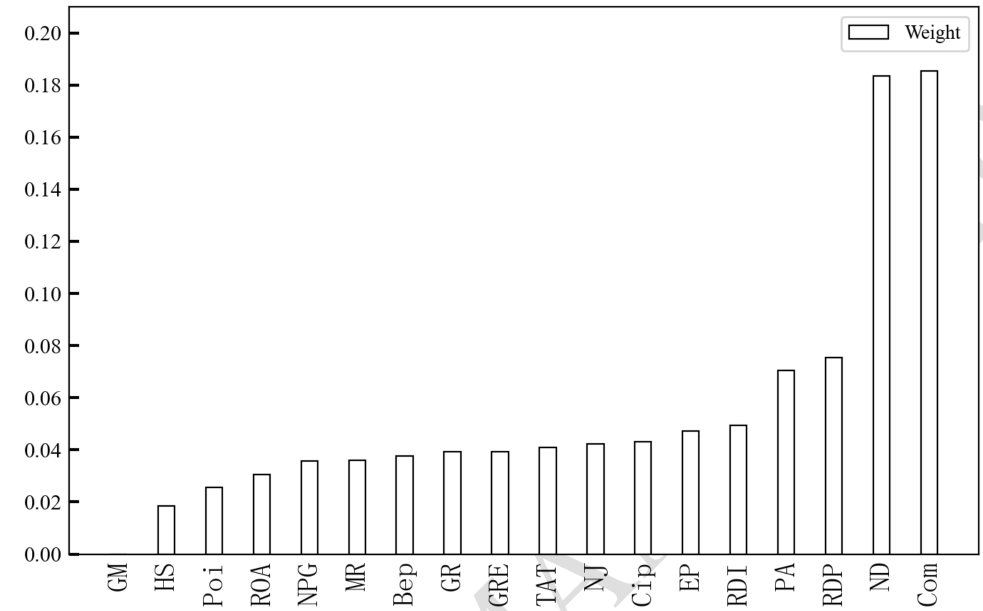


Figure 1. Distribution of evaluation index weight values

Table 4. Comprehensive Score Index

Year	Positive ideal solution distance (D+)	Negative ideal solution distance (D-)	Comprehensive evaluation value	Sort
2017	0.938	0.206	0.180	5
2018	0.871	0.341	0.281	4
2019	0.798	0.358	0.310	3
2020	0.537	0.682	0.560	2
2021	0.491	0.849	0.634	1

This paper utilizes formulas (8)-(11) to calculate the comprehensive evaluation value of the ESG performance of enterprises for five years and presents it in **Table 4**. The higher the evaluation value, the better the ESG performance, and the evaluation value sorted to 1 indicates the best ESG performance. The case enterprise continuously improved its ESG performance during these five years and reached the highest level in 2021. This indicates that the enterprise has taken a series of practical measures, including enhancing its independent innovation capability, fulfilling its social responsibility, and improving its business philosophy and corporate governance structure, thus steadily enhancing its ESG performance and laying a solid foundation for sustainable development in the future. From Table 4, we can see the trend of change and improvement in enterprises' ESG performance. The study also confirms a close connection between ESG performance and the long-term development of enterprises. Good ESG performance can help enterprises reduce operational risks, improve market image, and obtain more power for high-quality development.

Table 5. ESG Performance Evaluation Results

Year	Economic	Technology	Environment	Social	Corporate Governance
2017	0.237	0.000	0.000	0.154	0.206
2018	0.373	0.083	0.171	0.455	0.210
2019	0.464	0.227	0.317	0.449	0.215
2020	0.729	0.600	0.732	0.622	0.485
2021	0.737	1.000	1.000	0.626	0.524

Based on the five dimensions of economy, technology, environment, society, and corporate governance, the ESG performance of the case enterprise is evaluated for five years, and the evaluation results and change trends are presented in **Table 5** and **Figure 2**. The economic development aspect of the enterprise has been improving in these five years, with both operating revenue and net profit maintaining a year-on-year increase, which is consistent with the overall ESG performance trend and reflects the enterprise's operation and management level improvement. Enterprises have also achieved remarkable results in technological innovation, with R&D investment and R&D achievement indicators showing a steady upward trend, and technological innovation performance has improved significantly, helping to strengthen core competitiveness. Enterprises have also demonstrated a positive attitude towards environmental management and social responsibility, with indicators such as the coverage rate of environmental protection training and the proportion of public welfare expenditure showing significant improvement, indicating that enterprises are paying more attention to fulfilling their environmental and social responsibilities. Enterprises have also made some improvements in corporate governance, with corporate governance indicators such as the setting of independent directors and specialized board committees being strengthened and governance performance steadily improving, laying the foundation for enhanced ESG strength. In conclusion, the case enterprises have made significant progress in economic, technological, environmental, social, and corporate governance aspects, and their comprehensive ESG strength has been significantly enhanced, laying a solid foundation for the enterprises to realize green transformation in the future.

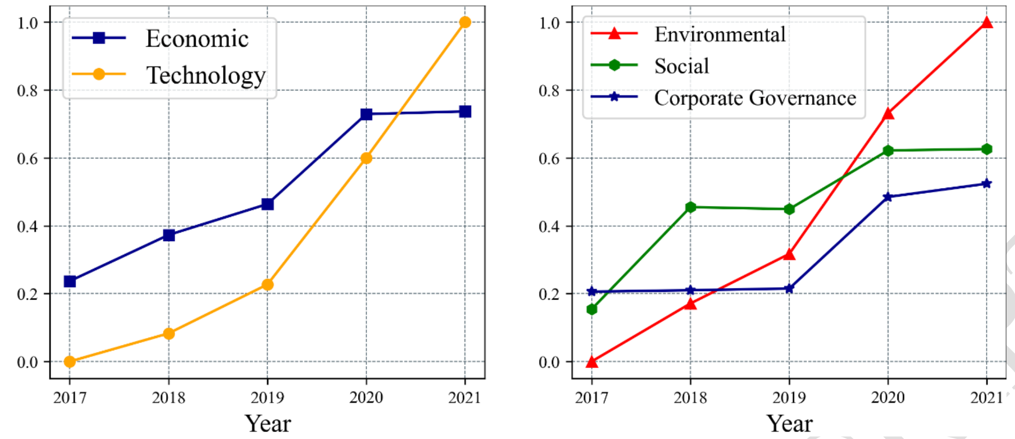


Figure 2. Trend of ESG Performance

6. Conclusions and Recommendations

6.1. Conclusions

In conclusion, anchored in the principles of sustainable development, this study adeptly formulates a robust ESG performance evaluation system tailored for construction enterprises. The multidimensional framework meticulously integrates economic, social, technological, environmental, and corporate governance dimensions, presenting a holistic perspective on the enterprise's commitment to sustainability. Through a meticulous case study involving a representative state-owned construction enterprise, the study employs a sophisticated entropy weight-TOPSIS model to rigorously assess the five-year ESG performance.

The results of the evaluation underscore the paramount influence of corporate governance and technology on the overall ESG performance of the enterprise. Significantly, the case enterprise manifests notable advancements across all dimensions, signifying substantial improvements in economic practices, technological innovation, environmental stewardship, social engagement, and corporate governance. The comprehensive fortification of ESG strength attests to the commendable dedication to sustainable business practices.

This optimistic trajectory establishes a firm groundwork for the enterprise's prospective endeavors in steering towards a green transformation. The study not only furnishes valuable insights into the present state of ESG performance within the construction industry but also provides a strategic roadmap for other enterprises aspiring to undertake sustainable and responsible practices. In sum, the findings reiterate the significance of holistic sustainability approaches, emphasizing their role in effecting meaningful and enduring transformations within construction enterprises.

6.2. Recommendations

On this basis, the study puts forward some countermeasure suggestions that can potentially enhance the ESG performance of construction enterprises from the following five aspects:

(1) Enhance economic efficiency. Construction enterprises can establish a scientific project cost prediction system, use digital management tools to refine project operation data, monitor project cost status in real-time, and promptly discover and regulate cost risks. At the same time, the application of information technology is needed to build a comprehensive quality management system, implement quality accountability, strengthen the quality control process, and systematically improve project quality. It can also introduce strategic planning mechanisms, establish a rotation system performance appraisal system to stimulate the vitality of the management team and improve the enterprise management mechanism.

(2) Strengthen technological innovation. Construction enterprises can adopt the collaborative innovation model of production, learning, and research, establish cooperation platforms with universities, and introduce high-end technical talents to support enterprise technological innovation. It can also increase investment in technology research and development, strive to obtain the certification of high-tech enterprises, and enjoy the support of tax incentives. At the same time, it establishes an employee innovation incentive mechanism to encourage internal innovation and enhance R&D efficiency. In addition, select new technology areas to carry out strategic investment layouts, promote the transformation of technological achievements, and continuously improve core competitiveness.

(3) Fulfillment of environmental responsibility. Construction enterprises should establish a standardized environmental protection management system for noise, exhaust gas, aerosols, and other

pollution management for the construction process. Low-noise construction equipment can be used, and shelters can be set up for sound insulation. At the same time, choose low-carbon and environmentally friendly building materials and processes, optimize the energy use structure, increase the proportion of clean energy, and reduce the negative impact of construction on the environment. In addition, establish a green training mechanism for employees to enhance environmental awareness.

(4) Strengthen human resource management. Construction companies can stabilize the backbone team by establishing a flexible salary system and implementing equity incentives, year-end incentives, and other measures. It can also establish an intelligent talent training system, create specialized training institutions, plan career development routes, provide customized employee training, and make the best use of talent. In addition, it should actively create an inclusive and open corporate culture, advocate the concept of employee care, enrich employee life, and improve corporate cohesion.

(5) Improve corporate governance. Construction companies can establish a scientific and reasonable corporate governance structure and clarify each functional department's division of powers and responsibilities. It can also optimize the board of directors' structure by appointing independent directors with professional backgrounds to improve decision-making efficiency and independence. In addition, it establishes and improves internal audit, risk control, and other departments, improves the internal control system, and strengthens the management and control of business risks. At the same time, an information disclosure system is established to realize the transparency of corporate governance.

7. Research Limitations

There are some limitations in the study. Firstly, although the entropy weight-TOPSIS method has its merits in performance evaluation, there are methodological limitations, including the dependence on the determination of weights and the need to validate its accuracy further. Second, the data sources used in the study are limited to China State Construction Group Corporation, which may differ from the entire construction industry. Hence, future research needs to consider a broader range of data sources to improve the comprehensiveness of the evaluation. In addition, the ESG indicator system in the study can be further improved by introducing more relevant indicators to capture the sustainability performance of the firms more comprehensively. Finally, the study focuses on a specific case, and how to apply the methodology to other construction firms to form a generalized ESG performance evaluation framework needs to be further studied and explored.

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Conflict of Interest

The authors declare no conflict of interest.

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