

ESG Disclosure of Listed Companies in China's Pharmaceutical Industry under the "Dual Carbon" Goal

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Abstract: As the problem of global climate change becomes increasingly serious, the Chinese government has proposed a "dual carbon" goal of achieving carbon peak by 2030 and carbon neutrality by 2060. Environmental, social and governance (ESG) is no longer an emerging issue, and governments, regulators, investors and consumers are all placing different levels of demands on companies within this concept. The pharmaceutical industry is linked to national economies and people's livelihoods, while at the same time being characterised by high environmental impact, high energy consumption and complex pollutant components, etc. Against the backdrop of the "double carbon" target, ESG disclosure by listed companies in the pharmaceutical industry is particularly important. Based on the existing literature and empirical data, this study analyses the status quo and problems of ESG disclosure of listed companies in China's pharmaceutical industry, and puts forward countermeasures and suggestions to optimise ESG disclosure of listed companies in the pharmaceutical industry, in order to provide theoretical references and practical guidance for promoting the green transformation and high-quality development of China's pharmaceutical industry.

Keywords: Dual-Carbon Goal; China's Pharmaceutical Industry; Listed Companies; ESG Disclosure; Quality Assessment

1. Introduction

Under the severe situation of global climate change, the Chinese government has proposed a "dual-carbon" goal, aiming to promote a comprehensive green transformation of the national economy and social development. Enterprises, as the main body of economic

activities, need to fulfill their social responsibilities, reduce emissions and improve efficiency, and promote sustainable development. Environmental, social and governance (ESG) disclosure has become an important manifestation of corporate transparency and integrity, and is also an important channel for investors to understand the sustainable development capability and social responsibility fulfillment of enterprises.

The pharmaceutical industry has a bearing on the national economy and people's livelihood, and is an important safeguard for people's health and social stability. At the same time, the pharmaceutical industry is also characterized by high pollution, high energy consumption and complex pollution components. Pharmaceutical manufacturing industry as a high-level technology cross-sector, its environmental activities and control occupy an important part of the country's major enterprises. The specificity and complexity of the production and operation of the pharmaceutical industry determines the differences between its internal control information disclosure and other enterprises. In the context of the "dual-carbon" goal, the pharmaceutical industry needs to actively explore the path of green production and low-carbon development to realize sustainable development.

However, there are still many problems with ESG information disclosure by listed companies in China's pharmaceutical industry, with varying quality of disclosure and lack of systematic and comprehensive disclosure content, making it difficult to meet stakeholders' needs. In recent years, the number of Chinese companies disclosing ESG information has been increasing year by year, but the quality of the report disclosure varies, mostly with qualitative glorification content, lacking inter-company comparability. This is contrary to the original

purpose of the system, which is to require companies to fulfill their social responsibilities and to strengthen financial regulation to prevent financial crises. Therefore, studying the quality of ESG disclosure in the pharmaceutical industry under the “dual-carbon” goal will not only help to promote the industry’s green transformation and high-quality development, but also enhance corporate transparency and competitiveness, and satisfy regulatory and social expectations.

2. Literature Review

In recent years, scholars at home and abroad have conducted extensive research on corporate ESG disclosure. As the concept of sustainable development continues to deepen, the ESG evaluation system provides a new standard for scrutinizing corporate sustainable development behaviors, performance and potential. The ESG disclosure practices of listed companies are shifting from quantitative growth to quality improvement, from voluntary to mandatory disclosure, and from single exposure to comprehensive disclosure.

2.1 ESG Disclosure Study

2.1.1 Early exploratory phase (Before 2000)

Gray, Kouhy, and Lavers introduced the concept of CSR reporting and found that CSR reporting contributes significantly to transparency and accountability [1]. Ullmann demonstrated that corporate disclosure of social responsibility can lead to improved financial performance, emphasizing the critical importance of information disclosure [2].

2.1.2 Research deepening and expansion (After 2000)

The Global Reporting Initiative (GRI) launched the G3 Guidelines in 2006, which standardize corporate ESG disclosure standards and promote the standardization and normalization of ESG disclosure globally [3]. The International Organization for Standardization (ISO) released the international standard for CSR, ISO 26000 in 2010, providing guidelines for global corporations in terms of social responsibility and sustainable development, which promotes the standardization of CSR disclosure [4]. Clarkson, Overell, and Chapple pointed out that regulations, market pressures, and stakeholder demands are the main factors that drive corporations to make ESG disclosures [5]. Eccles, Ioannou, and Serafeim suggested that high-quality ESG disclosure can help enhance

firms’ market performance and investor trust [6]. Liu and Lee showed that high-quality ESG disclosure can promote firms’ innovations in technology and products [7]. Li et al. concluded that green governance, although it cannot bring short-term profits, helps enhance the long-term value and growth ability of enterprises, while pointing out that the overall level of green governance of listed companies is low [8]. Wang and Zhang pointed out that the domestic ESG indicator system lacks support, the evaluation process is not transparent, the indicator setting is qualitative, and the evaluation method is subjective [9]. Deng and Bai found that China has the problem of not specifying the scope and standard of information disclosure, and only puts forward generalized requirements for some contents [10]. Zhang and Xiao point out that the breadth and depth of information disclosure by listed companies in China is uneven and rarely involves negative information, which requires both top-down and bottom-up participation to improve ESG performance [11].

2.2 Research on “Dual-Carbon” Goals and Corporate Behavior

2.2.1 Initial exploration (By 2020)

Porter and van der Linde proposed the theory of compatibility between environmental protection and competitiveness, emphasizing that environmental policies can enhance the competitiveness of firms by fostering innovation [12]. Stern presented the significant impacts of climate change on the global economy and called for action by firms and governments to address climate change [13].

2.2.2 Policy impact studies (Post-2020)

Zhang and Liu pointed out the necessity of policy-driven corporate emission reduction and green transformation under China’s “dual-carbon” target, especially in high-emission industries [14]. Chen and Hao analyzed the impact of the “dual-carbon” target on ESG disclosure of Chinese corporations and suggested that policy has a positive effect on the fulfillment of corporate environmental responsibility [15]. Zheng and Chang suggest that the pilot policy of low-carbon cities promotes the fulfillment of corporate environmental social responsibility through the enhancement of green technological innovation and green environmental protection investment [16]. Wang et al. point out that the pilot policy for low-carbon cities improves the ESG performance of enterprises by increasing

the level of green technology innovation and environmental governance investment. Local governments should play a guiding role in the policy to categorize and promote the low-carbon transformation of heavily polluting industries [17]. Han emphasizes the promotion of all-round linkage between authorities, financial institutions, and enterprises to ensure that the disclosure system is put into practice and to develop ESG disclosure standards in line with China's national conditions [18].

2.3 Research on ESG Disclosure in Pharmaceutical Industry

2.3.1 Early attention (Before 2020)

Lo and Sheu explored the global ESG disclosure practices of the pharmaceutical industry and analyzed the impacts of regulations and markets in various countries [19]. Choi and Wang examined the CSR of the pharmaceutical industry, pointing out the industry's unique needs and challenges in terms of product safety, environmental impacts, and social responsibility [20]. Kolk explored the environmental reporting practices of pharmaceutical companies, emphasizing the importance of environmental disclosure in the industry and analyzing the lack of transparency in the industry [21].

2.3.2 Policy drivers and innovation (Post 2020)

Liu and Liu examined the ESG disclosure of the Chinese pharmaceutical industry in the context of the "dual-carbon" target, proposed the role of policies in promoting the industry's green transformation, and analyzed the effects of policy implementation [22]. Chen & Jiang explored the green innovation and disclosure strategies of the pharmaceutical industry under the "dual-carbon" goal and analyzed the innovative practices and challenges of corporate environmental protection and social responsibility [23]. Li found that high-quality social responsibility accounting disclosure in the pharmaceutical industry can significantly improve the economic efficiency of enterprises, but the level of social responsibility accounting disclosure of enterprises in this industry is generally low [24]. Based on a fuzzy qualitative comparative analysis, Nie points out that there is much room for improvement in environmental information disclosure of enterprises in the heavy pollution industry and suggests that stricter disclosure standards should be formulated [25].

To summarize, although scholars have

conducted a lot of research on corporate ESG disclosure, there is still a lack of systematic research on ESG disclosure of listed companies in China's pharmaceutical industry under the background of the "dual-carbon" goal. In particular, the unique production and operation characteristics and environmental impacts of the pharmaceutical industry require the construction of an ESG disclosure evaluation system that is more suitable for the characteristics of the industry and the proposal of targeted optimization.

3. Current Situation of ESG Disclosure of Listed Companies in China's Pharmaceutical Industry

3.1 ESG Disclosure Participation

In recent years, listed companies in China's pharmaceutical industry have shown a positive development trend in environmental, social and corporate governance (ESG) disclosure. From 2013 to 2023, the overall number of ESG information disclosures by Chinese listed companies has increased year by year, reflecting the increasing importance that companies have attached to the concept of sustainable development. ESG disclosure has shown a trend of transformation from quantitative growth to quality improvement, from voluntary disclosure to mandatory disclosure, and from single exposure to comprehensive disclosure. Some enterprises in the industry have already started to proactively publish specialized ESG reports, marking the enhancement of enterprises' willingness to disclose on their own. These reports mostly cover enterprises' initiatives and achievements in environmental protection, social responsibility and corporate governance, showing their sustainable development capabilities from different angles. As shown in **Table 1**, there are 332 A-share listed companies in China's pharmaceutical industry in 2023, of which 121 disclose ESG-related reports (including ESG reports, social responsibility reports and sustainability reports) in 2023, with a disclosure rate of 36.45%, a rate that is in the middle of the entire manufacturing industry.

Pharmaceutical manufacturing, as an advanced technology cross-cutting industry, has a significant portion of environmental activities and controls among the country's major corporations. Studies have shown that good ESG disclosure has a significant positive contribution

to the value of pharmaceutical manufacturing firms. Specifically, ESG disclosure can enhance long-term corporate competitiveness and market value by enhancing corporate reputation, reducing financing costs and attracting investors.

Table 1. ESG Disclosure Participation of Listed Companies in China's Pharmaceutical Industry, 2023

Item	Number/ Percentage
Number of listed companies in the industry (number)	332
Number of companies publishing ESG-related reports (number)	121
ESG-related report disclosure rate (%)	36.45

Data source: ESG Industry Report from China Lianhe Credit Rating Co., Ltd.

Although the participation of Chinese pharmaceutical industry listed companies in ESG disclosure has increased, as shown in **Figure 1**, the ESG ratings of most pharmaceutical industry listed companies are moderately low, and there is still a lot of room for improvement in the disclosure level of the indicators of the industry companies as a whole.

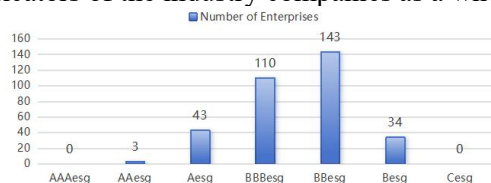


Figure 1. Distribution of ESG Ratings of Listed Companies in China's Pharmaceutical Industry, 2023

Data source: ESG Industry Report from China Lianhe Credit Rating Co., Ltd.

3.2 Distribution of ESG Disclosure Content

Under the background of “dual-carbon” target, the ESG disclosure of Chinese listed companies in the pharmaceutical industry presents different characteristics in the three dimensions of environment, society and governance. ESG disclosure of Chinese listed companies in the pharmaceutical industry in each dimension in 2023 is shown in **Table 2**.

Table 2. Disclosure of ESG Dimensions of Listed Companies in China's Pharmaceutical Industry, 2023

Item	Percentage (%)
Indicator E disclosure rate	22.83
Indicator S disclosure rate	42.25
Indicator G disclosure rate	84.68

Data source: ESG Industry Report from China Lianhe Credit Rating Co., Ltd.

In the environmental dimension, the disclosure content of pharmaceutical enterprises mainly includes environmental management policies, pollutant synergistic control, energy resource utilization, environmental protection investment and green technology innovation. With the introduction of the “double carbon” goal, more and more pharmaceutical companies have begun to disclose information related to carbon emissions, including carbon emissions, carbon reduction targets and low-carbon development strategies. The pharmaceutical manufacturing process involves a large number of physical and chemical processed products, and its environmental activities and control occupy an important part of the country's major enterprises. However, the disclosure rate of environmental dimensions in China's pharmaceutical industry is still only 22.83%, which calls for more comprehensive and detailed environmental information disclosure.

In the social dimension, the disclosure of information of pharmaceutical enterprises mainly focuses on product quality and safety, protection of employees' rights and interests, public health contribution and social welfare activities. As pharmaceutical products are directly related to public health and safety, pharmaceutical companies are under greater pressure in terms of social responsibility. Effective ESG disclosure can help companies make better decisions and provide investors with more understanding when making investment decisions. The disclosure rate of social dimensions in China's pharmaceutical industry is around 42% in 2023, which still has room for improvement.

In the governance dimension, listed companies mainly disclose information on corporate governance structure, board composition and operation, shareholder protection and internal control. Audit quality and board independence play an important role in the relationship between ESG disclosure and firms' financial sustainability, and help firms achieve sustainability by increasing transparency and mitigating management's opportunistic behavior. The disclosure rate of the governance dimension in China's pharmaceutical industry has now reached nearly 85%, making disclosure in this dimension relatively adequate.

3.3 Regional and Industry Differences in ESG Disclosure

There are significant regional and industry distribution differences in the ESG disclosure of Chinese pharmaceutical industry listed companies. Overall, the quality and level of ESG disclosure of companies in economically developed regions are significantly higher than those in less developed regions. In terms of regional distribution, the ESG disclosure level of pharmaceutical companies in the eastern coastal region is generally higher than that in the central and western regions. This is closely related to the level of regional economic development, the degree of marketization and regulatory efforts.

Within the industry, the quality of ESG disclosure of large pharmaceutical companies is significantly better than that of small and medium-sized enterprises. This is mainly due to the fact that large enterprises have more sufficient human and financial resources to better construct an ESG disclosure system. Meanwhile, the level of social responsibility information disclosure of state-controlled pharmaceutical enterprises is generally higher than that of privately-controlled enterprises, reflecting the differences in ESG practices and information disclosure among enterprises of different ownership.

ESG disclosure is also associated with firm characteristics. The study shows that financing constraints can enhance the promotional effect of ESG disclosure on firm value; ESG disclosure is more conducive to enhancing firm value in post-reform firms than in firms before national policy reform; and ESG disclosure can enhance firm value through the mediating role of profitability. This suggests that the value effect of ESG disclosure is jointly influenced by the firm's own characteristics and the external environment.

4. Challenges of ESG Disclosure for Chinese Pharmaceutical Industry Listed Companies

4.1 Overall Low Disclosure Rate and Quality of Disclosure

Taking 2023 as an example, in China's A-share market, among all 332 pharmaceutical listed companies, only 121 have disclosed ESG-related reports (including ESG reports, social responsibility reports and sustainability reports), with a disclosure rate of 36.45%, which is still at the middle-to-lower level in the entire

manufacturing industry.

In addition, in the case of lower disclosure rate, the overall quality of ESG disclosure of listed companies in China's pharmaceutical industry is not optimistic, in the ESG industry report from China Lianhe Credit Rating Co., Ltd. 2023, the overall rating of listed companies in the pharmaceutical industry, the BB grade accounted for the most, and even some companies were rated as B grade, while the highest grade AAA grade none of them were shortlisted, and the quality of ESG disclosure of large enterprises.

4.2 Inconsistent Disclosure Standards

Currently, an important issue facing ESG disclosure of listed companies in China's pharmaceutical industry is the lack of a unified disclosure standard, which is still in the preliminary exploration stage, and the issue of whether to adopt mandatory disclosure is controversial in the academic community. In recent years, China's ESG economic and social development is undergoing a comprehensive green transformation and upgrading under the background of "double carbon". The Securities and Futures Commission (SFC) explicitly requires ESG to be included in corporate disclosure, which puts higher demands on the management capabilities of listed companies, and the market has higher expectations for the ESG performance of listed companies. However, at this stage, the quality of reports on ESG disclosure by listed companies in China's pharmaceutical industry varies, most of which contain qualitative embellishments and lack inter-company comparability. This is contrary to the original purpose of the system, which is to require companies to fulfill their social responsibilities and to strengthen financial regulation to prevent financial crises. The development of a scientific and reasonable ESG disclosure evaluation index system and the clarification of evaluation standards and methods can effectively promote pharmaceutical companies to improve the quality of ESG disclosure and enhance corporate transparency and credibility.

4.3 Inadequate Internal Governance Mechanisms

The imperfect internal governance mechanism of listed companies in the pharmaceutical industry in terms of ESG information disclosure is an important factor affecting the quality of

disclosure. Shareholding concentration, executive shareholding, and whether to set up a strategy committee among the internal corporate governance variables play a significant role in the voluntary disclosure of corporate carbon information, while the other corporate governance variables have not yet exerted their governance function on carbon information disclosure. Corporate governance structure has a significant effect on the improvement of environmental information disclosure level. Specifically, corporate governance factors such as state-owned equity, the proportion of shares held by the first largest shareholder, audit committee, and the establishment of the Ministry of Ecology and Environment have a very significant effect on the improvement of the level of environmental information disclosure, while the green finance policy strengthens the environmental protection role of these factors. In addition, the nature of ownership and management shareholding also have a significant impact on social responsibility information disclosure. Compared with privately held listed companies, state-owned listed companies have a higher level of social responsibility disclosure; in general, the higher the management shareholding, the higher the level of social responsibility disclosure. Specifically, there is a significant positive correlation between management shareholding and social responsibility disclosure in privately-held listed companies, while the correlation between management shareholding and social responsibility disclosure in state-held listed companies is not significant.

4.4 Inadequate Monitoring and Evaluation Systems

At present, the regulation and evaluation system of ESG disclosure for Chinese pharmaceutical industry listed companies is still unsound. Although the regulation of ESG disclosure in various industries has been improving, it still needs further improvement. For Chinese companies, more voluntary disclosure is adopted in practice, with various forms of disclosure, making it difficult to effectively measure and compare companies' ESG performance. The establishment of a fair information disclosure system, the strengthening of information disclosure, the establishment of a sound regulatory system for market players, and the promotion of a social integrity system are of

great significance in safeguarding transaction security and maintaining market order.

5. Countermeasure Suggestions for Optimizing ESG Disclosure of Listed Companies in China's Pharmaceutical Industry

5.1 Strengthening Internal Corporate Governance

Pharmaceutical companies should set up a specialized ESG management organization and construct a perfect ESG governance structure. The establishment of an ESG committee can significantly improve the level of corporate ESG disclosure and enhance corporate information processing by improving the ESG governance structure, increasing the attention of the board of directors and management to ESG information, and attracting the participation of external stakeholders.

Enterprises should also establish a sound ESG information management system, clarify the responsibilities of each department in the collection, organization and disclosure of ESG information, and ensure the timeliness and accuracy of the information. Enhance ESG awareness training for employees, improve their understanding and recognition of ESG concepts, and form a good ESG cultural atmosphere. At the same time, establish an internal audit and quality control mechanism to systematically manage and evaluate ESG information to ensure the authenticity and reliability of the disclosed information.

5.2 Improvement of External Oversight Mechanisms

Relevant government departments should strengthen the supervision of ESG disclosure in the pharmaceutical industry, formulate guidelines for ESG disclosure in line with industry characteristics, and clarify the basic requirements for disclosure content, frequency and form. Environmental control should be combined with the competitive attributes of the industry, and environmental legislation, environmental regulatory system and environmental information disclosure guidelines should be continuously improved. Improve the supervision and inspection mechanism of information disclosure, establish an incentive and constraint system combining rewards and punishments, and guide enterprises to improve

the quality and level of ESG information disclosure.

Promote the development of third-party rating agencies, cultivate a specialized and standardized rating system, and provide investors with objective and fair ESG assessment information. The study suggests that a mandatory information disclosure system should be adopted based on cost-benefit analysis, with specific proposals to transform semi-mandatory disclosure into mandatory disclosure from both the legal level and exchange regulatory documents, and to develop quantitative disclosure indicators for each industry in order to better standardize and improve the quality of listed companies' disclosure and maximize social benefits.

Utilizing the guiding role of industry associations, formulate industry standards and best practice guidelines for ESG disclosure in the pharmaceutical industry, carry out training and experience exchange activities, and enhance the overall ESG disclosure level of the industry. Strengthen industry self-discipline management, play the role of peer supervision, establish ESG disclosure evaluation and ranking mechanism, and create a favorable environment for industry development.

5.3 Improving the Quality of Information Disclosure

Pharmaceutical companies should improve the quantitative level of ESG disclosure and reflect their performance in environmental, social and governance aspects through specific data and indicators. In particular, accurate and comprehensive quantitative data should be provided on carbon emissions, energy consumption, water use and waste treatment. The government should make a unified standardization of environmental information disclosure as soon as possible, reward enterprises with good environmental performance, and enterprises also need to focus on the collection of data related to daily environmental management.

Enhance the comprehensiveness and systematization of ESG information disclosure to avoid selective disclosure or information omission. Pharmaceutical companies should disclose ESG-related information comprehensively and objectively, including positive results and existing problems, in order to enhance the authenticity and credibility of the

information. The study shows that there is a significant positive relationship between the quality of environmental information disclosure and enterprise value, i.e., the higher the quality of environmental information disclosure, the greater the value of the enterprise.

Improve the timeliness and standardization of ESG information disclosure, and issue ESG reports on a regular basis in accordance with regulatory requirements and market expectations to ensure the timeliness of the information. At the same time, disclose information in accordance with uniform standards and formats to enhance the comparability and readability of the information.

5.4 Promoting Technology Application and Innovation

Pharmaceutical companies should make full use of digital technology to improve ESG information collection and analysis capabilities. With the help of big data, artificial intelligence, Internet of Things and other technical means, build an intelligent system for ESG data collection, processing and analysis to improve the comprehensiveness and accuracy of information collection. Use digital tools to assess and predict ESG performance and provide data support for enterprises to formulate ESG strategies and goals.

Innovate ESG information disclosure methods and expand information dissemination channels. In addition to traditional annual reports and social responsibility reports, ESG information can be released through diversified channels such as corporate websites, social media and thematic websites, so as to enhance the accessibility and dissemination of information. Explore the use of data visualization technology to present ESG information in the form of charts, interactive interfaces, etc., to enhance the readability of information and user experience.

Establish a platform for ESG information sharing in the pharmaceutical industry to promote information exchange and experience sharing among enterprises. Bring together ESG best practice cases and cutting-edge research results through the industry platform to provide pharmaceutical companies with opportunities for learning and reference. Promote the establishment of an industry ESG database to provide data support for policy making, academic research and market evaluation, and promote the continuous improvement of the

industry ESG disclosure system.

6. Conclusion

Under the strategic leadership of the “dual-carbon” goal, strengthening ESG information disclosure by listed companies in China’s pharmaceutical industry is not only an inevitable requirement to respond to the national sustainable development strategy, but also an important way to enhance corporate competitiveness. Through the analysis of this study, we can find that the current ESG information disclosure of Chinese listed companies in the pharmaceutical industry is characterized by uneven quality, inconsistent standards, imperfect internal governance mechanisms, and unsound supervision and evaluation systems. These problems constrain the comparability, reliability and validity of ESG information, and are not conducive to stakeholders’ accurate assessment of corporate sustainability.

In order to optimize the quality of ESG disclosure of listed companies in China’s pharmaceutical industry, this study proposes countermeasures such as constructing a scientific evaluation system, strengthening the internal management of enterprises, perfecting the external supervision mechanism, as well as improving the quality of information disclosure and promoting the application and innovation of technology. The effective implementation of these measures will help promote the development of ESG disclosure in the pharmaceutical industry in the direction of standardization, standardization and high quality, and provide strong support for the industry’s green transformation and high-quality development.

In the future, with the in-depth promotion of the “dual-carbon” strategy, the continuous improvement of related policies, and the growing demand for ESG information from various stakeholders, ESG information disclosure by listed companies in China’s pharmaceutical industry will have a broader space for development. High-quality ESG disclosure based on scientific evaluation indicators and governance mechanisms will not only create greater value for enterprises, but also make positive contributions to the realization of the “dual-carbon” goal and the sustainable development of the economy and society.

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