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Original Paper

Analysis of Zijin Mining's Green Transformation and Effectiveness under ESG Concepts

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Abstract

Based on the ESG concept, this paper discusses the practice and effect of non-ferrous metal industrial enterprises in green transformation. Taking Zijin Mining as a case study, it analyses the motivation of Zijin Mining's green transformation and combs through its green governance path, assesses the effectiveness of the transformation from the three levels of governance, environment and society, and evaluates the effect of governing Zijin Mining's green transformation. The study finds that Zijin Mining's green transformation has significantly improved economic performance, energy saving and emission reduction, and actively promoted social performance, reflecting the corporate environmental and social responsibility. The conclusions of this paper not only provide feedback for Zijin Mining's green governance, but also provide practical references for the green transformation of enterprises in the same industry, helping enterprises to achieve the goal of sustainable development.

Keywords

zijin mining, green transformation, green performance

1. Introduction

Under the increasing awareness of global environmental protection and the constraints of the legal framework of the Paris Agreement, China is facing the dual challenges of economic growth and environmental protection. ESG concepts, as an important concept for promoting green transformation of enterprises and a key framework for evaluating the sustainability of enterprises, provide an important guideline for enterprises to explore the path of green transformation. ESG is Environmental, Social and Governance, emphasising the integration of green development ideas into the economic activities of enterprises. The concept of green transformation originated from the "green economy"

proposed by British economist David Pearce in 1989. After that, Blättel-Mink (1998) defined green transition as the process of enterprises' legitimising the use of resources through green innovation within the framework of legitimacy theory, and emphasised the necessity of harmonious coexistence between enterprises and the environment. Nan & Levine (2010) demonstrated that when the ecological environment and natural resources have developed to a certain stage, enterprises will not be able to achieve green development in the future. science and technology develop to a certain stage, enterprises will adjust their strategies to green transition. Janson (2013) pointed out that green transformation is the process of transforming from high pollution and high energy consumption to an environmentally friendly development model that saves energy and reduces dependence on natural resources in order to achieve sustainable development. Li (2023) further proposed that green transformation is a necessary way for enterprises to implement the new development concept and achieve high-quality development. Existing studies have shown that factors such as industry competition and environmental regulation are important factors driving green transformation of enterprises (Hart, 1995), while technological innovation is a key path to realise the transformation (Cagno, 2015; Zhao and Wu, 2018; Chen et al., 2022).

As a leading company in the non-ferrous metal industry, Zijin Mining's green transformation practice has attracted much attention in the industry. This article focuses on the case of Zijin Mining's green transformation under the ESG concept, analysing its transformation motivation, implementation path and achieved results, with the aim of extracting promotable experiences that can be used as a reference for enterprises in the same industry and even in a wider field.

2. Zijin Mining Green Transformation Case Introduction

2.1 Case selection

This paper chooses Zijin Mining as the research object mainly based on the following reasons: Firstly, Zijin Mining has a complete industrial chain and is in a mature development stage, and its green transformation practice can purely reflect the application effect of ESG concepts in traditional energy-consuming enterprises, which provides empirical evidence cases for green transformation; Secondly, Zijin Mining has outstanding performance in the field of ESG, actively constructing a perfect ESG system and winning a number of awards, with remarkable transformation results, which is of high research value and typicality; thirdly, as a listed enterprise for many years, Zijin Mining has high transparency and standardisation in information disclosure, especially in recent years, it has strengthened the preparation and release of ESG reports, which provides detailed and authoritative data support for the research of this paper.

Zijin Mining Group Corporation ("Zijin Mining"), as a globally renowned multinational mining giant in the exploration, development and technological R&D of metal mineral resources, with business covering a wide range of metals such as copper, gold, zinc, lithium and other metals, has an extensive domestic and international mining layout and strong technological strength. Zijin Mining not only

occupies an important position in the international metal mining industry, but also has achieved remarkable success in the green and efficient development of resources, driven by its scientific and technological innovation.

2.2 Zijin Mining Green Transformation Motivation and Path Analysis

2.2.1 Analysis of Zijin Mining's Green Transformation Motivation

From the environmental perspective, with the clarification of the global carbon neutrality target and the promotion of China's "dual-carbon" strategy, the high-energy-consuming and high-emission industries represented by Zijin Mining are facing enormous environmental protection pressure. In order to achieve sustainable development, Zijin Mining actively responds to national environmental protection policies, reduces carbon emissions through green transformation, and improves resource utilisation efficiency, so as to cope with green barriers in international trade and enhance international competitiveness.

From the social level, Zijin Mining, as a member of society, bears an important social responsibility. In the past, its environmental problems not only affected its economic performance, but also damaged its social image. Therefore, Zijin Mining is actively responding to social concerns through green transformation, meeting the public's expectations for a better environment, reshaping its corporate social image and enhancing social trust.

From the perspective of governance, under the ESG concept, the governance level of an enterprise is directly related to its sustainable development capability. Through green transformation, Zijin Mining optimises its governance structure, improves its management level, reduces the risk of pollution accidents and ensures sound operations. At the same time, green transformation also helps Zijin Mining to enhance its international competitiveness and better cope with the complex environment of global economic fluctuations and industry overcapacity.

2.2.2 Analysis of Zijin Mining's Green Transformation Path

(1) Green management system construction. Zijin Mining has established an all-round green transformation management system from the board of directors to the first-line work sections to ensure that the green transformation strategy is systematically and strategically promoted. The company has passed the certification of ISO14001 and other international environmental protection standards, and takes the initiative to dock with international environmental protection standards, while at the same time following national environmental protection regulations and improving the level of environmental management. In order to promote green transformation, Zijin Mining continuously deepens the reform of environmental protection system and builds a scientific, standardised and feasible system. The Group has formulated core green transformation policies, and the affiliated enterprises have refined their implementation programmes in accordance with the actual situation, forming an up-and-down linkage of the green transformation institutional framework to ensure the effective implementation of green transformation policies and the implementation of environmental protection responsibilities at all levels.

(2) Green production and pollution control. Zijin Mining fully implements the green production model, and reduces pollution at source and improves resource utilisation through technological innovation and digital transformation. The company strengthens environmental impact assessment, selects environmentally friendly materials and processes, and implements waste recycling, effectively reducing the environmental load in the production process. In terms of energy management, the company builds an efficient energy management system, improves the comprehensive utilisation rate of resources, and actively explores the application of renewable energy to promote the transformation of production in the direction of low-carbon and environmental protection. In terms of pollution control, Zijin Mining has taken a series of measures: wastewater management follows the principle of "source prevention, process control and end treatment", and implements the technology of waste water diversion, in-depth treatment and recycling, to enhance the efficiency of wastewater treatment; waste gas management realises the high-efficiency purification and comprehensive utilisation of waste gases by means of process optimisation, equipment upgradation and on-line monitoring technology; solid waste management adheres to the principle of resource utilisation. Solid waste management adheres to the principle of resource utilisation, classifying and recycling tailings, waste rock and smelting waste to reduce environmental pollution and enhance economic benefits.

(3) Ecological responsibility and transparent governance. Zijin Mining attaches great importance to biodiversity protection and ecological restoration, strictly abides by natural resources protection regulations, ensures minimal disturbance to the natural environment from mining activities through the Mine Geological Environment Protection and Land Reclamation Programme and biodiversity assessment, and gives priority to the use of native plants to restore the original appearance of mining areas. In order to enhance the transparency and social influence of green transformation, Zijin Mining has continuously released its Environmental, Social and Governance (ESG) Report since 2018, with its content enriched and improved year by year, and third-party certified to ensure the authenticity and reliability of the information. The report comprehensively demonstrates the Company's strategic planning, implementation progress and effectiveness in green transformation, which not only enhances the Company's green reputation and image, but also provides learnable experience for enterprises in the same industry. In recent years, the Company's ESG report has become more focused on key areas such as climate governance, ecological and environmental management, and social responsibility, demonstrating Zijin Mining's determination and achievements on the road to green transformation.

3. Analysis of the effect of green transformation of Zijin Mining

3.1 Analysis of the effects of the environmental dimension

3.1.1 Resource consumption

Zijin Mining understands the fundamental role of resources in its business development. In the face of finite resources and growing global concern for sustainable development, it has actively taken measures to promote green transformation centred on reducing energy consumption intensity and water intensity.

As shown in Table 3.1, Zijin Mining's energy consumption intensity has shown a fluctuating downward trend from 2019 to 2023, and its fresh water consumption intensity has also declined year on year. This trend indicates that the company has effectively reduced its consumption of energy and water resources while generating revenue, reflecting its foresight and execution in environmental management.

Table 3.1 Energy Consumption of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Energy consumption intensity (MJ per 10,000 yuan of industrial added value)	—	15.53	13.50	11.69	12.45
Fresh water consumption intensity (t per million yuan of revenue)	332.33	296.04	269.04	269.00	225.39

Source: Zijin Mining ESG Report

Further analysing Zijin Mining's energy use in depth, as shown in Table 3.2, it is easy to see that the enterprise has achieved significant results in the consumption of traditional energy sources, such as heavy oil and liquefied petroleum gas (LPG), and the annual consumption of these energy sources has been declining year on year. However, it is worth noting that the total energy consumption has increased to a certain extent due to the expansion of the enterprise's scale and the commissioning of new projects. In the face of this challenge, Zijin Mining has not stood still, but has actively entered the field of new energy, and has diversified and decarbonised its energy structure by increasing the proportion of renewable energy used. In the past three years, the proportion of renewable energy in Zijin Mining's energy mix has increased significantly, which not only demonstrates the company's active exploration and application of new energy technologies, but also sets a good example of how it can respond to climate change and realise the goal of sustainable development.

Table 3.2 Direct Energy Consumption Data and Proportion of Renewable Energy for Zijin Mining, 2019-2023

Item	2019	2020	2021	2022	2023
Kerosene (t)	3929	1833	1481	592	379
Diesel (t)	202336	256856	345894	392930	529236
Petrol (t)	1162	1457	1502	1061	614
Coal (t)	610665	859536	636682	560249	528850
Natural gas (million cubic metres)	36	14	23	18	25
Proportion of renewable energy in total energy consumption (%)	/	/	/	16.21	21.48

Source: Zijin Mining ESG Report

3.1.2 Pollutant emissions

Zijin Mining has implemented a series of effective measures to manage the discharge of wastewater, waste gas, and solid waste, thereby minimising environmental impacts. As shown in Table 3.3 and Table 3.4, the COD emission intensity of wastewater shows an overall decreasing trend, and although the total amount of wastewater pollutants and the emission intensity increase in 2021 due to the commissioning of the new mine project and the impact of high rainfall, the concentration of pollutants discharged has always been kept at a lower level, which is in line with, or even far lower than, the wastewater emission standards of the project location. This result is attributable to the company's strict environmental protection monitoring system and efficient wastewater treatment facilities. However, in the area of solid waste management, the amount of general waste generated per unit of revenue has fluctuated over the past two years, a result that suggests the need for continued optimisation and improvement in waste management. In the area of gas emissions, the emission intensity of major waste gases and greenhouse gases, such as sulphur dioxide, generally showed a year-on-year decreasing trend, indicating that the enterprise has made positive progress in waste gas management and greenhouse gas control.

Table 3.3 Wastewater and Solid Waste Emissions of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
COD emission intensity (g per million yuan of revenue)	2544.70	1748.21	2328.43	1381.83	1002.25
General waste generation (t per 10,000 yuan of revenue)	33.22	32.34	28.45	26.21	32.71
Hazardous waste generation (t per million yuan of revenue)	3.04	1.63	1.59	1.19	0.55

Source: Zijin Mining ESG Report

Table 3.4 Waste Gas and Greenhouse Gas Emissions of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Sulphur dioxide emission intensity (g per 10,000 yuan of revenue)	101.45	78.42	65.91	46.20	45.95
Nitrogen oxide emission intensity (g per 10,000 yuan of revenue)	70.33	44.83	39.47	29.68	23.42
Particulate matter emission intensity (g per 10,000 yuan of revenue)	47.28	37.70	33.51	22.80	20.84

GHG emissions per 10,000 yuan of industrial added value (tCO_2e per 10,000 yuan of industrial added value)	—	1.85	1.79	1.55	1.53

Source: Zijin Mining ESG Report

3.1.3 Resource utilisation

As shown in Table 3.5, Zijin Mining's water recycling rate climbs year by year between 2019 and 2023, thanks to the enterprise's great attention to water resource management and the extensive application of advanced water treatment technologies. At the same time, the comprehensive utilisation rate of general waste and hazardous waste has also achieved a significant increase in the past two years, reflecting the deepening of the enterprise's green governance concept. By improving the efficiency of resource utilisation of waste, Zijin Mining has not only reduced environmental pressure, but also created additional economic value for the company.

Table 3.5 Water Resources and Solid Waste Recycling of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Water recycling utilisation rate (%)	91.29	91.86	92.02	94.29	94.80
Comprehensive utilisation rate of general waste (%)	7.69	12.91	13.62	14.71	14.88
Comprehensive utilisation rate of hazardous waste (%)	15.78	23.19	34.07	48.41	48.98

Source: Zijin Mining ESG Report

3.1.4 Technological innovation

As shown in Table 3.6, Zijin Mining's investment and achievements in technological innovation have shown remarkable performance. Although the proportion of environmental protection investment has fluctuated slightly in recent years, dropping from 0.53% in 2019 to 0.47% in 2023, the proportion of R&D investment has shown a steady upward trend, rising from 0.40% in 2019 to 0.53% in 2023. This indicates that enterprises are paying more attention to solving environmental protection problems through technological innovation and improving production efficiency and resource utilisation. Meanwhile, the number of new patents increases year by year, showing the continuous progress of enterprises in technology research and development. The proportion of R&D personnel declined after reaching a high of 16.70% in 2020, but still remained at a high level. These figures show that enterprises' emphasis on R&D has not weakened, and the size of their R&D teams remains large, providing strong support for their green transformation. These efforts have contributed to the enhancement of the technological strength of enterprises and laid a solid foundation for them to realise their green, low-carbon and circular development goals.

Table 3.6 Technological Innovation of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Proportion of environmental protection investment (%)	0.53	0.64	0.63	0.54	0.47
Proportion of R&D investment (%)	0.40	0.38	0.35	0.47	0.53
Number of newly added patents (pieces)	27	24	32	29	58
Proportion of R&D personnel (%)	1.21	16.70	10.25	10.14	9.48

Source: Zijin Mining Annual Report, ESG Report

3.2 Analysis of the effects of the social dimension

3.2.1 Employee protection

As shown in Table 3.7, the per capita welfare level of Zijin Mining has basically maintained a sustained increase in recent years, and in particular achieved significant growth in 2021, reflecting the company's emphasis on the quality of life of its employees and its proactive endeavours to enhance employee welfare. Meanwhile, the proportion of safety investment has steadily increased and expanded by 0.17% in 2023, demonstrating Zijin Mining's strong commitment to safeguarding the safety of its employees. The Company effectively safeguards the legitimate rights and interests of its employees by providing comprehensive coverage of labour contracts, social insurance and benefits such as annual medical check-ups. The Company also actively carries out employee training to enhance employees' vocational skills and comprehensive quality, creating favourable conditions for their career development. These measures have stabilised the staff turnover rate at a low level, further enhancing the stability and cohesion of the workforce.

Table 3.7 Employee Protection of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Average compensation and benefits per employee (10,000 yuan per employee)	10.29	10.74	16.22	18.64	17.80
Proportion of workplace safety investment (%)	0.50	0.52	0.66	0.79	0.96
Employee turnover rate (%)	7.68	9.31	7.57	8.66	8.00

Source: Zijin Mining Annual Report, ESG Report

3.2.2 Social image enhancement

Zijin Mining not only focuses on its own sustainable development, but also actively fulfils its responsibilities to society on the road to green transformation. As shown in Table 3.8, between 2019 and 2023, the number of jobs provided by the enterprise, the community input, the total tax payment and the social contribution value per share all show a year-on-year increase, especially in 2023, when a

significant increase is achieved. This shows that Zijin Mining is more focused on giving back to society through practical actions after its green transformation, demonstrating its responsibility as an industry leader. By actively participating in social welfare activities, such as poverty alleviation, education and environmental protection, Zijin Mining has further enhanced its social reputation and established a good corporate image.

Table 3.8 Social Responsibility Performance of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Employment opportunities provided (jobs)	36605	36860	43876	48836	55239
Community investment amount (million yuan)	195.21	231.93	423.83	454.74	827.29
Total tax payments(billion yuan)	59.25	65.17	100.60	128.26	137.66
Social contribution value per share (yuan)	0.73	0.84	1.53	1.94	2.13

Source: Zijin Mining ESG Report

3.2.3 Supply chain management

Customers are the cornerstone of enterprise survival and development. Zijin Mining has established a sound customer demand information collection and feedback mechanism, and the enterprise is able to understand and respond to customer demand in a timely manner, and continuously optimise the product development and production process. As shown in Table 3.9, during the period from 2019 to 2023, Zijin Mining's product qualification rate and customer satisfaction reach nearly 100%, and no product recall or complaint has occurred. This reflects Zijin Mining's strict control of product quality and highlights its good reputation in the hearts of customers.

Table 3.9 Product Management and Customer Service of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Qualified rate of mineral products (%)	99.90	99.80	99.90	100.00	99.98
Number of recalled and complained products (t)	0.00	0.00	0.00	0.00	0.00
Customer satisfaction (%)	99.28	99.29	99.22	99.60	99.65
Product packaging wood (t)	206	253	699	703	479
Product concentrate packaging (t)	2725	2370	1841	3818	2887

Source: Zijin Mining ESG Report

Zijin Mining attaches great importance to the co-operative relationship with its suppliers in the process of green transformation, as shown in Table 3.10, the number of Zijin Mining's suppliers has maintained steady growth in recent years, while the proportion of domestic suppliers has declined slightly but still

occupies a dominant position. It is worth noting that the enterprise has incorporated ESG indicators into the supplier evaluation system, and in 2023, 1,532 new suppliers were screened by Zijin Mining using ESG standards. Through this initiative, it not only improves the overall environmental protection level of the supply chain, but also promotes mutually beneficial and win-win relationships with suppliers. In addition, Zijin Mining strictly enforces green policies in the procurement process, effectively reducing environmental risks in the supply chain.

Table 3.10 Number of Suppliers of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Total number of suppliers (units)	4923	4669	5380	5444	6712
—Suppliers from China(units)	4495	4172	4480	4229	4304
Number of new suppliers screened using ESG criteria (units)	592	917	762	1547	1532

Source: Zijin Mining Annual Report, ESG Report

3.3 Analysis of the effects of corporate governance dimensions

3.3.1 Board governance

As shown in Table 3.11, the proportion of independent directors of Zijin Mining has remained stable over the past four years, all at 46.15 per cent, a proportion that is at a high level in the A-share market, providing more professionalism and independence in the company's decision-making. The number of board meetings remained at a level of around 20, reflecting the Company's dynamic adjustment of decision-making frequency according to the internal and external environments, maintaining a balance between governance compliance and efficiency. The gender diversity ratio of board members, after fluctuating slightly from 2019-2021, will significantly increase to 15.38% in 2022 and remain stable, reflecting the company's progressive focus on diversity at the governance level; the overall trend of growth in total executive compensation (with an increase of 244.5% from 2019-2022), will decline slightly to $103.84 million in 2023, showing the market-based incentives continue to strengthen. Overall, the stable sole director structure, flexible decision-making mechanism and diversified governance practices together build the institutional cornerstone of corporate governance, which fits the core requirement of governance effectiveness under the ESG framework.

Table 3.11 Governance Structure of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Proportion of independent directors (%)	41.67	46.15	46.15	46.15	46.15
Number of Board meetings (times)	22	31	17	25	23
Gender diversity ratio among board members (%)	8.33	7.69	7.69	15.38	15.38

Total executive compensation (million yuan)	34.93	55.53	65.01	120.35	103.84

Source: CSMAR database

3.3.2 Business Ethics

In order to achieve compliance and transparency in its business activities, Zijin Mining has incorporated anti-corruption work into its core system of corporate governance. The company has established a tiered and regularised review mechanism to effectively prevent corruption risks by conducting at least an annual review for new construction projects and key projects, and at least a biennial review for other projects. In the field of supply chain management, the company implements a sunny and transparent supply chain, requiring all subsidiaries to embed integrity clauses in contracts with suppliers and contractors, cutting off the channels of collusion of interests between insiders and co-operators at the institutional level, and compressing the room for fraud. As can be seen from Table 3.12, Zijin Mining has achieved remarkable results in the construction of business ethics and the implementation of anti-corruption policies. Through a systematic training system, the enterprise has achieved comprehensive coverage of directors, supervisors and senior management, employees and external partners. In the past three years, the participation rate of training for directors, supervisors and senior management of governance bodies has always remained at 100%, and the coverage rate of business ethics training for suppliers and contractors has shown a year-on-year incremental trend, and has climbed to 73.77% in 2023. At the same time, the enterprise has actively improved the complaint and report handling mechanism, and the proportion of relevant issues disposed of has been steadily increasing in dynamic management, demonstrating its determination and effectiveness in continuously strengthening the construction of business ethics.

Table 3.12 Business Ethics Training Coverage and Complaint Handling Proportion of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Directors, supervisors, and senior management (%)	83.29	87.19	100.00	100.00	100.00
Employees (%)	68.00	63.96	64.82	75.50	87.97
Suppliers and contractors (%)	58.24	61.55	62.10	70.90	73.77
Proportion of complaints and reports handled (%)	—	—	94.16	95.59	93.42

Source: Zijin Mining ESG Report

3.3.3 Shareholder and investor relations

Zijin Mining strengthens internal control and risk management by formulating and improving various regulations, effectively enhancing the corporate governance level, while strengthening the protection of shareholders' rights and interests. As shown in Table 3.13, the degree of equity balance remained at a

high level between 2019 and 2023, and the earnings per share and total dividends showed an upward trend and achieved substantial growth between 2020 and 2023. By actively communicating with investors and sharing the fruits of corporate development through regular investor meetings and releasing detailed annual reports and ESG reports, Zijin Mining has successfully constructed a good relationship with investors, which provides strong support for the long-term stable development of the enterprise.

Table 3.13 Shareholder and Investor Relations of Zijin Mining, 2019–2023

Item	2019	2020	2021	2022	2023
Degree of equity balance	1.20	1.20	1.34	1.43	1.38
Earnings per share (EPS) (yuan per share)	0.18	0.25	0.60	0.76	0.80
Total dividends (billion yuan)	31.40	35.07	53.75	81.15	96.60

Source: CSMAR database, Zijin Mining annual report, ESG report

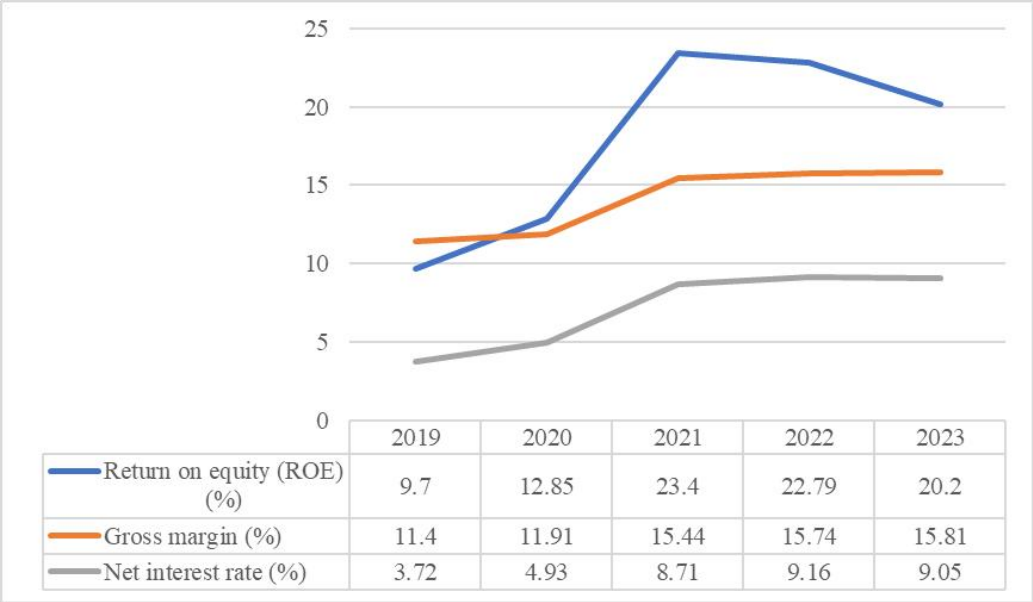
3.3.4 Management operations

In analysing the effect of corporate governance on Zijin Mining's green transformation, this paper presents the financial health of Zijin Mining under the management of operators through the analysis of its core financial indicators, and provides a quantitative basis for the optimisation of corporate governance. Given the maturity of the traditional financial indicator system and high data availability, this paper selects key indicators such as Zijin Mining's return on net assets and total asset turnover ratio, and analyses its management and operation performance in the process of green transformation from the four dimensions of profitability, operation, debt servicing, and development capability, with a view to identifying potential economic problems in the transformation and providing decision-making references for the sustainable governance of the enterprise.

(1) Profitability analysis

As shown in Figure 3.1, Zijin Mining's return on net assets has generally shown an upward trend in recent years, climbing from 9.70% to 20.20%, with the average annual increase significantly exceeding the level at the beginning of the transition. This trend echoes the rebound of the non-ferrous metal industry under the economic "new normal", but more importantly, it highlights the positive results of the enterprise's initiative to implement the green transformation strategy. Especially during the period of green transformation (2021-2023), the average annual growth rate of this indicator reaches 16.10%, which is a qualitative leap from 6.5% in the previous period (2019-2020). Strongly proved that in the context of high-quality development, green transformation is not only the embodiment of corporate social responsibility, but also an effective path to enhance corporate profitability. In addition, although the role of the rebound of international metal prices after 2020 in boosting gross profit margins and net profit margins should not be ignored, the significant improvement in Zijin Mining's profitability

indicators is more attributable to the successful implementation of its green transformation strategy, which has a positive impact on corporate profitability.



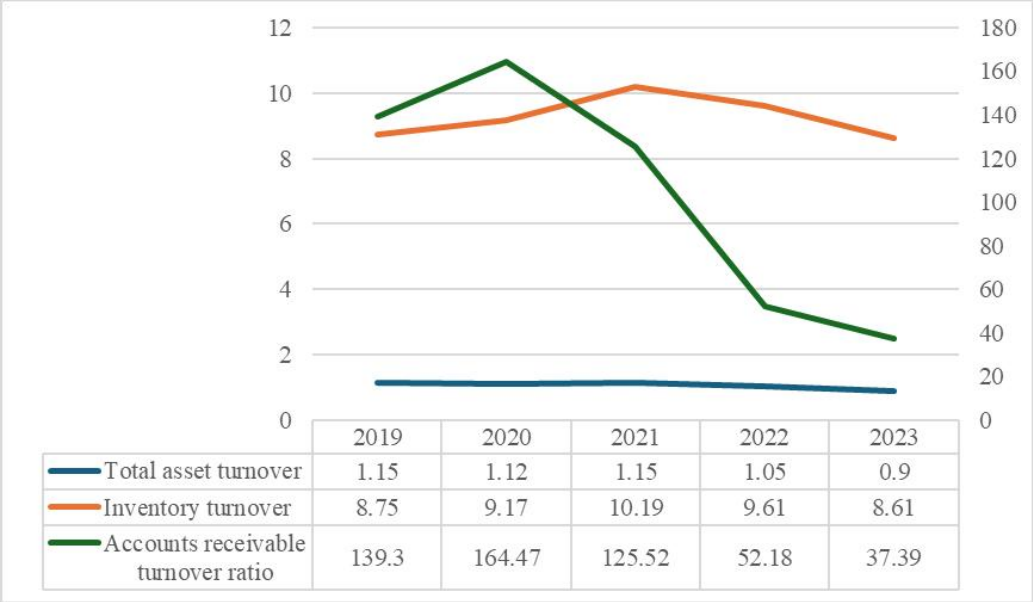
	2019	2020	2021	2022	2023
Return on equity (ROE) (%)	9.7	12.85	23.4	22.79	20.2
Gross margin (%)	11.4	11.91	15.44	15.74	15.81
Net interest rate (%)	3.72	4.93	8.71	9.16	9.05

Figure 3.1 Profitability Indicators of Zijin Mining, 2019-2023

Source: CSMAR database

(2) Operational capability Analysis

As can be seen from Figure 3.2, Zijin Mining has demonstrated efficient control over the use of capital. Although the total asset turnover ratio fluctuates in phases due to capacity expansion, it maintains an overall level of over 0.9, indicating that the green transformation has not weakened the operational efficiency, but instead promoted the refinement of internal management through process optimisation. The fluctuation of accounts receivable turnover reflects the dynamic changes in the market economic environment, while the slight decline in 2022 and 2023 can be attributed to the short-term impact of capacity expansion, without concealing the relative stability of its overall collection efficiency. Particularly noteworthy is that the inventory turnover ratio has consistently remained at around 10, a direct reflection of Zijin Mining's optimised inventory management and enhanced supply chain resilience. This series of data shows that the green transformation has not only not had a negative impact on Zijin Mining's operating efficiency, but has instead played a positive role in promoting the refinement of its internal management and the optimisation of its processes, laying a solid foundation for the company's sustainable and healthy development.



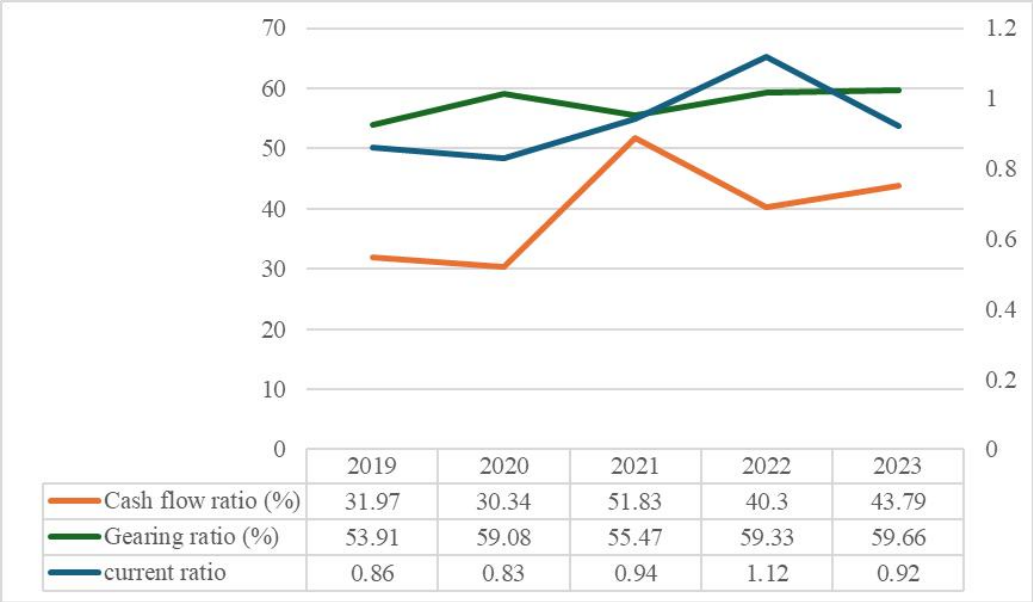
	2019	2020	2021	2022	2023
Total asset turnover	1.15	1.12	1.15	1.05	0.9
Inventory turnover	8.75	9.17	10.19	9.61	8.61
Accounts receivable turnover ratio	139.3	164.47	125.52	52.18	37.39

Figure 3.2 Operating Capacity Indicators of Zijin Mining, 2019-2023

Source: CSMAR database

(3) Solvency analysis

The data presented in Figure 3.3 reveals the financial resilience of the enterprise. Although the gearing ratio rose from 53.91% to 59.66%, the increase was stable and controllable, showing Zijin Mining's prudent strategy and effective regulation of liability management. The current ratio fluctuates but maintains a relatively stable level, close to the range of 1, reflecting the moderate protection of short-term capital liquidity of the enterprise. Especially crucial is the fluctuating upward trend of the cash flow ratio, which indicates that the ability of the enterprise to repay debts with cash and equivalents is gradually increasing, providing strong support for Zijin Mining to maintain financial soundness in the complex economic environment. On the whole, Zijin Mining's long-term solvency is solid, and its short-term solvency has room for improvement, but the overall situation is under control.



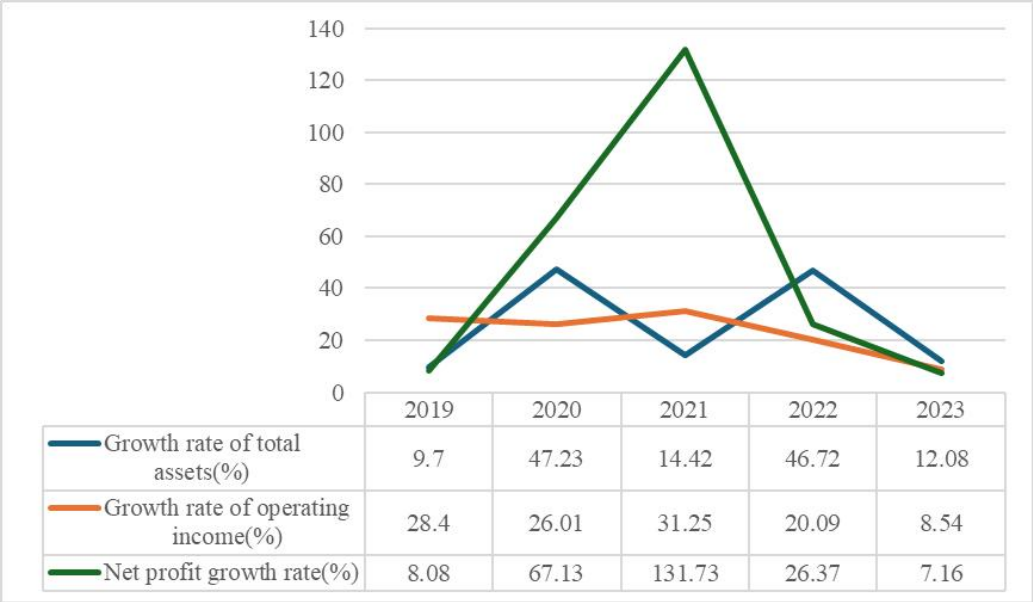
	2019	2020	2021	2022	2023
Cash flow ratio (%)	31.97	30.34	51.83	40.3	43.79
Gearing ratio (%)	53.91	59.08	55.47	59.33	59.66
current ratio	0.86	0.83	0.94	1.12	0.92

Figure 3.3 Solvency Indicators for Zijin Mining, 2019-2023

Source: CSMAR database

(4) Growth capacity analysis

Figure 3.4 reveals the volatility of Zijin Mining's total asset growth rate, which to some extent reflects the dynamic adjustment of the market environment and the company's internal expansion strategy. The significant jump in net profit margin in 2021 is mainly due to the efficiency improvement brought about by capacity expansion, reflecting Zijin Mining's growth in economic efficiency through optimised resource allocation in the context of green transformation. The climbing growth rate of operating income in the previous period reflects the solid market position and the release of growth potential of the enterprise. Although the fluctuation of total assets growth rate and net profit growth rate makes it difficult to directly conclude the single impact of green transformation on growth capacity, the positive growth of net profit margin indicates that even with a large initial investment in green transformation, the enterprise is still able to realise a sustained improvement in profitability through reasonable strategic deployment and capacity expansion. Therefore, it is reasonable to speculate that green transformation has injected sustainable development momentum into Zijin Mining, and its long-term growth ability is worth looking forward to, while short-term fluctuations need to be considered in conjunction with the market environment and the adjustment of corporate strategy.



	2019	2020	2021	2022	2023
Growth rate of total assets(%)	9.7	47.23	14.42	46.72	12.08
Growth rate of operating income(%)	28.4	26.01	31.25	20.09	8.54
Net profit growth rate(%)	8.08	67.13	131.73	26.37	7.16

Figure 3.4 Growth Capacity Indicators of Zijin Mining 2019-2023

Source: CSMAR database

4. Conclusions and Implications

4.1 Conclusions

Driven by global carbon neutrality targets and ESG concepts, Zijin Mining has achieved synergistic improvement of economic performance and environmental benefits through systematic green transformation. According to the study, the motivation for the transformation is diversified, covering national environmental protection policy and international carbon neutrality pressure, social responsibility, public supervision and industry green development trend, as well as the enterprise's own needs for international market adaptation, pursuit of long-term economic benefits and risk prevention and control. In terms of the implementation path, a "trinity" transformation framework has been constructed: the top-level design of the green management system realises the innovation of the governance structure, the cleaner production system driven by technological innovation reshapes the production paradigm, and the social capital accumulation is strengthened by the mechanism of stakeholder synergy.

Zijin Mining's green transformation has achieved remarkable results in the environmental, social and governance dimensions. In the environmental dimension, the intensity of resource consumption has declined to varying degrees, the proportion of renewable energy has increased, the intensity of pollutant emissions has continued to decrease, the comprehensive utilisation rate of solid waste has improved significantly, and investment in technological innovation has increased. In the social dimension, employee welfare and safety investment increased steadily, social contribution continued to expand, and customer satisfaction and supply chain ESG management improved simultaneously. In the corporate governance dimension, the independence and diversity of the board of directors were

strengthened, the effectiveness of business ethics construction was remarkable, and the financial performance was sound, achieving both governance efficiency and market value.

4.2 Implications

Under the ESG framework, Zijin Mining's green transformation practice provides valuable insights for the corporate sector. Firstly, enterprises should proactively embrace green transformation as an inevitable way to fulfil their social responsibilities, so as to build a good market image, enhance risk resilience and achieve sustainable development. This requires a change in mindset, with green transformation being seen as a long-term strategy rather than a short-term response.

Secondly, the establishment of a sound green management system and a clear governance programme is the key to success. Enterprises should scientifically plan their green development goals, implement them in phases, and optimise their management structure to ensure clear responsibilities and efficient mechanisms. Drawing on Zijin Mining's experience, the motivation of management and technical staff should be enhanced by strengthening management functions, clarifying the division of responsibilities, and supplementing it with incentive mechanisms. At the same time, cultivate a green corporate culture to make it an endogenous driving force for green transformation.

Furthermore, technological innovation and energy transformation are the core drivers of the green transformation of enterprises. Enterprises should continue to optimise production processes, introduce advanced technologies, improve resource efficiency and reduce pollution emissions. Increase R&D investment, strengthen technological innovation, and promote the transformation of energy structure, such as the development of clean energy, the implementation of "oil" to "electricity", and explore the application of "hydrogen energy" and other new clean energy. At the same time, we will vigorously develop a circular economy and enhance the efficiency of the energy sector. At the same time, we will vigorously develop a circular economy, enhance the comprehensive utilisation rate of resources, and strengthen our capacity for sustainable development.

Finally, enterprises should focus on performance improvement and information disclosure to enhance their core competitiveness. In the mining industry, resource control is a core advantage. Enterprises need to continuously improve product quality and ensure a high-quality and stable supply of resources to support the acquisition of cyclical and excess profits. At the same time, they should strengthen information disclosure and transparency to enhance investor and public trust and further consolidate their market position.

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