

The Impact of Green Finance Reform and Innovation Pilot Zone Policy on Corporate ESG Performance: A Case Study of Huayou Cobalt

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Abstract. Whether and how the green finance innovation reform pilot zones policies (GFRPZP) affect the ESG performance of micro enterprises is an important topic in green finance research. This paper takes Huayou Cobalt, a company registered in the first batch of pilot zones, as a case, and adopts a longitudinal single-case study method to construct an analytical framework of three transmission paths: "financing constraints - information disclosure - green innovation", to investigate the mechanism by which the policies affect the ESG performance of enterprises. The research findings show that GFRPZP, through differentiated green loans and green bond issuance, effectively reduced the green financing costs of enterprises, and shifted the financing structure from mainly short-term to a balance of both short and long terms; the mandatory environmental information disclosure requirement prompted enterprises to upgrade their reporting systems from qualitative descriptions to international quantitative disclosure, forcing the improvement of ESG management capabilities; the facilitation of green finance reduced the funding threshold for green technology research and development, and enabled enterprises to make breakthroughs in clean energy, water resource recycling, and carbon emission reduction of products. These three paths form a mutually reinforcing mechanism - increased R&D investment improves environmental performance, information disclosure reduces financing costs, and abundant funds then feedback to technological innovation, ultimately driving the continuous improvement of the enterprise's ESG comprehensive performance.

Keywords: Green finance innovation reform pilot zones, ESG performance, Huayou Cobalt, Transmission mechanism, Case study

1. Introduction

1.1. Research background

The global climate consensus has accelerated the transition to a low-carbon economy. China proposed the "dual carbon" target in 2020 and launched the policy of green financial reform pilot zones in 2017. The first batch of pilot zones were set up in Zhejiang, Guangdong, Guizhou, Jiangxi and Xinjiang. The policy guides the allocation of funds to green industries through green credit,

green bonds, mandatory environmental disclosure and ESG-linked financing. As of 2023, the balance of green loans in China exceeded 30.08 trillion yuan [1].

The expansion of new energy vehicles has driven the demand for cobalt, nickel and lithium. Huayou Cobalt, headquartered in Jiaxing, Zhejiang Province - the first batch of pilot zones - is the largest cobalt producer in China. Its operations span mineral extraction in the Democratic Republic of the Congo, nickel processing in Indonesia and manufacturing bases in China, exposing the company to ESG-sensitive scenarios. The company went public in 2015, providing a research window to observe the impact of policies.

1.2. Research question

This study investigates the following central issue--- How do the policies of the Green Finance Innovation and Reform Pilot Zone(GFRPZ) affect the ESG performance of Huayou Cobalt? Through which mechanisms do the policies reach the enterprise? What actions has Huayou taken for ESG? What lessons can be drawn from this case regarding the micro-effectiveness of green finance policies?

1.3. Research significance

1.3.1. Theoretical significance

This study expands the theory that formal policy tools and market mechanism enrich the stakeholder theory in the Chinese context: Hu [2] emphasizes that good ESG needs to take into account the interests of all parties; Mahajan et al. [3] discuss the interdependence of interests, but in the Chinese context, the government, as the meta-stakeholder, has overwhelming influence, and green finance has restructured the hierarchy - environmental regulation and the status of ESG investors have risen - challenging the Western model. This study also advances the signaling theory [4], revealing the multi-directional signal ecology in green finance: enterprises, governments, and investors convey signals. Huayou's sustainable development-linked bonds convey differentiated signals to regulators, creditors, and customers - this aspect has not been sufficiently discussed in the literature.

1.3.2. Practical significance

Existing literature mostly focuses on macroeconomic outcomes - carbon emission reduction, industrial upgrading, and regional green growth [5]. This study supplements the empirical evidence from high-environmental-sensitivity emerging economies at the micro level, demonstrating how green financial tools (such as sustainable development-linked bonds) can be rigidly linked to emission reduction targets, achieving a linkage between financing costs and environmental performance.

1.4. Research structure

Part 2 reviews relevant literature and establishes the theoretical framework. Part 3 explains the basis for case selection, introduces the enterprise profile of Huayou Cobalt and the GFRPZ. Part 4 conducts a core case analysis through three transmission paths. Part 5 analyzes the changes in the ESG performance of Huayou Cobalt in the three dimensions of environment, society, and governance. Part 6 discusses based on the existing research findings. Part 7 presents policy implications and research limitations.

2. Literature review and theoretical framework

2.1. Green finance policy research

Green finance originated from sustainable finance and environmental regulation. White [6] first clarified that through financial means to internalize environmental externalities and optimize resource allocation is the theoretical boundary of environmental finance. Salazar [7] further defined green finance as a bridge connecting the environmental protection industry and the financial system.

In 2017, GFRPZ marked the transition from national principles to local pilot projects. Hangzhou and Quzhou in Zhejiang Province launched bank green credit performance evaluation, green bond interest subsidies, mandatory environmental information disclosure, and green enterprise certification systems, which had positive effects on enterprises' environmental investment, green innovation, and regional carbon emission reduction [8].

2.2. Determinants of ESG performance

2.2.1. External impacts of ESG performance

DiMaggio and Powell [9] proposed three types of isomorphic pressure: mandatory pressure from regulations and green credit, normative pressure from industry standards, and imitation pressure from peer behavior. Xu et al. [10] found that the 2015 Environmental Protection Law significantly improved the ESG scores of high-pollution enterprises. Media supervision and ESG rating differences, as informal institutions, strengthened external pressure [11].

2.2.2. Internal impacts of ESG performance

The resource dependence theory views ESG as a strategic tool: high ratings help obtain green loans, bonds, and government subsidies. Better ESG promotes green innovation through enhancing information transparency and reducing employee turnover rate. However, Xiao Hongjun and Ding Fengru [12] discovered "ESG silence" - managers suppress information dissemination due to short-termism and concerns about "greenwashing" - indicating that organizational capabilities and management cognition act as mediators between external pressure and ESG outcomes. The signaling theory adds that ESG disclosure reduces information asymmetry, especially in emerging markets. Xiao Hongjun and Ding Fengru [12] criticized inconsistent ESG standards and called for contextualized assessment. In summary, external pressure and internal capabilities jointly determine ESG performance. A longitudinal study of the heavily polluting enterprise Huayou Cobalt in the experimental area can reveal the actual operation of the mechanism.

2.3. Green finance and corporate behavior

Firstly, it affects green investment. Wen, Lee and Zhou [13] found that credit is based on environmental performance, forcing high-energy-consuming enterprises to invest in clean production. Second, it increases information disclosure. Xiao Hongjun and Ding Fengru [11] pointed out that enterprises in the experimental area have shifted to structured quantitative disclosure. Third, it adjusts the financing structure. The experimental area amplifies the effect through credit constraints and positive incentives [14]. He et al. [15] showed that high-rated enterprises received lower interest rates, forming positive feedback. Xu Haoqing, Lin Haofeng and Xing Jie [10] demonstrated that the experimental area improved ESG performance through financing constraints.

Fourth, Huayou's establishment of a due diligence system for cobalt procurement in the Democratic Republic of the Congo is an example of supply chain governance [5].

Yang Jingjing and Hu Jin [16] found that the impact of ESG on green innovation varies depending on ownership and industry characteristics, indicating that enterprise heterogeneity moderates the interaction between regulation and enterprises - this prompted this study to adopt a case design. Taking Huayou Cobalt as an example, it provides an ideal scenario for examining how enterprises respond in multiple contexts such as green finance, regulatory pressure, and participation in ESG strategies.

2.4. Analytical framework: three transmission pathways

Path 1: The experimental zone tightens credit standards, widens the cost gap between green and non-green financing, and offers preferential interest rates and quotas to ESG-performing enterprises while imposing high costs on those with poor ESG performance. This financing constraint drives enterprises to improve their ESG performance. Path 2: Information disclosure shifts from voluntary to mandatory. Enterprises must establish an ESG reporting framework to facilitate data collection and goal setting. Path 3: Green bonds offer interest rate subsidies to provide low-cost funds for R&D, encouraging investment in clean technologies [17]. These three paths reinforce each other: green innovation improves environmental indicators, enhances disclosure quality, and increases the availability of green financing.

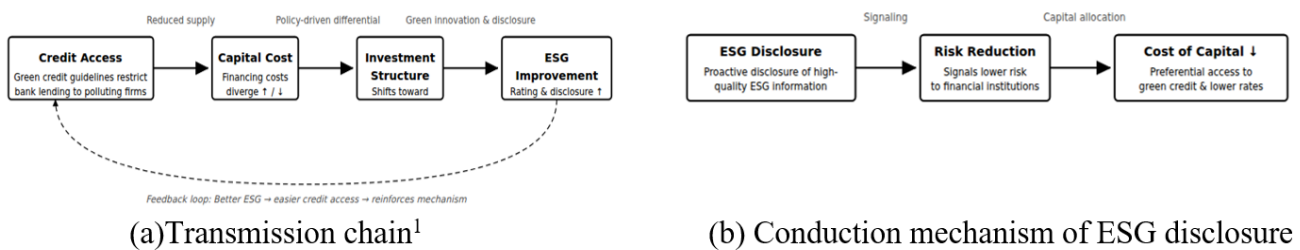


Figure 1. Two transmission pathways

2.5. Innovation point

The current research has certain limitations. Firstly, the mainstream quantitative methods capture average effects, but rarely explore how individual enterprises respond to the interaction of financing constraints, disclosure requirements, and innovation incentives. Secondly, the three paths are examined in isolation, and it has not been verified whether they reinforce or counteract each other in individual enterprises. This study reveals how Huayou Cobalt responded along the three transmission paths to the policies of the experimental area, and demonstrates the dynamic process of the interaction between credit tightening, improved disclosure, and green innovation.

3. Case selection and Huayou cobalt overview

The single-case longitudinal design was adopted. Huayou is located in the first batch of experimental zones in Jiaxing, Zhejiang [8]. It went public in 2015 before and after the policy

¹ All the images in this article were drawn by the author.

coverage. Besides it has released ESG reports since 2016. Huayou is the world's largest cobalt refining enterprise and a major producer of lithium-ion battery precursors. In 2023, its cobalt production was 40,600 tons². Huayou upgraded its ESG report in 2022, adopted the GRI and TCFD framework in 2024, established a board ESG committee, introduced due diligence on the cobalt supply chain in 2017, joined the United Nations Global Compact in 2023, and signed a sustainable development-linked loan in 2024.

4. Case analysis: mechanisms of policy impact

This part examines how the policies of GFRPZ influenced the ESG development paths of Huayou Cobalt through three transmission channels: financing constraints, environmental information disclosure, and green technological innovation.

4.1. Policy shock and temporal alignment

On June 23, 2017, the People's Bank of China in conjunction with six ministries and commissions approved five provincial-level green finance pilot zones, among which was the Huzhou-Qizhou area in Zhejiang Province, directly included in the pilot scope. The activities of improving the company's behavior due to relevant policies are shown in the following figure.

Table 1. Timeline of policy events and Huayou's ESG responses (2015–2024)³

Year	Policy Event	Huayou Cobalt Response	ESG Dim.
2015	-	Listed on SSE (603799.SH)	G
2016	-	First CSR report issued	E+S+G
2017	Zhejiang Pilot Zone est. (June, Huzhou)	OECD-aligned supply chain due diligence	S
2019	Huzhou green enterprise evaluation system	Applied for Green Factory certification	E
2020	-	ESG KPIs integrated into performance evaluation	G
2022	-	Board-level ESG Committee established	G
2023	-	Joined UN Global Compact; Huafei Ni project	S+E
2024	SSE Sustainability Reporting Guidelines (pilot)	Report renamed to Sustainability Report	E+S+G
2025	-	Appointed VP & CSO; conducted full double materiality assessment;	E+S+G

4.2. Pathway 1: easing financing constraints through green credit

² All the data in this article are derived from Huayou Cobalt's annual reports from 2017 to 2025, or its CSR or ESG reports from 2017 to 2025.

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The policy requirements of the GFRPZ stipulate that banks in the pilot areas should incorporate environmental risks into their credit processes, offer preferential interest rates for green projects, and expand the acceptable guarantee scope for green loans. In 2016, almost all loans were short-term borrowings (used to repay old debts). By 2024, the proportion of short-term and long-term loans was roughly equal. The significant improvement in the term structure indicates that policies such as green credit have enabled enterprises to obtain longer-term loans, which is direct evidence of the effectiveness of the policies in the GFRPZ.

Table 2. Debt structure of Huayou

Year	Short-term (RMB bn)	Long-term (RMB bn)	Total (RMB bn)	Short %	Long %
2016	30.91	3.06	33.97	91.0%	9.0%
2017	55.56	3.43	58.99	94.2%	5.8%
2018	51.22	2.66	53.88	95.1%	4.9%
2019	59.15	10.53	69.68	84.9%	15.1%
2020	58.62	14.22	72.84	80.5%	19.5%
2021	80.84	67.38	148.22	54.5%	45.5%
2022	120.20	119.28	239.48	50.2%	49.8%
2023	150.49	189.00	339.49	44.3%	55.7%
2024	207.54	195.02	402.56	51.6%	48.4%
2025	250.50	180.55	431.05	58.1%	41.9%

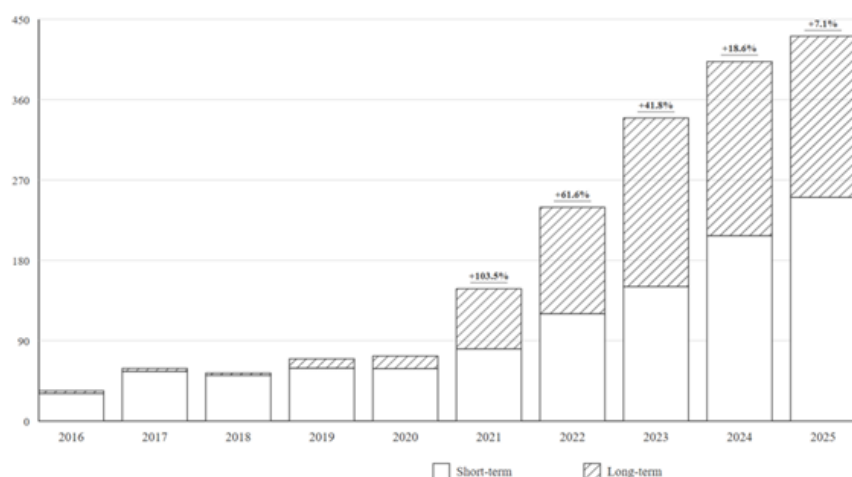


Figure 2. Total bank borrowing for Huayou from 2016 to 2025

By the end of 2024, some of Huayou's production bases have obtained national or provincial green factory certifications [18]. In 2024, Huayou received a \$300 million multi-currency sustainable development linked syndicated loan from Standard Chartered Bank; in 2025, Standard Chartered and Bank of East Asia provided 3.157 billion yuan in green credit, and also issued 500 million yuan of green innovation medium-term notes [19]. These financial tools are all linked to ESG performance.

The green science and technology medium-term notes have seen their interest rate drop from 2.89% in the first issue to 2.18% in the seventh issue [20]. The spread has narrowed by 71 basis

points [21]. Over the period from 2020 to 2025, a cumulative savings of several hundred million yuan in interest has been achieved, providing direct financial impetus for the continuous improvement of ESG performance. This financing cost channel is particularly important because it forms a self-reinforcing dynamic mechanism: better ESG performance leads to cheaper financing, which in turn provides funds for further ESG investments, creating a virtuous cycle that policymakers intend to achieve but cannot guarantee in advance.

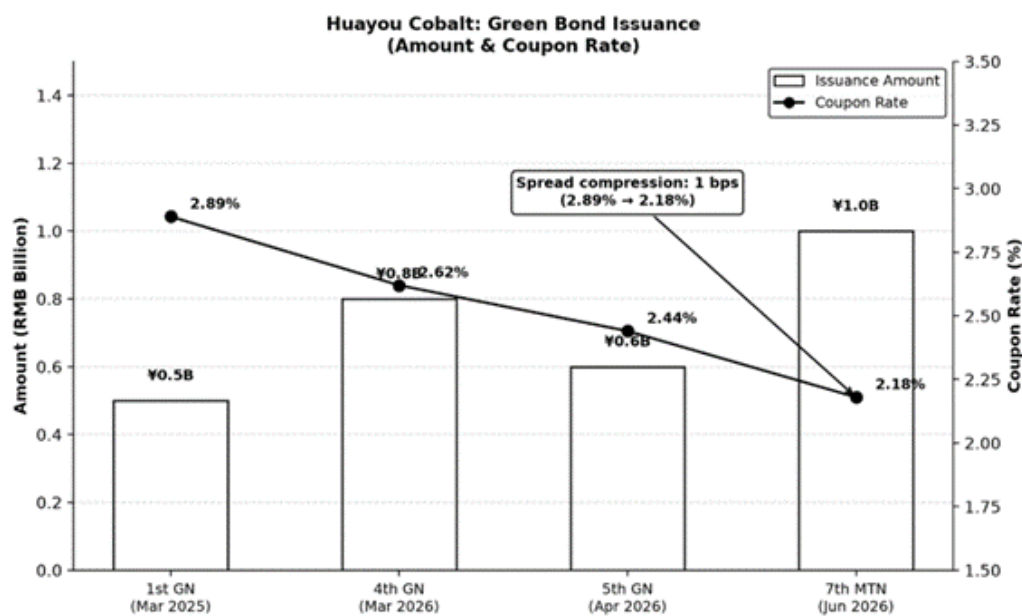


Figure 3. Green bond issuance of Huayou Cobalt

4.3. Pathway 2: environmental information disclosure pressure

4.3.1. The evolution of environmental information disclosure

Since the release of its first corporate social responsibility report in 2015, Huayou Cobalt's non-financial reports have undergone significant changes in scope, depth, and rigor.

The evolution of standards and the changes in the reporting framework. In 2015, the report did not mention any formal standards. In 2016, the report first referred to the GRI G4 guidelines, but only partially met the requirements. By 2018, the report adopted the GRI standards and for the first time included a GRI content index [22]. In 2022, the ESG report was further upgraded, aligning with the 2021 version of the GRI general standards, while also referring to the TCFD recommendations and the SASB framework. In 2023, the ESG report further expanded the compliance scope, covering GRI 2021, TCFD, CASS-ESG 5.0, and the United Nations Sustainable Development Goals. In 2024, the sustainability report followed the "Sustainable Development Report Guidelines No. 14" issued by the Shanghai Stock Exchange and the IFRS S1 standard issued by the ISSB, marking a shift from voluntary disclosure to a disclosure model guided by regulatory requirement [23].

Emission disclosure changes from 2015 to 2025. Taking carbon dioxide as an example, disclosures are also made regarding the proportion of clean electricity, the tonnage emissions of different products, and water circulation.

Table 3. Huayou cobalt GHG emissions disclosure evolution

Report Year	(CO ₂ e)t(Scope 1 +Scope 2)	Key feature
2015–2018	Not disclosed	No quantified carbon data
2019	549,345.02	Including indirect emissions resulting from internal production and external procurement
2020	439,736.65	Scope 1: 2,629.43t, Scope 2:32,696.99t, Scope 3:5,228.37t
2021	772,405.16	base year
2022	1,324,000	-
2023	1,717,200	Year-on-year comparison
2024	6,162,223	LCA; SGS assurance
2025	6,078,179	-

Table 4. Ton-level emission data of Huayou

Product	2023	2024	2025	Change
Precursor	1.67	1.62	1.41	↓15.6%
Nickel cathode	3.71	2.29	1.64	↓55.8%
Cathode material	1.74	1.66	1.26	↓27.6%
Mixed Hydroxide Precipitate	9.11	7.71	6.31	↓30.7%

Table 5. Clean electricity ratio of Huayou

Year	Clean ElectricityRatio	Clean ElectricityCapacity (MW)	Clean ElectricityGeneration—PV (MWh)
2017-2022	—	—	—
2023	34%	12	2,270
2024	40%	14	11,006
2025	39%	24	23,977

Table 6. Circulating water of Huayou from 2017-2025

Year	CirculatingWater (tones)	WaterRecycling Rate
2017-2022	—	—
2023	39,748,464	53.45%
2024	164,422,745	71.39%
2025	123,755,917	66.19%

Third-party audits are also very important. During the nine years prior to the release of the report (2015–2023), Huayou Cobalt's CSR or ESG reports were not subject to independent external audits. However, in 2024, SGS-CSTC Standard Technical Services Co., Ltd. conducted a reasonable assurance audit of some environmental key performance indicators in accordance with ISAE 3000. This change has made Huayou one of the most transparent enterprises in the Chinese non-ferrous metals industry.

4.4. Pathway 3: green innovation and technological upgrading

The R&D expenditure of Huayou Cobalt has continued to increase throughout the entire policy period, although there were significant differences in the reporting format and disclosure granularity in different years. All the following data are directly sourced from the company's official CSR, ESG and sustainable development reports.

Table 7. R&D expenditure of Huayou

Year	R&D Expenditure	% of Revenue
2013	RMB 47.76 million	~3%
2014	RMB 62.68 million	~3%
2015	RMB 45.98 million	>3%
2017	RMB 175.85 million	N/A
2018	RMB 380.22 million	N/A
2019	RMB 267.61 million	N/A
2020	RMB 370.78 million	N/A
2022	RMB 1.709 billion	N/A
2023	RMB 1.441 billion	2.38%
2024	RMB 1.300 billion	2.13%
2025	RMB 1.682 billion	N/A

Under this system, the number of patent applications by Huayou Cobalt has also been increasing year by year, supporting the development of green innovation.

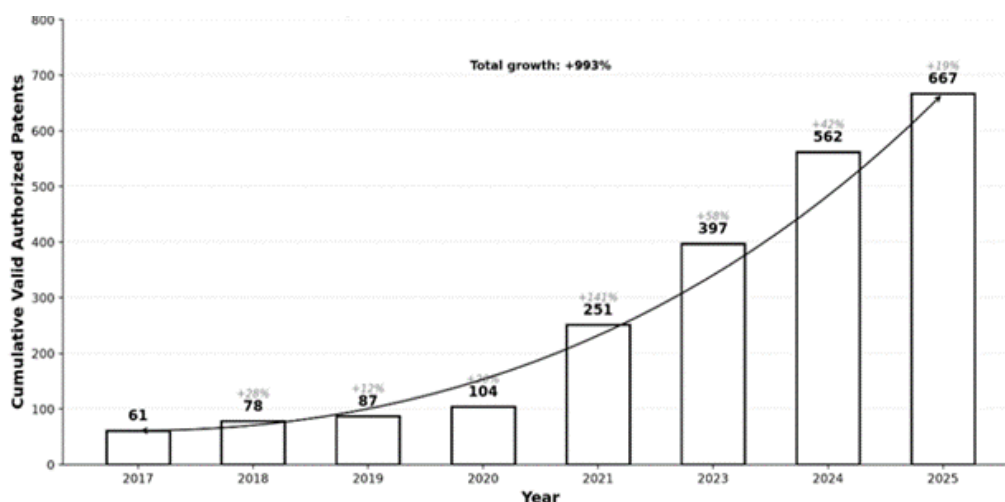


Figure 4. Cumulative patent applications of Huayou from 2017-2025

5. The impact of the green finance reform and innovation pilot zone policy on Huayou Cobalt's ESG performance

This part examines how the policies of the green finance innovation pilot zone influence the sustainable development performance of Huayou Cobalt Co., Ltd. from the three dimensions of environment (E), society (S), and governance (G), and traces the underlying transmission

mechanism. All data are derived from Huayou Cobalt Co.'s annual CSR, ESG or sustainable development reports from 2017 to 2025, as well as the Huazheng ESG rating database cited in part 4.

5.1. Environmental (E) dimension

The policy has promoted Huayou's greenhouse gas emission management through three mechanisms: preferential interest rates for green loans, mandatory environmental information disclosure, and facilitation of green bond financing. Before 2019, Huayou only had qualitative descriptions. In 2020, it made the first systematic disclosure of greenhouse gas emissions in scope one and two. The absolute emissions increased from 549,000 tons in 2019 to 6,078,000 tons in 2025, but the revenue expanded from several billion to 81 billion yuan during the same period. The unit carbon emission intensity per product continued to decline (electric nickel decreased by 55.8%, cathode materials decreased by 27.6%), indicating that the increase in emissions was due to capacity expansion and efficiency improvement. The proportion of clean electricity increased from 34% to 39%. The water recycling utilization rate rose from 53.45% to 66.19%. There were no major environmental penalties recorded from 2017 to 2025.

In terms of mechanisms, green finance has changed the cost-benefit structure of enterprises' environmental behaviors: preferential interest rates reduce the cost of green investment; mandatory environmental information disclosure forces the establishment of a calculation system; ESG ratings and industrial support are linked to form reputation constraints. All three have turned carbon emission management from an "optional" to a "mandatory" question.

5.2. Social (S) dimension

The impact is achieved through three channels: the "one-vote veto" of green credit strengthens the constraints on safety production; ESG ratings convey signals regarding social responsibility; the environmental and social assessment of financial institutions restricts relations with overseas communities. The number of work-related deaths decreased from 2 in 2022 to zero in 2024, and safety investment increased from 16.02 million yuan to 181 million yuan. There have been zero occupational diseases for three consecutive years. Social public welfare investment increased from 1.827 million yuan per year to 69.25 million yuan. The key lies in the transformation of social responsibility from a "moral initiative" to a "financing access condition" - safety accidents and community conflicts directly push up financing costs, and enterprises with poor S dimension performance fall into a negative spiral. Huayou increased community investment to improve its rating and at the same time obtained more stable green financing.

5.3. Governance (G) dimension

The company has established a four-level ESG governance structure: the board of directors - the strategic committee - the ESG and Sustainable Development Management Committee - the professional team. The board consists of 8 members, including 3 independent directors. The attendance rate has been 100% for the past three years. It plans to introduce ESG performance-based compensation by 2027. Besides, the report has evolved from qualitative CSR to an ESG report based on GRI standard, and was renamed the sustainable development report in 2024. 18 subsidiaries have obtained ISO 45001 certification, and 9 have obtained ISO 9001 certification. The ESG rating has risen from grade C in 2017 to a stable A grade since 2023.

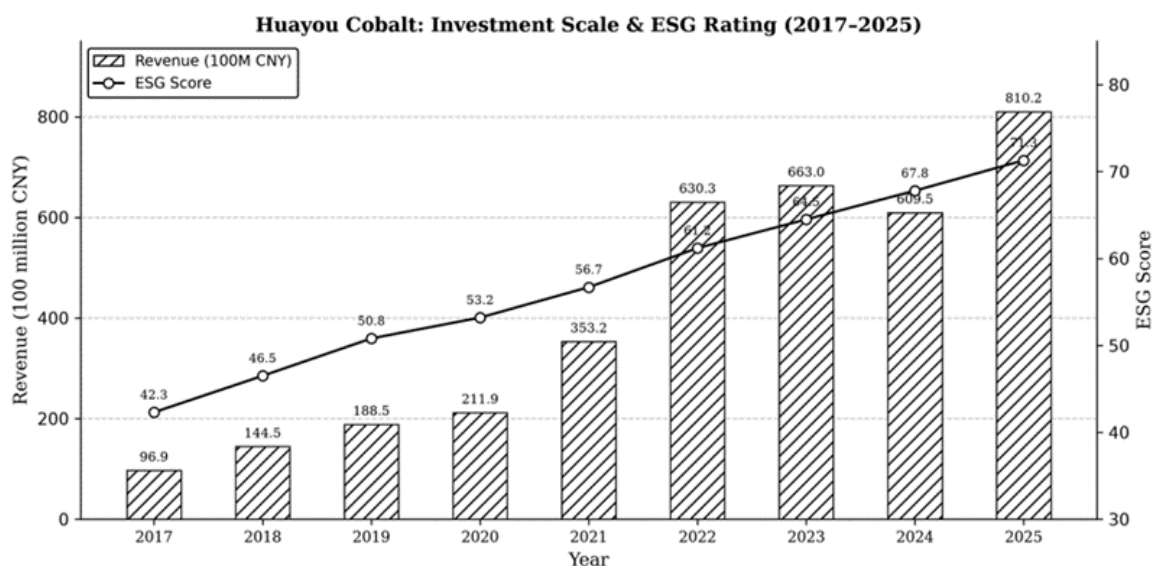


Figure 5. Huayou Cobalt: investment and ESG ratings

Green financial policies precisely target two sensitive points: the financing pressure of enterprises and institutional deficiencies. The embedded governance mechanism gives rise to the ESG governance framework, the appointment of independent directors, and ESG compensation; the standardization mechanism sets the GRI standards as the disclosure benchmark; the market supervision mechanism improves through rating agencies and investors' pressure. The governance structure of Huayou Cobalt has evolved from nothing to something, from crude to refined, and from qualitative to quantitative.

6. Discussion

6.1. Case discovery summary

Green financial policies have promoted the improvement of ESG indicators of Huayou Cobalt through three paths. In the financing constraint path, the proportion of bank loans from approximately 91% in 2016 to half short-term and half long-term in 2024 has decreased, and the cumulative spread of green bonds has been reduced by 71 basis points. In the information disclosure path, the reporting system has upgraded from qualitative descriptions without standards to quantitative reports that simultaneously benchmark against GRI, TCFD, and ISSB. In the green innovation path, research and development expenditure has increased from 46 million yuan to 1.3 billion yuan. These three paths reinforce each other. When innovation improves environmental indicators, the information disclosure will enhance and then financing costs decrease and investment in research and development will increase.

From the three dimensions of ESG: in the environmental dimension, the carbon intensity of electric nickel has decreased from 3.71 to 1.64 (a reduction of 55.8%), the proportion of clean electricity has increased from 34% to 39%, and there have been no major environmental penalties from 2017 to 2025; in the social dimension, the number of worker deaths has decreased from 2 in 2022 to zero in 2024, and community public welfare investment has increased from 18.27 million yuan to 69.25 million yuan; in the governance dimension, a four-level ESG governance framework has been established, and Huayou's rating has risen from C in 2017 to A in 2023.

Xu Haoqing et al. [10] found that environmental regulations enhance ESG scores through innovation, and the Huayou case verified this mechanism. In the same industry, Luoyang Metal Mining (outside the experimental area) has a rating of AA, indicating that policy and market-driven forces can work together. Additionally, absolute carbon emissions have increased from 549,000 tons to 607,800 tons, but the carbon intensity of electric nickel has decreased by 55.8%, suggesting that the total amount may underestimate the policy contribution.

6.2. Case implications

For policymakers, mandatory disclosure of information is the most cost-effective approach - the transformation of Huayou Quality began with mandatory environmental disclosure in the pilot zone rather than voluntary disclosure. For enterprises, ESG is a prerequisite for accessing green finance, and systematic construction is more effective than fragmented compliance. For financial institutions, ESG assessment needs to be differentiated by industry, as a universal system is difficult to accurately measure special issues such as supply chain management and carbon emission intensity in the non-ferrous metals industry.

7. Conclusion

7.1. Research conclusions

This article focuses on Huayou Cobalt Company and uses a single-case longitudinal analysis to examine the impact of the policies in the green finance innovation pilot zone on ESG performance. Based on institutional theory, stakeholder theory, and signal transmission theory, three transmission paths, namely "financing constraint - information disclosure - green innovation", are constructed. The validity of these paths is verified through the analysis of public data from 2015 to 2024.

Firstly, the policies in the pilot zone have a significant driving effect on Huayou's ESG performance. After the implementation of the policies, Huayou has achieved systematic improvements in environmental information disclosure, ESG governance structure, and green technological innovation, and its ESG rating has continued to rise. This indicates that green finance policies can effectively be transmitted to micro enterprises through a combination of market-based incentives and administrative supervision.

Secondly, the effects of the three paths vary. The financing constraint path has the most direct effect - green credit guidelines change the pricing logic of banks, and enterprises actively improve their ESG performance to obtain preferential financing. The information disclosure path has the strongest institutional rigidity - environmental information disclosure has shifted from voluntary to mandatory, forcing enterprises to establish quantitative reporting systems. The green innovation path has the most significant long-term effect - targeted support provides stable financial guarantees for research and development.

Thirdly, the three paths have a synergistic reinforcing effect. Green innovation improves environmental performance, enhances information disclosure quality, and thereby reduces financing costs, forming a virtuous cycle of "policy-driven - enterprise response - performance improvement - refinancing".

7.2. Policy recommendations

Expand the coverage of the pilot zone and extend it to the central and western regions. The Huayou case shows that policies can effectively reduce financing costs and promote information disclosure. However, the current pilot scope is still limited. Establish unified and industry-differentiated ESG disclosure standards. Enterprises face multiple standards coexisting, and it is recommended to introduce mandatory industry-specific ESG standards. Promote the synergy between green finance tools and industrial policies. It is suggested that green credit, green bonds, etc. be linked to industry emission reduction targets and circular economy plans. Promote the development of the ESG evaluation system. General ratings are difficult to reflect substantive issues such as supply chain management and carbon intensity in the non-ferrous metals industry. Establish a dynamic assessment and optimization mechanism for policies to ensure continuous effectiveness.

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