

The Theoretical Mechanism, Practical Dilemmas, and Innovative Pathways of Carbon Emission Rights Trading on the Financial Performance of “Three-High” Enterprises

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Abstract: Against the backdrop of increasingly severe global climate change, reducing greenhouse gas emissions has become a focal issue faced by the world collectively. The extractive industrial society, while enhancing socio-economic benefits, has also triggered a series of environmental and resource issues. “Three-High” enterprises (high pollution, high energy consumption, high emission) have become the primary entities regulated under the carbon emission rights trading system. Based on the Coase Theorem and the theory of diminishing marginal cost, this paper takes “Three-High” enterprises as the main research object and explores the financial impact of carbon emission rights trading on them from three aspects: the cost transmission mechanism, the revenue impact mechanism, and the market risk transmission mechanism. By examining the construction and implementation of carbon emission trading markets worldwide, the study investigates the main dilemmas in how carbon emission rights trading affects the financial performance of “Three-High” enterprises. The research findings indicate that the current fragmentation of the global carbon trading market mechanism makes it difficult for enterprises to formulate comprehensive financial development plans for carbon costs and carbon assets. Internally, insufficient financial management capabilities within enterprises also constrain the application of carbon emission rights. Furthermore, policy fluctuations and an imperfect external regulatory system reduce the stability of the carbon emission rights trading market, thereby creating uncertainties for corporate finances. Based on these issues, the study proposes innovative pathways for the impact of carbon emission rights trading on the financial performance of “Three-High” enterprises from three perspectives: promoting the standardization and coordinated development of the global carbon emission rights trading market; enhancing enterprises’ capabilities in managing carbon costs and carbon asset revenues; and optimizing the policy regulatory system to reduce financial uncertainties. It is hoped that this research can provide theoretical references for “Three-High” enterprises to optimize their financial performance under the carbon emission rights trading mechanism and assist them in achieving a sustainable transformation while addressing the challenges of climate change.

Keywords: Carbon Emission Rights Trading; “Three-High” Enterprises; Financial Performance

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1.Introduction

Since the beginning of the 21st century, the acceleration of industrialization has led to rising global temperatures, making carbon emissions an increasingly severe issue that has garnered worldwide attention. To address the problem of greenhouse gas emissions, the international community has successively established agreements such as the Kyoto Protocol, the Paris Agreement, and related accords. These agreements employ measures such as carbon taxes, carbon emission trading, and fiscal subsidies to regulate and reduce carbon emissions. The European Union launched the EU Emissions Trading System (EU ETS) in 2005, which became the world's first large-scale case of using market mechanisms to manage greenhouse gas emissions. The system plans to implement the Carbon Border Adjustment Mechanism (CBAM) starting in 2026, gradually phasing out free carbon emission allowances.

Carbon peak and carbon neutrality, as policy orientations that can significantly mitigate climate change, are gradually becoming a global consensus. As the world's second-largest economy and the largest carbon emitter, China solemnly announced at the global environmental governance forum in September 2020 that it would strive to peak carbon emissions before 2030 and achieve carbon neutrality before 2060. This marks the first time China has clearly communicated to the world a timeline for achieving carbon neutrality as a major energy-consuming country. Currently, to actively implement the "dual carbon" goals, China is vigorously advancing the construction of a carbon emission trading market, using market mechanisms to guide enterprises in reducing carbon emissions and promoting green, low-carbon development.

"Three-High" Enterprises refer to enterprises characterized by high pollution, high energy consumption, and high emission. These companies typically rely on intensive energy inputs and employ relatively traditional and outdated production processes, reflecting a resource-intensive development model. As a result, they contribute significantly to carbon emissions, resource depletion, and environmental pollution. In particular, typical "Three-High" industries such as steel, cement, and chemicals account for a substantial proportion of total carbon emissions.

Under the constraints of an increasingly mature carbon emission trading market and China's "dual carbon" goals (peak carbon by 2030, carbon neutrality by 2060), the development model of "Three-High" enterprises faces multiple challenges. From a policy perspective, governments continue to introduce stricter environmental regulations and carbon emission monitoring measures, imposing limits on the carbon emission allowances of such enterprises. If a company exceeds its carbon quota, it may face penalties such as heavy fines, production restrictions, or even suspension of operations. From a market perspective, the operation of the carbon emission trading market has turned carbon emissions into a factor of production with clear economic costs. If enterprises fail to control their carbon emissions effectively, they must purchase additional carbon allowances on the market, which directly increases production costs, reduces profit margins, and weakens the price competitiveness of their products. At the same time, growing consumer environmental awareness and increasing demand for green and low-carbon products mean that traditional products offered by "Three-High" enterprises may face shrinking market demand.

Therefore, an in-depth study of the impact mechanism of carbon emission trading on the financial performance of "Three-High" enterprises, an analysis of the challenges they face in practice, and the exploration of innovative development pathways are of significant practical importance. Such efforts will not only help "Three-High" enterprises better adapt to carbon trading policies and achieve financial optimization and sustainable development, but also contribute substantially to global climate governance, the realization of China's "dual carbon" goals, the establishment of a green low-carbon economic system, and the transformation and upgrading of industrial structure.

2. Conceptual Definition and Theoretical Mechanism of How Carbon Emission Trading Affects the Financial Performance of "Three-High" Enterprises

2.1 Conceptual Definitions

2.1.1 Concept of Carbon Emission Trading

Carbon emission rights refer to a type of entitlement that can be bought, sold, or transferred within the carbon emission trading market. In essence, this entitlement represents the legal permission granted to an enterprise to emit a certain amount of carbon dioxide and other greenhouse gases within a specific period. Under the framework of the Kyoto Protocol, carbon emission rights are recognized as a form of property right. Carbon emission trading allows participants to treat carbon

emission allowances as tradable commodities. Within this framework, trading activities encompass key steps such as the creation, allocation, buying and selling, settlement/retirement, and carrying over of carbon emission allowances.

The allocation and management of carbon emission rights are generally administered by designated national departments and authorized institutions. This process is consistently centered around the government's definition of the total carbon emission cap for a specific region, which is then allocated to various economic entities in the form of quotas. The distribution of quotas is based on the benchmarking principle and incorporates specific unit exemption mechanisms to accurately determine the amount of allowances each generating facility should receive.

2.1.2 The Concept of “Three-High” Enterprises

“Three-High” enterprises refer to those whose production activities typically inflict severe damage upon the ecological environment, constituting a collective term for enterprises that generate substantial economic value at the expense of environmental depletion. During periods of capital accumulation, such enterprises frequently achieve rapid output through substantial energy consumption and environmental pollution, thereby driving swift local economic growth and even becoming pivotal pillars of regional economies. Consequently, “Three-High” characterises enterprises exhibiting high pollution, high energy consumption, and high emission in their production operations. Within the context of climate governance, these enterprises have become primary targets for environmental regulatory constraints. Building upon existing research and utilising the classification criteria for heavily polluting industries outlined in China's Guidelines for the Classification of Listed Companies by Industry (2012 Edition), this paper categorises enterprises within the following sixteen sectors as heavily polluting: thermal power generation, steel, cement, electrolytic aluminium, coal, metallurgy, chemicals, petrochemicals, building materials, papermaking, brewing, pharmaceuticals, fermentation, textiles, leather, and mining.

2.2 Theoretical Basis of Carbon Emission Trading Mechanisms

The origin of carbon emission trading can be traced back to the 1960s, when American economist Dales proposed the Emissions Trading Theory, which laid an important theoretical foundation for the construction of carbon emission trading markets. The emissions trading theory posits that environmental resources are commodities with economic value, and that utilizing market mechanisms to achieve optimal allocation of resources can solve environmental pollution problems. Building on this, the Kyoto Protocol signed in 1997 became a key milestone in the development of carbon emission trading. The protocol clearly defined the emission reduction obligations of developed countries and innovatively proposed three flexible mitigation mechanisms: International Emissions Trading (IET), the Clean Development Mechanism (CDM), and Joint Implementation (JI). Among these, carbon emission trading, as one of the core mechanisms, formally entered the historical stage of global climate change response.

From a theoretical perspective, the Coase Theorem provides solid theoretical support for carbon emission trading. The Coase Theorem suggests that, under the conditions of zero transaction costs and clearly defined property rights, regardless of how initial property rights are allocated, the market mechanism can drive resources towards an optimal allocation, achieving a Pareto optimal state. In carbon emission trading, carbon emission rights are endowed with clear property attributes, becoming a commodity that can be freely traded on the market. Enterprises, considering their own emission reduction costs, trade carbon emission rights through the market, thereby minimizing the overall social cost of emission reduction. If an enterprise has low abatement costs, it can reduce emissions at a lower cost and sell its surplus carbon emission allowances to enterprises with higher abatement costs. For enterprises with high abatement costs, purchasing allowances is more economically efficient than reducing emissions themselves. Such transactions allow both parties to meet their respective emission reduction needs without incurring excessive costs, achieving efficient resource allocation.

The Marginal Abatement Cost Theory is also an important theoretical basis for carbon emission trading. Due to differences in production technology, processes, and energy structures among enterprises, their marginal abatement costs also vary. Enterprises with lower marginal abatement costs have a greater advantage in the emission reduction process, as they can achieve greater reduction volumes at relatively lower costs. Conversely, enterprises with higher marginal abatement costs face greater difficulties and higher costs in reducing emissions. The carbon emission trading market provides a platform for these

enterprises to trade with each other. This allows enterprises with lower abatement costs to convert their emission reduction achievements into economic benefits, while enterprises with higher costs can purchase carbon emission rights to meet their own emission needs, avoiding disruptions to normal production and operations caused by excessively high abatement costs. This trading mechanism, based on differences in marginal abatement costs, can fully mobilize enterprises' enthusiasm for emission reduction, improve the efficiency of total societal emission reduction, and achieve set emission reduction goals at the lowest social cost.

2.3 Theoretical Mechanisms of How Carbon Emission Trading Affects the Financial Performance of “Three-High” Enterprises

The impact of carbon emission trading on the financial performance of “Three-High” enterprises is primarily realized through three theoretical mechanisms: cost transmission, revenue impact, and risk transmission.

2.3.1 Cost Transmission Mechanism

Carbon emission trading affects the production and operational costs of “Three-High” enterprises, which can be categorized into direct cost increases and indirect cost increases. For Direct Costs, under a carbon emission trading system (ETS), a carbon emission allowance represents the permitted quota of carbon dioxide and other greenhouse gases that an enterprise is allowed to emit. If an enterprise's actual emissions exceed its allocated quota, it must purchase additional allowances on the market. Due to their high energy consumption and high emission characteristics, “Three-High” enterprises often have actual emissions that exceed their allocated quotas. Consequently, they face increased direct costs, such as purchasing carbon emission allowances and potentially paying carbon taxes, which significantly affect their operational costs. According to relevant research reports from the International Energy Agency (IEA), carbon prices in major global carbon markets are projected to continue rising in the coming decades, further increasing the cost burden for “Three-High” enterprises purchasing allowances. Additionally, a carbon tax, levied on corporate carbon emission behavior, aims to incentivize emission reduction through economic means. As carbon reduction policies advance, the likelihood of carbon tax implementation increases. Once a carbon tax is introduced, enterprises will face new direct cost pressures.

For Indirect Costs, indirect costs for “Three-High” enterprises under the ETS will also be affected by factors such as equipment upgrades, investments in technology research and development (R&D), and ripple effects on supply chain costs triggered by emission reduction actions. To comply with environmental monitoring requirements, “Three-High” enterprises often need to upgrade existing equipment and adopt more advanced energy-saving and emission-reduction technologies. For instance, the initial investment for equipment upgrades in a medium-scale cement plant could be as high as tens of millions of RMB, with annual maintenance and operational costs also amounting to millions. Technological R&D similarly requires substantial investment of funds and human resources. To develop more efficient emission reduction technologies, enterprises need to establish professional R&D teams and conduct long-term research and experiments. This process entails not only the risk of technical failure but also continuous capital investment for equipment procurement, material consumption, and personnel salaries, thereby driving up the indirect costs for “Three-High” enterprises.

2.3.2 Revenue Impact Mechanism

Carbon emissions trading may not only increase enterprises' production and operational costs, but carbon asset revenues in the carbon trading market will also become a significant source of income for “Three-High” enterprises under the carbon emissions trading system. This is primarily achieved by optimizing carbon emissions management and selling surplus allowances or CCERs. First, enterprises can reduce actual carbon emissions by optimizing carbon emission management through energy-saving and emission-reduction measures such as improving production processes and enhancing energy efficiency. This generates surplus carbon emission allowances that can be sold on the market, generating revenue for the enterprise. Second, CCERs generated from voluntary emission reduction projects also provide enterprises with avenues to obtain carbon asset income. Enterprises generate carbon reductions by investing in renewable energy projects like solar photovoltaic or wind power generation, or by participating in forest carbon sink initiatives. These reductions, verified and converted into CCERs, are sold on the carbon emissions trading market, yielding annual returns for enterprises.

The advancement of carbon emissions trading also indirectly boosts product market revenues for “Three-High” enterprises

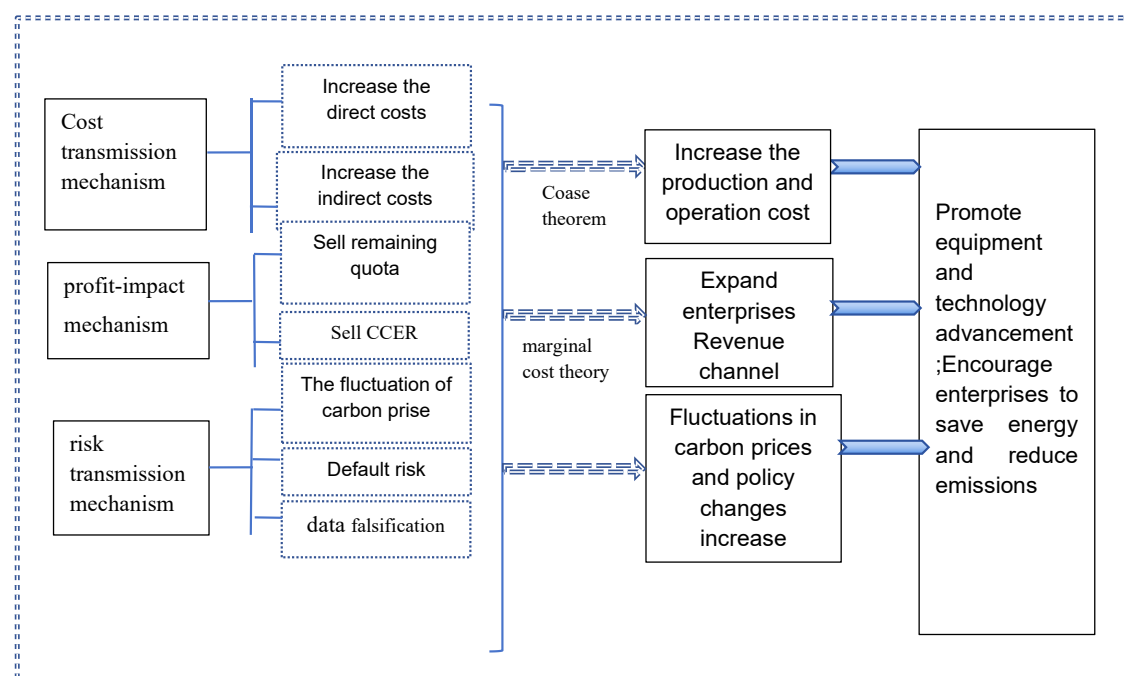
through green product premiums and expanded market share. As consumer environmental awareness grows and green consumption concepts become widespread, market demand for green, low-carbon products will intensify. If “Three-High” enterprises proactively adjust their product portfolios to manufacture green products meeting low-carbon standards, they can enhance their environmental image, thereby expanding market share and creating new profit growth points.

2.3.3 Risk Transmission Mechanism

Fluctuations in carbon prices and policy changes will also cause “Three-High” enterprises to face certain market risks in carbon emission rights trading, thereby affecting the financial performance of enterprises. Please provide the text you would like translated.

Fluctuations in carbon prices are one of the main manifestations of market risks. From the perspective of market supply and demand, if the supply of carbon emission quotas in the market is excessive and the supply of quotas is relatively stable, it will lead to a decline in carbon prices. Conversely, when the economy recovers and enterprises expand their production scale, the demand for carbon emissions increases. If the supply of quotas is insufficient, carbon prices will rise. With the construction and advancement of the carbon emission rights trading market, carbon trading may become an important channel for some “Three-High” enterprises to gain profits or make investments. Therefore, fluctuations in carbon prices will have an impact on the stability of enterprises’ production and operation. Policy changes also bring uncertainties to enterprises. Adjustments in the government’s carbon emission reduction policies and carbon emission rights trading rules can have a significant impact on the production and operation and financial conditions of enterprises. If the government tightens the allocation standards for carbon emission quotas, the quotas obtained by enterprises will decrease, which may force enterprises to increase their investment in emission reduction or purchase more quotas, thereby increasing costs.

Figure 1: Theoretical Transmission Mechanism of the Impact of Carbon Emission Rights Trading on the Financial Performance of “Three-High” Enterprises



In addition, in carbon emission rights trading, credit issues such as counterparty default and data fraud pose potential financial risks to “Three-High” enterprises. Counterparty default risk is an important component of credit risk. During the carbon emission rights trading process, both parties may fail to fulfill their contractual obligations for various reasons, leading to default situations. When the contract performance period is approaching, the seller may be unable to provide sufficient quotas due to poor business operations, forcing the buyer to purchase quotas at a higher price in the market to meet their own carbon emission needs. This not only increases the buyer’s procurement costs but may also result in penalties due to delayed performance, causing economic losses to the enterprise. Inaccurate credit evaluations by credit rating agencies

of counterparties also increase the default risk for enterprises. If credit rating agencies fail to fully consider the potential risk factors of counterparties and give overly high credit ratings, enterprises may suffer default losses when conducting transactions based on these ratings. Please provide the text you would like translated.

Data falsification is another serious credit issue. Some enterprises may engage in data falsification to reduce carbon emission costs or gain more economic benefits. Such behavior will undermine the fairness and transparency of the market, affect the confidence of market participants in the carbon market, cause abnormal fluctuations in carbon prices, and indirectly affect the financial conditions of other enterprises. Based on the Coase Theorem and marginal cost theory, carbon emission rights trading will influence the financial performance of “Three-High” enterprises by affecting their carbon trading costs, carbon asset returns and trading markets.

3.The Impact of Carbon Emissions Trading on the Financial Performance of “Three-High” Enterprises: Practical Dilemmas

3.1 Fragmentation of the Global Carbon Market Disrupts Corporate Financial Planning

Generally, the maturity of a market mechanism provides a more favorable environment for transactions between enterprises, facilitating the achievement of a Nash equilibrium. Similarly, the maturity of carbon market mechanisms directly determines the stability of costs and revenues for “Three-High” enterprises participating in trading. Currently, the global carbon market is characterized by multiple parallel standards and fragmented operations. This decentralized, fragmented governance model has become a major obstacle for companies in managing carbon assets within their financial systems. From the perspective of carbon price formation, even in mature markets like the EU Emissions Trading System (EU ETS), significant price volatility persists. In 2024, EU allowance prices fluctuated between € 70 and € 95 per tonne, with single-day surges exceeding 15% during policy adjustment periods. For instance, a European steel company with annual emissions of 5 million tonnes could face annual carbon cost variations exceeding tens of millions of euros for every € 10/tonne price fluctuation, making it impossible to accurately predict carbon expenditure in annual financial budgets.

The instability of emerging carbon markets is even more pronounced. According to data from the China Carbon Market Information Network, the average daily trading volume in China’s national carbon market in 2023 was less than 500,000 tonnes, merely 0.05% of the EU ETS’s average daily volume. This leaves “Three-High” enterprises frequently grappling with the difficulty of selling surplus allowances or purchasing urgently needed allowances at reasonable prices. Furthermore, global liquidity mismatches and a shortage of financial instruments exacerbate financial risks. Currently, 38 mandatory carbon markets worldwide cover 23% of global greenhouse gas emissions, yet only 12% of these markets have introduced carbon derivatives. Although the EU ETS boasts the most comprehensive product suite, it only launched carbon futures in 2021. Markets like South Korea and New Zealand still lack basic hedging tools, preventing “Three-High” enterprises from effectively managing price risks. In the voluntary carbon market, the coexistence of six major standards, such as VCS and GS, leads to verification cost differences of up to 30% for the same project under different standards. Moreover, only about 60% of VCS-certified emission reductions are recognized by regional mandatory markets, severely limiting the value realization of corporate carbon assets.

3.2 Inadequate Internal Carbon Financial Management Capability Constrains Cost Optimization

Long reliant on high-carbon, high-emission production models, “Three-High” enterprises have historically paid little attention to carbon financial management, resulting in significant gaps in their systems for managing carbon emission costs and carbon asset trading. The most prominent issue is a lack of professional expertise. A 2024 International Energy Agency survey of 200 global energy and manufacturing firms revealed that approximately 68% had not established dedicated carbon asset management teams. Additionally, 45% of U.S. refineries, due to insufficient expertise, could not accurately calculate baseline emissions. This led to situations where they either over-allocated allowances, causing assets to sit idle, or under-allocated, forcing emergency purchases at high prices. This is not an isolated case; Chinese power companies face similar challenges.

Furthermore, carbon emission allowances, as a 21st-century concept, are generally not incorporated into traditional financial risk management frameworks. Data from the International Carbon Action Partnership indicates that between 2022 and 2024, 37% of European “Three-High” enterprises did not factor carbon costs into their return-on-investment calculations for new

project decisions. This resulted in newly commissioned facilities incurring losses due to rising EU carbon prices. Disclosure gaps are even more significant in emerging economies. In India, only a small fraction of large steel companies comply with the carbon disclosure requirements of the Securities and Exchange Board. In Brazil, a striking 41% of mining companies faced fines due to incomplete carbon asset reporting, with their financing costs consequently increasing by 1.8 to 2.5%. Moreover, ineffective cross-departmental coordination is a common global problem. Production departments tend to prioritize output increases, while finance departments focus on cost control. This misalignment leads to a disconnect between carbon reduction investments and financial planning.

3.3 Policy Volatility and an Incomplete Regulatory System Increase Financial Uncertainty

3.3.1 Fragmentation in Global Carbon Market Trading Mechanisms Disrupts Corporate Financial Planning

Generally, the maturity of a market mechanism provides a more favorable external environment for transactions between enterprises, facilitating the achievement of a Nash equilibrium. Similarly, the maturity of a carbon market mechanism directly determines the cost and revenue stability for “Three-High” enterprises when participating in the market. Currently, the global carbon market exhibits a fragmented landscape with multiple standards operating in parallel. This compartmentalized, piecemeal management model has become a major obstacle for enterprises in managing their carbon assets. In terms of carbon price formation, even in mature markets like the EU Emissions Trading System (EU ETS), significant price volatility persists. In 2024, EU Allowance (EUA) prices fluctuated between € 70 and € 95 per ton, with single-day surges exceeding 15% during policy adjustment periods. For example, a European steel company with an annual emission of 5 million tons could see a difference in its annual carbon cost exceeding tens of millions of euros for every € 10/ton fluctuation in the carbon price. This volatility makes it impossible for companies to accurately forecast their carbon expenditure in annual financial budgets.

Instability is even more pronounced in emerging emissions trading schemes. According to data disclosed by China Carbon Market Information Network, the average daily trading volume in China’s national carbon market in 2023 was less than 500,000 tons, a mere 0.05% of the EU ETS’s average daily volume. This situation frequently leaves “Three-High” enterprises struggling to sell surplus allowances or purchase needed allowances at reasonable prices. Furthermore, global liquidity mismatches and a shortage of financial instruments exacerbate financial risks. Currently, 38 mandatory carbon markets worldwide cover about 23% of global greenhouse gas emissions, but only 12% of these markets have launched carbon derivatives. Although the EU ETS boasts the most complete product suite, it only launched carbon futures in 2021. Markets like South Korea and New Zealand still lack basic hedging tools, preventing “Three-High” enterprises from effectively managing price risks. In the voluntary carbon market, six major standards like VCS and Gold Standard coexist. Verification costs for the same project can differ by up to 30% across these standards, and only about 60% of Voluntary Carbon Units (VCUs) issued under VCS are recognized by regional compliance markets, severely restricting the value realization of corporate carbon assets.

3.3.2 Insufficient Internal Carbon Financial Management Capability Hinders Corporate Cost Optimization

“Three-High” enterprises, long reliant on high-carbon, high-emission production models, have historically neglected carbon financial management, resulting in significant shortcomings in their systems for managing carbon emission costs and carbon asset trading. The most prominent issue is a lack of specialized expertise. A 2024 International Energy Agency (IEA) survey of 200 global energy and manufacturing companies revealed that approximately 68% had not established dedicated carbon asset management teams. Due to insufficient expertise, 45% of U.S. refineries could not accurately calculate their baseline emissions, leading either to over-allocation of allowances (causing idle assets) or under-allocation (forcing emergency purchases at high prices). This is not an isolated case; Chinese power companies face similar challenges.

Moreover, carbon emission allowances, as a 21st-century concept, are generally not incorporated into traditional financial risk frameworks. Data from the International Carbon Action Partnership (ICAP) indicates that between 2022 and 2024, 37% of European “Three-High” enterprises did not factor carbon costs into their Return on Investment (ROI) calculations for new project investment decisions. This oversight resulted in newly operational facilities incurring losses due to rising EU carbon prices. The disclosure gap is more significant in emerging economies. In India, only a small portion of large-scale steel

companies meet the carbon disclosure requirements of the Securities and Exchange Board of India (SEBI). In Brazil, as many as 41% of mining companies faced penalties due to incomplete carbon asset reporting, subsequently seeing their financing costs increase by 1.8% to 2.5%. Additionally, failed cross-departmental coordination is a common global issue. Production departments often prioritize output increases, while finance departments focus more on cost control. This misalignment leads to a disconnect between carbon reduction investments and financial planning.

3.3.3 Policy Volatility and an Incomplete Regulatory System Increase Financial Uncertainty

A volatile policy environment and uneven regulatory enforcement globally impose additional financial burdens on “Three-High” enterprises. Policy fragmentation and unpredictability have become major risks for these companies in the carbon market. Currently, the EU simultaneously implements the Emissions Trading System and regulations on the carbon intensity of maritime fuels. This dual regulation has significantly increased compliance costs for shipping companies, with an estimated 30% of these costs attributed to unclear policy coordination.

Beyond market fluctuations induced by policy, significant gaps also exist between regions in their Monitoring, Reporting, and Verification (MRV) systems. The EU achieves a data accuracy rate of about 98% through unified satellite monitoring, while Southeast Asia still relies heavily on manual reporting, resulting in larger measurement deviations. In a case investigated by the IEA, a Malaysian chemical company in 2023 faced a discrepancy of 1.2 million tons in its calculated emissions due to differences in accounting methodologies used by different verification bodies. Such disparities in emissions accounting, stemming from policy and statistical caliber differences, pose substantial risks to corporate development. Furthermore, penalties for global carbon data fraud show signs of local protectionism. Sanctions for corporate carbon data falsification vary significantly across regions, with low violation costs in some areas. This unfair implicit protection effectively condones data fraud.

4. Innovative Pathways for Emissions Trading to Influence the Financial Performance of “Three-High” Enterprises: Mitigation Strategies

Addressing the practical challenges outlined above regarding how emissions trading affects the financial performance of “Three-High” enterprises, this paper proposes targeted countermeasures from three dimensions: international coordination, enterprise self-improvement, and policy regulation.

4.1 Promoting the Standardization and Coordinated Development of the Global Carbon Emissions Trading Market

To mitigate the disruptions that parallel standards and operational fragmentation in the global carbon market cause to corporate financial planning, international rule-making bodies should take the lead. Under the framework of the United Nations Framework Convention on Climate Change (UNFCCC) and in collaboration with institutions like the World Bank and the International Energy Agency (IEA), efforts should be made to establish globally unified standards for carbon allowance accounting and a mutual recognition mechanism for certified emission reductions. This would reduce regulatory discrepancies between different markets. By gradually achieving mutual recognition of emission reductions between voluntary carbon standards (e.g., VCS, Gold Standard) and compliance markets (e.g., EU ETS, China’s national ETS), verification costs for cross-market transactions can be lowered, and accounting differences arising from disparate standards can be minimized (Li & Lai, 2025).

Regarding inter-market linkages, mature carbon markets can foster the development of emerging markets through “linking mechanisms.” The EU could expand the scope of its linkage with the UK and Swiss carbon markets. China could promote pilot programs for coordination between its national ETS and regional markets like the Guangdong-Hong Kong-Macao Greater Bay Area, enhancing market liquidity through mutual allowance recognition and joint trading platforms. Simultaneously, countries should be encouraged to accelerate the development of carbon derivative markets. Drawing on the EU’s experience with carbon futures, markets like South Korea and New Zealand should gradually introduce tools such as carbon futures and options. This would provide “Three-High” enterprises with means to hedge against carbon price volatility, preventing financial risks associated with a lack of risk management instruments.

4.2 Enhancing Enterprise Capability in Managing Carbon Emission Costs and Carbon Asset Returns

“Three-High” enterprises are often capital-intensive, leading their financial management teams to focus expertise traditionally on areas like fixed asset management and cost-budget control. Emissions trading and the associated management of related revenues and costs, as novel domains, impose higher competency requirements on corporate financial personnel. Therefore, in the context of emissions trading, “Three-High” enterprises should invest in specialized training to upgrade their financial staff’s knowledge in new areas such as carbon market rules, carbon financial accounting, and environmental science. By combining internal training with external recruitment, the professionalism of the finance department can be enhanced, and the enterprise’s capacity for carbon emission and carbon asset accounting can be strengthened. This lays the foundation for effective management of carbon costs and carbon asset returns.

Regarding the refinement of financial systems, it is essential to fully integrate carbon factors into traditional financial management processes. A separate “Carbon Cost Budget” line item should be established during budget formulation, incorporating carbon price forecasts to predict annual carbon expenditures. In investment decision-making, carbon costs must be included in project Return on Investment (ROI) calculations. European “Three-High” enterprises can reference long-term EU carbon price trends to assess the profitability feasibility of high-carbon projects, thereby avoiding losses in newly operational facilities due to carbon price increases. Furthermore, enterprises must strictly comply with local disclosure requirements to improve carbon asset information reporting, reducing the risks of penalties and increased financing costs due to incomplete reporting.

To improve internal departmental coordination, regular carbon management meetings should be convened to establish a linkage mechanism among production, finance, and environmental protection departments. The production department needs to provide timely feedback on how production plan adjustments affect carbon emissions. The finance department can then optimize carbon cost control strategies accordingly, supported by emission monitoring data from the environmental protection department. This helps prevent misalignment between carbon reduction investments and financial planning caused by departmental silos.

4.3 Optimizing the Policy and Regulatory System to Reduce Financial Uncertainty

Addressing the primary issue of inadequate regulation in current emissions trading, organizations like the International Carbon Action Partnership (ICAP), the UNFCCC, and the IEA should actively promote the unification and standardization of emissions trading, working towards a harmonized global system for Monitoring, Reporting, and Verification (MRV). Climate governance and the execution of “dual carbon” goals cannot be achieved by any single country alone. Leveraging the EU’s advanced satellite monitoring technology, the EU should provide corresponding technical support to emerging emissions trading markets in regions like Southeast Asia and Africa. By sharing experience and facilitating technology transfer, these relatively underdeveloped regions can gradually transition from manual reporting to automated monitoring, thereby minimizing regional measurement deviations.

Furthermore, concerning market incoordination and the issue of overlapping carbon tax levies, synergistic design between carbon taxes and carbon markets should be strengthened. In cross-border carbon transactions between different countries and regions, clear deduction ratios between carbon taxes and carbon allowances should be established to prevent increased corporate carbon costs due to double taxation. Regarding enforcement, the penalty costs for carbon emission data fraud must be substantially increased. Simultaneously, local protectionism should be rejected, and cross-regional supervision should be implemented to address lax enforcement in certain jurisdictions. This ensures a fair competitive environment for compliant enterprises and avoids carbon cost disparities stemming from regulatory differences.

5. Conclusion

Against the backdrop of the continuous development of international carbon emissions trading, nations are increasingly prioritizing the implementation of emissions trading pilots. Based on the aforementioned research, this paper argues that by promoting the standardization and coordinated development of the global carbon emissions trading market, the current fragmented market landscape can be broken. This would lower the costs and risks for enterprises engaging in cross-market transactions, creating a stable and predictable operating environment for carbon asset management. On the other hand, by enhancing their internal capabilities in managing carbon emission costs and carbon asset returns, and by fully

integrating carbon factors into all aspects of financial management—from building professional expertise to optimizing inter-departmental coordination mechanisms—enterprises can effectively improve their competitiveness within the carbon market, achieving cost optimization and profit maximization. In the future, as carbon emissions trading mechanisms continue to improve and mature, “Three-High” enterprises must consistently monitor market dynamics and policy changes, flexibly adjust their financial strategies, and enhance their capabilities in managing financial carbon costs and carbon assets. Only by doing so can they better adapt to the evolving demands of the carbon market, achieving a win-win outcome for both economic efficiency and environmental benefits.

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