

The Impact of Carbon Market Mechanisms on Green Investment and Financial Risks: A Comparative Study of Guangdong, China, and New South Wales, Australia

Jianping Luo^a

University of Newcastle, Newcastle, Australia

^aEmail: Jianping.Luo@uon.edu.au

Abstract

This article analyses the impact of the carbon market mechanism on green investment and financial risks by taking Guangdong Province, China and New South Wales, Australia, as examples. Carbon pricing and related policies are not only important tools for environmental governance, but also affect the investment decision-making, capital allocation and financial risk exposure of enterprises. Therefore, while promoting low-carbon transformation, the carbon market mechanism will also have a more direct impact on the financial market and enterprise management. This study adopts a qualitative comparative research design, mainly through literature review, policy text analysis and case comparison. Guangdong Province was selected as a typical case of the Regional Carbon Emission Rights Trading System (ETS). In contrast, NSW better reflects the characteristics of the policy mix, and its low-carbon transformation is also affected by the "security mechanism" at the Australian federal level, the state-level net zero emission target and the power infrastructure policy. The study found that the carbon market mechanism can promote the development of green investment by increasing the cost of high-emission activities, enhancing enterprises' expectations of low-carbon investment, and guiding more capital to clean technologies. However, at the same time, these mechanisms may also bring certain financial risks, such as fluctuations in carbon prices, revaluation of industry assets, uncertainty in policy implementation, and transformation pressures faced by enterprises. The comparison results show that Guangdong's policy model relies more on direct carbon market price signals, and affects the emissions and investment behaviour of enterprises through the carbon trading mechanism. New South Wales, on the other hand, attaches more importance to long-term policy guidance and supports low-carbon investment through net zero emission targets and infrastructure planning. This article believes that two aspects should be considered at the same time when evaluating carbon policy. On the one hand, it is necessary to examine its ability to promote green investment and capital flow to low-carbon fields; on the other hand, it is also necessary to pay attention to its ability to identify and manage financial risks in the process of low-carbon transformation.

Keywords

Green Investment; Financial Risk; Carbon Market; Guangdong Carbon Market; New South Wales Financial.

1. Introduction

Climate change has become an important issue that the government, enterprises and financial markets need to face together. In order to promote low-carbon transformation, more and more countries and regions have begun to adopt carbon pricing, carbon emission trading mechanisms, net zero emission policies and green financial instruments. These policies are not

only used to reduce greenhouse gas emissions, but also have a wider impact on business operations and capital markets. The core function of the carbon market mechanism is to convert carbon emissions into economic costs that enterprises can quantify and bear, and influence the production mode and investment decision-making of enterprises through price and policy signals. As the cost of emissions continues to rise, the cost advantage of high-emission activities may gradually weaken. Enterprises will also be more motivated to adjust production methods and consider adopting technologies and projects with lower emission levels. At the same time, low-carbon technology, energy efficiency projects and clean energy infrastructure may receive more capital support, thus promoting the gradual flow of funds to areas that are more in line with the direction of low-carbon transformation.

Existing research shows that carbon pricing can promote enterprises to increase investment in emission reduction and environmental protection by changing the cost structure and investment expectations of enterprises[1,2]. At the same time, the study also shows that carbon price fluctuations and carbon market shocks may affect stock prices, industry valuations and financial market risk spillover[3,4]. This shows that the carbon pricing mechanism is not only a tool for environmental governance, but also affects capital allocation and financial risks.

However, there are still limitations in the existing research. Research on green investment usually focusses on whether carbon mechanisms can promote low-carbon investment, while financial risk research focusses more on the impact of carbon price fluctuations on the market and asset prices. These two issues are often discussed separately. In fact, the same carbon mechanism may promote green investment on the one hand, and may also bring new financial risks on the other hand. For example, strict carbon restrictions may increase the attractiveness of low-carbon projects, but if policies are unstable or carbon prices fluctuate greatly, enterprises and financial institutions may face greater uncertainty. Therefore, it is necessary to explore the relationship between green investment and financial risk within a unified analysis framework.

Against this background, this article chooses Guangdong Province, China and New South Wales, Australia as comparative cases to analyse how the carbon market and related policy mechanisms affect green investment and financial risks in different institutional environments. Guangdong Province represents the Regional Emissions Trading System (ETS) with quota allocation, carbon trading and compliance obligations as the core. This model mainly affects emission behaviour and investment decisions through market price signals and enterprise performance requirements. In contrast, NSW reflects a policy combination model. Its low-carbon transformation is not only influenced by Australia's federal safeguard mechanism, but also jointly driven by state-level net zero emissions policies and power infrastructure planning. Therefore, there are certain differences between the two places in terms of policy tools, market signals and investment guidance methods. By comparing these two cases, this article hopes to further explain how different carbon management paths form different investment incentives and bring different types and degrees of financial risk exposure.

This article adopts the method of literature review, policy text analysis and comparative case studies to discuss three key issues: First, how does the carbon mechanism affect green investment? Second, how does the carbon mechanism affect financial risks? Third, how can the institutional differences between Guangdong and NSW lead to different results in terms of green investment and financial risk? This article believes that the evaluation of carbon policy should not only focus on whether it promotes emission reduction and green investment, but also evaluate its ability to manage financial risks in the process of low-carbon transformation.

2. Literature Review

2.1. Carbon Market Mechanisms and Green Investment

Under the background of the global continuous low-carbon transformation, the carbon market mechanism has become an important policy tool. Compared with traditional administrative control, the carbon pricing mechanism creates economic incentives by setting costs for emission behaviour, thus affecting the production choices and long-term investment decisions of enterprises. In theory, when the cost of carbon emissions rises, enterprises are more likely to reduce investment in high-carbon activities and increase investment in clean technology and low-carbon projects[1].

Existing research generally believes that the carbon market mechanism can promote green investment, but the strength of its effect depends on policy design and market conditions. Theoretically, carbon pricing will change the relative rate of return of different investment projects. The attractiveness of high-emission projects has decreased, while the relative competitiveness of low-carbon projects has increased. Therefore, the carbon market has the potential to promote the transfer of capital to green industries and clean production technologies[1].

However, the effect of carbon pricing on investment is not always consistent. One important reason is policy and price uncertainty. Fuchs et al. point out that uncertainty surrounding carbon prices can reduce the market value of expected decarbonisation investments and may also delay firms' investment decisions. This suggests that carbon pricing alone may not be sufficient to encourage long-term green investment. If firms expect carbon prices to fluctuate significantly in the future, or believe that policy settings may change frequently, they may become more cautious about committing capital to large-scale green projects. This is particularly relevant for investments that require high upfront costs and have long payback periods. In these cases, greater uncertainty can weaken the investment signal created by carbon pricing and reduce firms' willingness to invest immediately.[5].

Based on empirical research on China's carbon trading pilot, carbon market policies can promote environmental protection and green investment of enterprises to a certain extent. For example, the research of Lv et al. found that China's carbon emission trading policy has significantly improved the investment level of enterprises in environmental protection. For enterprises with strong financing constraints or facing greater regulatory pressure, this promotion effect is more obvious. These research results show that the impact of the carbon market mechanism on green investment is not only from direct cost pressure. It may also further affect the investment behaviour of enterprises through the regulatory and financing environment in which they are located. In other words, whether carbon market policies can effectively promote green investment depends not only on the carbon price itself, but also on the financing conditions, regulatory requirements and overall institutional environment faced by enterprises[2].

Other studies further show that the Carbon Emissions Trading System (ETS) may affect green investment by changing the strategic spending and capital allocation behaviour of enterprises. Luu et al. (2025) believe that ETS policies may affect the dynamic adjustment of green-related capital expenditures by changing the asset structure and strategic priorities of enterprises[6]. Additionally, Liu et al. (2025) also note that market-based environmental regulations, such as pilot carbon markets, can promote corporate green innovation, thereby supporting a broader low-carbon investment environment[7]. These studies show that the relationship between the carbon market mechanism and green investment depends not only on the carbon price level itself, but also on financial support, policy credibility and the overall investment environment.

2.2. Carbon Pricing and Financial Risk Transmission

In addition to affecting the investment behaviour of enterprises, the carbon market mechanism may also have an impact on financial risks. In recent years, carbon-related policies and carbon price fluctuations have been increasingly included in financial market analysis, especially within the framework of climate transition risks. That is to say, carbon restrictions not only change production costs, but also may affect asset value, industry volatility, and risk perception of investors and financial institutions.

More and more studies are exploring the interaction between carbon price fluctuations and the capital market. Dong et al. (2024) built a risk spillover network between the carbon market and the stock market, and found that carbon price fluctuations can be transmitted across different industries, and there are significant differences in this transmission between industries. This shows that the carbon market shock may not affect financial stability through a single direct channel, but gradually spread through cross-market associations. In other words, the impact of the carbon market on finance is often uneven, depending on the industry structure, the degree of exposure to carbon emissions, and market sensitivity[3].

At the corporate level, the study of Ma et al. (2024) shows that there is a clear correlation between stock price fluctuations and carbon price fluctuations of regulated enterprises in China's carbon market. The research results show that carbon price signals have entered the financial pricing process and affect market expectations. This is particularly important because it means that the carbon market mechanism not only guides corporate environmental behaviour, but also may be part of a broader financial risk assessment, which is particularly prominent in high-carbon industries[4].

2.3. Institutional Design and Regional Differences

The effectiveness of the carbon market mechanism largely depends on the institutional design. Carbon pricing is not operated in isolation. Its effectiveness is affected by factors such as coverage, quota allocation, compliance rules, pricing mechanism, market liquidity and policy credibility. Therefore, more and more studies show that different institutional arrangements help explain why the carbon market differs in different regions and countries[1,8].

A key dimension is the credibility and stability of the policy. Jotzo et al. (2012) pointed out that the uncertainty about the trend of carbon pricing in Australia has weakened investor confidence and may delay low-carbon investment. This study shows that even if the carbon pricing policy has been implemented, the expected return on investment may be very limited if the future policy direction is unclear. This is consistent with the broader view that carbon policy must not only be "strict" but also "predictable". Since investors usually make decisions in the long term, the instability of policy signals will reduce their ability to invest in large-scale low-carbon projects[9].

In contrast, the situation in NSW represents a different path. The state relies not only on the traditional emissions trading system, but is jointly influenced by federal and state policies. In recent years, the reform of the carbon emission quota trading mechanism has emphasised a more predictable and gradual baseline tightening, while the state's net-zero plan and power infrastructure roadmap have guided capital to renewable energy and low-carbon infrastructure[10-12]. This suggests that low-carbon investment can also be facilitated through a "policy-led pathway," in which direct market transactions do not necessarily play a central role, but long-term policy guidance is stronger.

3. Case Selection and Data Sources

This article takes Guangdong, China and New South Wales, Australia as examples for comparative research. Guangdong was chosen because it was one of the earliest areas in China

to launch the regional carbon emission trading pilot, which is highly representative. Guangdong Province's carbon emission trading system implements direct carbon constraints on participating enterprises through quota allocation, trading, monitoring, reporting, verification and compliance rules. Enterprises must consider emission costs in production and investment decisions, so the Guangdong case is suitable for analysing how the regional carbon market affects green investment and financial risks.

NSW was chosen because it represents an alternative to low-carbon governance. Unlike Guangdong, which has an independent state-level traditional ETS, NSW is comprehensively affected by Australia's federal safeguards mechanism, state-level net zero policy and power infrastructure policy. Federal safeguards impose restrictions by gradually reducing emission baselines for large industrial facilities, while NSW' net-zero plan and power infrastructure roadmap guide green investment through long-term policy objectives and infrastructure planning. Therefore, the case of NSW is suitable for analysing the policy combination and investment-driven low-carbon transformation path.

This paper primarily draws on secondary sources and publicly available data. Sources include academic literature, government policy documents, official reports, carbon market databases, and carbon market fact sheets. For the Guangdong case, this paper primarily utilizes data from ICAP regarding the Guangdong ETS, as well as academic research on China's carbon trading pilot programs, green investment, and financial risks. For the NSW case, this paper primarily utilizes data from the Australian Commonwealth's DCCEEW regarding the Safeguard Mechanism, as well as policy materials from the NSW Government and EnergyCo concerning the Net Zero Plan and the Electricity Infrastructure Roadmap. Through these sources, this paper compares the differences in institutional design, forms of carbon constraints, green investment incentives, and financial risk exposure between the two regions.

4. Case Studies, Investment, and Comprehensive Risk Analysis

4.1. Guangdong Carbon Emissions Trading Pilot: Institutional Design, Investment Incentives, and Risk Exposure

Institutional Design

Guangdong is one of the earliest regions in China to launch a pilot of regional carbon emission trading, representing a carbon management model with the market mechanism as the core. Through quota allocation, trading, monitoring, reporting, verification and compliance obligations, the carbon emission trading system of Guangdong Province implements direct carbon constraints on participating enterprises. According to [13], Guangdong's carbon emission trading system covers petrochemicals, papermaking, domestic aviation, ceramic manufacturing, ports and data centres and other industries. In addition, airports, textile enterprises and public buildings that have reached the threshold can also participate voluntarily under the new regulations. The system covers multiple high energy consumption or emission-related areas, making the carbon market not only a requirement for environmental compliance, but also an important factor affecting the cost structure and investment decision-making of enterprises.

Allowance allocation is a key institutional arrangement of the Guangdong ETS. The pilot program primarily relies on free allocation, employing both the benchmark method and the historical method based on output data. For the 2024 compliance year, allowances will be allocated for free primarily through historical emissions, emission intensity, or the benchmark method [13]. Free allocation helps alleviate short-term cost pressures on enterprises and ensures smoother market operations in the early stages; however, if free allowances are overly abundant, the incentives for enterprises to reduce emissions and invest in low-carbon technologies may be weakened. Therefore, the actual effectiveness of the Guangdong ETS

depends on the scarcity of allowances, the strictness of compliance requirements, and the level of market trading activity.

The Guangdong ETS is also influenced by the development of the national carbon market. In March 2025, Guangdong's ecological and environmental authorities released the 2024 allowance allocation plan, reducing the total emissions cap from nearly 300 million metric tons of CO₂ to 94 million metric tons, primarily reflecting the transition of the cement and steel sectors to the national carbon market[14]. This indicates that the Guangdong ETS does not operate in isolation; its coverage and market role will adjust as the national ETS expands. This change stems primarily from adjustments to the coverage scope, rather than a short-term, significant decline in local emissions.

Impact on Green Investment

Guangdong's carbon emission trading system mainly promotes green investment through market pressure. Enterprises entering the carbon market need to fulfil their obligations such as quota management, carbon trading and emission compliance, and the cost of emissions will be reflected in the price of carbon quotas. When quotas are tightened or carbon costs rise, enterprises will face greater pressure to reduce emissions, so they are more motivated to invest in energy-saving transformation, clean equipment, process optimisation and emission reduction technology. For example, ceramics, paper and petrochemical enterprises can reduce future compliance costs by upgrading equipment, improving energy efficiency and optimising production processes. Data centres can reduce carbon emissions by improving electricity efficiency, using low-carbon electricity or optimising cooling systems. An important feature of the Guangdong model is the direct connection between the cost of carbon emissions and the investment decision-making of enterprises. Enterprises can judge the economic feasibility of green investment by comparing the difference between continuous emission costs and emission reduction investment according to changes in carbon prices.

However, this kind of investment incentive will also be affected by institutional design. If the proportion of free quotas is too high and the actual carbon cost borne by enterprises is low, the motivation for emission reduction and green investment may be weakened. At the same time, changes in the relationship between local ETS and national ETS may also increase the uncertainty of enterprises' expectations for future policies. If the market liquidity is insufficient or the carbon price signal is weak, enterprises may lack sufficient short-term pressure to carry out large-scale low-carbon investment. Therefore, although the Guangdong model can provide more direct carbon price signals, the effect of promoting green investment still depends on the scarcity of quotas, market liquidity, compliance requirements and policy stability.

Exposure to Financial Risks

In Guangdong, financial risks are more likely to manifest through carbon price volatility and changes in corporate compliance costs. Since the ETS establishes a tradable allowance price, fluctuations in carbon prices directly impact the cost expectations and market valuations of high-emission enterprises. If allowance supply tightens or the market anticipates rising carbon prices, covered enterprises may face greater pressure on their valuations and financing costs. For example, enterprises lacking the technological readiness for emissions reductions must rely solely on purchasing allowances to meet compliance targets. Rising carbon prices would directly increase their operational pressures, thereby affecting their cash flow stability, debt-repayment capacity, and asset value.

Financial risks in Guangdong are also reflected in industry repricing. Carbon exposure is more pronounced in sectors covered by the ETS, and investors are more likely to incorporate carbon costs into corporate valuations. If a sector faces high emission reduction costs and slow technological adoption, the market may demand a higher risk premium; conversely, if companies can reduce emissions through technological upgrades, they may secure more stable

financing terms. Consequently, financial risk channels in Guangdong are relatively market-driven and are more susceptible to fluctuations in carbon market prices, allowance supply, and market liquidity. Financial institutions must closely monitor carbon price trends and changes in allowance policies to assess carbon-related risks within their credit and investment portfolios.

4.2. New South Wales Policy Framework: Institutional Design, Investment Incentives, and Risk Exposure

Institutional Design

New South Wales does not have an independent state-level traditional ETS; its low-carbon transition is primarily driven by the Australian Federal Guarantee Mechanism, the NSW Net Zero Plan, and the Electricity Infrastructure Roadmap, representing a policy-combination, investment-driven approach.

At the federal level, the reformed Cap-and-Trade Scheme took effect on July 1, 2023, and is designed to reduce emissions over time by gradually lowering the emissions baselines for covered facilities[10]. Generally, emissions baselines under the scheme will decrease by 4.9% annually through 2030[16], meaning large industrial facilities must either progressively reduce emissions or meet stricter requirements through compliance arrangements.

At the state level, NSW guides green investment through long-term policy and infrastructure planning. The Electricity Infrastructure Roadmap, released in 2020, is described as a 20-year plan aimed at transforming the electricity system into one that is affordable, clean, and reliable[11]. EnergyCo (n.d.) notes that the roadmap targets at least 12 gigawatts of renewable energy generation capacity and 2 gigawatts of long-duration energy storage capacity by 2030[15]. NSW's Net Zero Plan also covers sectors such as energy, electric vehicles, hydrogen, primary industries, technology, the built environment, carbon finance, and organic waste. It is projected that the implementation of the Electricity Infrastructure Roadmap will support over 9,000 jobs and attract up to A\$37 billion in private investment, with the majority flowing to regional areas of NSW[12]. These targets provide a clear investment direction for renewable energy, energy storage, transmission networks, and related infrastructure projects.

Impact of Green Investment

Green investment in NSW stems more from policy packages and infrastructure planning than from a single carbon price. The long-term roadmap enhances project visibility, making it easier for wind power, solar, energy storage, transmission networks, and related infrastructure projects to secure financing. The gradually declining emissions baselines under the Federal Safeguards Mechanism also encourage large industrial facilities to consider low-carbon technologies and emissions reduction investments. For investors, clear policy targets and project pipelines help reduce some uncertainty, which is particularly advantageous for energy and infrastructure projects with long lead times and high capital requirements.

The advantage of the NSW approach lies in the fact that policy targets and infrastructure planning can provide a relatively stable direction for large-scale green projects. Compared to Guangdong, green investment signals in NSW do not stem entirely from carbon prices, but rather from policy targets, project pipelines, and infrastructure delivery plans. This approach helps channel private capital into the clean energy sector, but investment outcomes are highly dependent on policy implementation capabilities. If delays occur in approvals, grid construction, or project delivery, green investments may face cash flow and return uncertainties even with clear policy targets.

Financial Risk Exposure

In NSW, financial risks primarily stem from policy implementation and the energy transition process. Since there is no standalone state-level traditional ETS, carbon price volatility is not

the primary source of risk. Risks are more evident in whether infrastructure construction proceeds on schedule, whether renewable energy and energy storage projects are successfully implemented, whether grid connections are timely, whether traditional energy assets depreciate rapidly, and whether large industrial facilities can adapt to the progressively tightening emission baselines under the guarantee mechanism. For example, if a renewable energy project has secured investment but grid construction is delayed, project revenues and cash flows will be affected; conventional coal-fired power assets face significant repricing pressure under net-zero policies and the expansion of renewable energy.

Risks in NSW also include policy implementation risks. While long-term policy goals can boost investor confidence, investors still face uncertainty if there are delays in approvals, planning, grid construction, or project delivery. For financial institutions, this uncertainty affects project financing risks, loan term arrangements, and the valuation of infrastructure assets. Therefore, financial risks in NSW do not stem from a single carbon price, but rather from the degree of coordination between policy implementation, infrastructure delivery, and the energy system transition. Financial institutions need to focus on the progress of policy implementation, the efficiency of project approvals, and the capacity for grid upgrades.

4.3. Comprehensive Comparison of the Two Regions

Table 1. Comprehensive Comparison of Carbon Governance, Green Investment, and Financial Risks in Guangdong and NSW

Comparison Dimensions	Guangdong	New South Wales
Policy Framework and Core Tools	Regional carbon emissions trading pilot (ETS), centered on allowance allocation, trading, MRV, and compliance	Federal Safeguard Mechanism (annual reduction of emission baselines) + State-level Net-Zero Plans + Electricity Infrastructure Roadmap
Carbon Constraints and Price Signals	Carbon prices are determined through allowance trading, providing a relatively direct signal; businesses must hold sufficient allowances to meet compliance requirements	Carbon constraints are reflected in federal baseline reductions and state-level investment plans; price signals are relatively indirect, manifesting more as compliance pressure and policy expectations
Green Investment Drivers	Carbon prices and compliance costs drive businesses to consider emissions reduction investments, primarily impacting sectors covered by the ETS	Guides capital flows toward renewable energy, energy storage, and transmission networks through long-term policy goals, infrastructure roadmaps, and project pipelines
Key Investment Areas	Energy efficiency upgrades, clean equipment, and process optimization in ETS-covered industries such as petrochemicals, paper manufacturing, aviation, ceramics, ports, and data centers	Wind power, solar power, energy storage, grid interconnections, transmission infrastructure, and low-carbon retrofits of large industrial facilities
Policy Advantages	Direct link between emission costs and corporate investment decisions; transparent market signals	Clear long-term planning facilitates large-scale clean energy and infrastructure investments, reducing uncertainty for certain projects
Key Constraints	Excessive free allowances, weak carbon prices, and insufficient market liquidity may weaken investment incentives; subject to adjustments in the national ETS coverage scope	Policy implementation, approval speed, grid construction, and infrastructure delivery capabilities directly impact investment realization; carbon price signals are not direct
Major Risk Sources and Nature	Carbon price volatility, changes in allowance supply, and uncertainty regarding compliance costs—primarily market-related risks	Policy implementation delays, project postponements, infrastructure bottlenecks, and depreciation of traditional energy assets—primarily policy implementation and transition risks
Typical Risk Scenarios	Rising carbon prices increase compliance costs for enterprises, affecting profits, valuations, and financing costs; industry repricing	Delays in transmission network construction lead to uncertain returns on renewable energy projects; rapid depreciation of traditional coal-fired power generation assets
Risk Management Focus Areas	Stabilize carbon price expectations, improve transparency of the allowance system, and enhance market liquidity	Improve the stability of policy implementation, accelerate infrastructure delivery, and manage the risks associated with the phase-out of traditional energy sources

Both Guangdong and NSW promote green investment through carbon mechanisms or carbon-related policies, but their institutional logics differ. Guangdong follows a “price signal” approach, focusing on making enterprises directly face emission costs through an ETS, with relatively direct carbon price signals; NSW follows a “policy planning” approach, focusing on providing direction for low-carbon investment through long-term policy goals and infrastructure roadmaps, with relatively indirect carbon price signals.

Guangdong’s advantage lies in the close link between carbon price signals and corporate financial decisions, which helps directly tie green investment to cost-benefit analysis; however, its disadvantage is that it is susceptible to price volatility, allowance allocation, and market liquidity. If market trading is inactive or there are excessive free allowances, the effectiveness of the mechanism diminishes. NSW’s advantage lies in its long-term policies and infrastructure planning, which provide a stable direction for large-scale green projects and attract private capital; however, its disadvantage is that the effectiveness of green investment relies more heavily on government implementation capacity, approval speed, grid development, and policy continuity. If project delivery is delayed, financial risks may still rise.

Overall, the main differences between the two regions can be summarized in Table 1.

As shown in Table 1, Guangdong needs to pay more attention to the internal stability of the carbon market, such as price fluctuations, quota distribution rules and market liquidity; while NSW should pay more attention to policy implementation capacity and infrastructure construction. When evaluating the carbon mechanism, it is necessary to consider both the effectiveness of its incentive investment and the controllability of financial risks, both of which cannot be ignored.

5. Conclusion and Policy Recommendations

5.1. Key Findings

This article compares Guangdong, China and New South Wales, Australia to analyse how the carbon market mechanism affects green investment and financial risks. The study does not regard the carbon mechanism only as an environmental policy tool, but also as an institutional arrangement that affects the investment behaviour and financial risk exposure of enterprises at the same time.

The study found that the carbon mechanism can promote green investment, but this effect does not occur automatically, but is mainly realised through three channels: cost pressure, policy expectations and financing conditions. Carbon pricing and emission restrictions will increase the cost of high-emission activities, thus enhancing the relative attractiveness of low-carbon projects. In Guangdong Province, this role is mainly realised through the Emissions Trading System (ETS). Quota allocation forms scarcity expectations, transaction prices provide cost signals, and compliance obligations bring pressure to reduce emissions. Together, these factors promote enterprises to include carbon costs in investment decisions and increase their attention to low-carbon projects. In contrast, NSW relies more on policy guidance and infrastructure planning. The gradual decline in the emission baseline under the federal safeguards mechanism has increased the compliance pressure on enterprises, while the state-level power infrastructure planning and net zero policy have provided a clearer investment direction. These policies jointly guide capital flow to low-carbon fields such as renewable energy, energy storage and power transmission networks. Therefore, although both Guangdong Province and NSW can promote green investment, there are obvious differences in the realisation paths between the two. Guangdong relies more on direct market and price signals, while NSW relies more on long-term policy guidance and infrastructure planning.

In terms of financial risks, the nature of the risks faced by the two regions is different. The risks in Guangdong Province mainly come from within the carbon market, including fluctuations in

carbon prices, changes in quota supply and uncertainty in compliance costs. These market-driven risks affect enterprise valuation, industry pricing and credit evaluation of financial institutions. The risks of NSW mainly stem from the transformation process, including delayed policy implementation, slow project approval, delayed power grid construction, and depreciation of traditional energy assets. These are policy implementation and transformation risks, which affect project financing, asset returns and infrastructure valuation. This shows that the choice of carbon management path determines the source and nature of financial risk, and the risk management strategy must also be adjusted according to the chosen path.

5.2. Theoretical Implications

This article puts forward two theoretical revelations. First of all, this article integrates green investment and financial risk into the same analysis framework, revealing the inherent tension between the two. Although carbon policies can promote capital flow to low-carbon areas, they may also increase financial risks through price fluctuations, asset revaluation and policy uncertainty. Existing studies usually discuss the impact of carbon pricing on green investment or financial markets separately, and pay less attention to the possible dual effects of the same policy mechanism. Therefore, when evaluating carbon policies, investment incentives and risk exposure should be considered at the same time.

Secondly, this article emphasises that institutional design is a key factor affecting the effectiveness of the carbon mechanism. Focusing only on the carbon price level is not enough to explain the final investment and risk results. Factors such as policy coverage, quota allocation, compliance rules, market liquidity, policy credibility and financing conditions will affect the actual effect of carbon policies. The comparison between Guangdong and NSW shows that the direct carbon market model and the policy combination model have their own advantages and limitations, and their effectiveness depends on the local institutional foundation, the degree of financial market development and the ability to implement policies.

5.3. Policy Recommendations

Based on the above findings, this paper proposes the following actionable policy recommendations.

For the Guangdong, regional, and national carbon markets in China:

First, gradually tighten allowance allocation to strengthen expectations of allowance scarcity. Currently, the Guangdong ETS relies primarily on free allocation; if allowances are too generous, the carbon price signal will be weakened, and enterprises will lack sufficient cost pressure to invest in low-carbon initiatives. It is recommended that the competent authorities gradually reduce the proportion of free allowances during the transition period, introduce a paid allocation mechanism, and clarify the medium- to long-term path for tightening allowances. This will enable enterprises to form stable price expectations, thereby making them more willing to make early investments in emissions reduction.

Second, improve the transparency and predictability of the carbon market to reduce the risk of carbon price volatility. Uncertainty in carbon prices can delay investment decisions and amplify financial risks. It is recommended that key information-such as the total allowance volume, allocation rules, verification results, and compliance progress-be published regularly, and that a carbon price stabilization mechanism (such as a price corridor or auction reserve price) be established to allow for appropriate intervention when market volatility becomes excessive. At the same time, the timeline for integrating local ETS systems with the national ETS and the rules for sectoral transitions should be clarified as early as possible to reduce policy uncertainty caused by institutional adjustments.

Third, develop the carbon derivatives market to provide risk management tools for enterprises. Carbon price volatility directly impacts the cash flow and valuation of high-emission

enterprises. It is recommended that, when conditions are ripe, derivatives such as carbon futures and carbon forwards be introduced to allow covered enterprises to lock in carbon costs in advance, thereby reducing the disruption caused by carbon price volatility to business decisions. At the same time, financial institutions should develop financing products linked to carbon allowances to support investment in emission reduction technologies.

Fourth, strengthen requirements for carbon risk disclosure and stress testing by financial institutions. It is recommended that financial regulatory authorities incorporate carbon-related risks into the macroprudential assessment framework for financial institutions, requiring banks and asset management institutions to regularly disclose their exposure to high-carbon assets and conduct stress tests under carbon price shocks to identify and manage transition risks in advance.

Regarding the New South Wales approach and similar policy-combination pathways:

First, strengthen coordination in policy implementation and shorten project approval and grid connection cycles. The core constraints of the NSW pathway are policy implementation capacity and the speed of infrastructure delivery. It is recommended that an interdepartmental coordination body be established to streamline approval processes across planning, environmental, energy, and transportation sectors, set clear approval timelines, and implement “one-stop” approval for key transmission and energy storage projects to avoid uncertainty regarding project returns and rising financing costs caused by administrative delays.

Second, establish a commitment to policy stability and a phased evaluation mechanism. Long-term policy goals are a core prerequisite for attracting private capital. It is recommended that the state government make a bipartisan commitment to the key objectives of the net-zero plan and the electricity infrastructure roadmap to avoid shifts in policy direction caused by changes in government. At the same time, an independent phased evaluation mechanism should be established to periodically review progress toward targets and promptly disclose project delivery status to the market, thereby boosting investor confidence.

Third, develop just transition measures for traditional energy communities and businesses affected by the transition. Coal-fired power generation assets face the risk of rapid depreciation under net-zero policies, which could trigger regional financial stability issues. It is recommended that a transition fund be established to provide affected workers and businesses with support for retraining, industrial diversification, and infrastructure upgrades. At the same time, power companies should be required to disclose their stranded asset risks to help financial institutions assess their loan and investment exposures.

Fourth, explore the introduction of moderate carbon price signals or internal carbon pricing guidelines under the federal safeguard mechanism. NSW lacks a direct carbon trading price, and the carbon constraints faced by businesses are relatively indirect, which may affect the sense of urgency regarding low-carbon investment in some industries. It is recommended that, within the framework of the federal safeguard mechanism, estimates of implied carbon prices or industry-benchmark emission intensities be published periodically to provide businesses with quantifiable reference indicators to support their internal investment decisions.

Common Lessons for Guangdong and NSW:

First, green investment and financial risk management should be incorporated into the same policy evaluation framework. The experiences of both regions indicate that the design of carbon policies cannot focus solely on emission reductions and the volume of green investment; it must also simultaneously assess their potential impact on financial stability. It is recommended that policymakers conduct a “dual impact assessment” before introducing major carbon policies—evaluating both their role in promoting green investment and their transmission effects on financial risks.

Second, select a carbon governance path suited to the institutional foundation and avoid simple transplantation. Guangdong's price-signal-based approach and NSW's policy-planning-based approach each have their own applicable conditions. The Guangdong approach requires relatively mature financial markets and strong corporate price sensitivity, making it suitable for regions dominated by manufacturing and energy-intensive industries; the NSW approach requires strong government enforcement capabilities and a tradition of long-term planning, making it suitable for transition scenarios driven by infrastructure investment. When designing carbon policies, each region should fully consider its own institutional endowments rather than simply replicating the experiences of other regions.

In summary, carbon market mechanisms and carbon-related policies are not only important tools for driving green investment but also significant sources of financial risk. Effective carbon governance requires striking a dynamic balance between promoting investment and managing risk. Guangdong needs to enhance the effectiveness of carbon price signals while effectively managing market volatility risks, whereas NSW needs to strengthen policy guidance while accelerating infrastructure delivery and mitigating transition risks. Only by giving equal weight to investment incentives and risk management can carbon mechanisms play a more stable and sustainable role in the low-carbon transition.

References

- [1] Newell, R. G., Pizer, W. A., & Raimi, D. (2013). Carbon markets 15 years after Kyoto: Lessons learned, new challenges. *Journal of Economic Perspectives*, 27(1), 123–146. <https://doi.org/10.1257/jep.27.1.123>
- [2] Lv, S., Lv, Y., Gao, D., & Liu, L. (2023). The path to green development: The impact of a carbon emissions trading scheme on enterprises' environmental protection investments. *Sustainability*, 15(16), 12551. <https://doi.org/10.3390/su151612551>
- [3] Dong, Q., Zhao, Y., Ma, X., & Zhou, Y. (2024). Risk spillover between carbon markets and stock markets from a progressive perspective: Measurements, spillover networks, and driving factors. *Energy Economics*, 129, 107228. <https://doi.org/10.1016/j.eneco.2023.107228>
- [4] Ma, J., Feng, J., Chen, J., & Zhang, J. (2024). Volatility spillover from carbon prices to stock prices: Evidence from China's carbon emission trading markets. *Journal of Risk and Financial Management*, 17(3), 123. <https://doi.org/10.3390/jrfm17030123>
- [5] Fuchs, M., Stroebel, J., & Terstegge, J. (2024). Carbon price uncertainty and decarbonization investments (Working Paper No. 32937). National Bureau of Economic Research. <https://doi.org/10.3386/w32937>
- [6] Luu, N. H., Nguyen, D. T., Dao, L. T. A., & Phung, U. N. (2025). Transformative influence of emissions trading schemes on corporate investments: Insights from the People's Republic of China. *Asian Development Review*, 42(3), 29–50. <https://doi.org/10.1142/S0116110525500180>
- [7] Liu, S., Xiong, X., & Gao, Y. (2025). Market-based environmental regulations and green innovation: Evidence from the pilot carbon markets in China. *Research in International Business and Finance*, 77, 102896. <https://doi.org/10.1016/j.ribaf.2025.102896>
- [8] OECD. (2025). Effective carbon rates 2025: Emissions trading systems-A variety of designs. Organisation for Economic Co-operation and Development.
- [9] Jotzo, F., Jordan, T., & Fabian, N. (2012). Policy uncertainty regarding Australia's carbon price: Expert survey results and implications for investment. *Australian Economic Review*, 45(4), 395–409. <https://doi.org/10.1111/j.1467-8462.2012.00709.x>
- [10] DCCEE. (2024). Safeguard mechanism reforms factsheet. Australian Government Department of Climate Change, Energy, the Environment and Water.
- [11] NSW Government. (2020). Electricity infrastructure roadmap. NSW Climate and Energy Action.
- [12] NSW Government. (n.d.). Net zero plan. NSW Climate and Energy Action.
- [13] ICAP. (2025a). China-Guangdong pilot ETS. International Carbon Action Partnership.

- [14] ICAP. (2025b). China-Guangdong pilot ETS: 2024 allocation plan update. International Carbon Action Partnership.
- [15] EnergyCo. (n.d.). The electricity infrastructure roadmap. NSW Government.
- [16] DCCEEW. (2026). Safeguard mechanism. Australian Government Department of Climate Change, Energy, the Environment and Water.