Driving Technological Upgrading through Carbon Markets, Turning Green into Gold

——Guangdong's Approach to Corporate Emission Reduction and Low-Carbon Technology Deployment

Abstract: As China's national carbon market expands, Guangdong province , China, has built a regional carbon market system guided by its local system coordinating government, trading markets, enterprises, and green finance. It stabilizes carbon prices through dynamic sector coverage, differentiated allowance allocation, and linking the CCER mechanism with its Carbon Inclusive Mechanism, using the Guangzhou Emissions Exchange to connect allowance trading, registration, and green technology assessment. Regulated enterprises have turned compliance pressure into retrofit incentives, adopting low-carbon processes like hydrogen metallurgy and efficient furnaces. The province has also piloted online carbon allowance pledge-financing and explored alignment with the Greater Bay Area's carbon market. This shows tiered incentives can drive scaled adoption of mature low-carbon technologies, while costly frontier technologies still need coordinated fiscal and financial support—offering a model for linking emissions reduction with innovation in China's regional carbon markets.

Keywords: carbon market; Carbon Inclusive Mechanism; allowance allocation; corporate innovation; carbon finance

I Background

Carbon markets serve as a core market-based instrument for the global low-carbon transition: by pricing emissions, they translate emission reduction targets into tangible cost-benefit signals for enterprises. China rolled out local carbon trading pilots in 2011, inaugurated its national carbon market in 2021, and extended coverage to the iron and steel, cement, and aluminum smelting sectors in 2025, with its scope expanding steadily. Guangdong launched its carbon trading scheme in 2013 and pioneered paid quota auctions, establishing itself as the most liquid regional carbon market in the country. In recent years, as the national market has expanded and certain sectors were transferred to the national market, notable trends have emerged: softer carbon prices and weaker incentives for technological innovation. Amid this shift toward national market alignment and deeper paid quota allocation, Guangdong has built a coordinated system spanning government, market entities, enterprises, and finance. By layering carbon financial instruments onto its dual-track framework of mandatory compliance and the Carbon Inclusive Mechanism, Guangdong turns quota constraints into drivers of both emission reduction and technological innovation.

II Key Measures

(1) Government Regulation: Dynamically Improving Coverage, Allowance Allocation, and Compliance Management while Balancing Emission-Reduction Constraints and Market Stability

- We combined free and paid allowances with gradual tightening for stable, predictable carbon costs, and adjusted regulatory scope in step with the national market's expansion.
- We linked the CCER and Carbon Inclusive mechanisms to create market-based rewards for voluntary emission-reduction and low-carbon innovation projects.
- We optimized the management of historical allowances and enterprise surpluses/shortfalls, while strengthening verification, compliance supervision, and interdepartmental coordination to enforce carbon constraints and cushion market-expansion impacts.

(2) Trading Market Operations: Facilitating Price Formation, Emission-Reduction Revenues, and Technology Commercialization to Support and Incentivize Low-Carbon Innovation

- We introduced diverse market participants and connected primary and secondary markets to facilitate allowance circulation and reasonable price formation.
- We undertook the registration and trading of emission reductions under the Carbon Inclusive Mechanism to establish market-based incentive channels for small and medium-sized emission-reduction projects and mature low-carbon technologies.
- We built a green technology trading platform and explored links among technology screening, emission-reduction assessment, and carbon asset identification to support the commercialization of low-carbon technologies.



Figure 1. Guangzhou Emissions Exchange (Image source: Guangzhou Municipal Ecology and Environment Bureau, reproduced from Guangzhou Daily New Flower City; Photo by Li Bo)

(3) Corporate Practice: Converting Compliance Constraints into Emission-Reduction Actions and Advancing the Application of Frontier Low-Carbon Technologies and Energy-Saving Process Retrofits

- Under the constraints imposed by the annual reduction factor in the Guangdong carbon market, a large petrochemical enterprise A has implemented energy-saving technologies such as high-efficiency ultra-clean industrial furnaces and the upgrading and utilization of low-grade steam, continuously improving energy efficiency.



Figure 2. 95+ High-Efficiency Ultra-Clean Industrial Furnace Retrofit Project (Image source: Huizhou Headlines)

(4) Green Finance: Improving Carbon Asset Financing and Risk Safeguards to Broaden Funding Channels for Emission Reduction and Innovation in the Real Economy

- We improved carbon asset financing and circulation mechanisms to transform allowances from compliance instruments into financing resources for sustained low-carbon innovation.
- We strengthened standards, registration, and default-disposal mechanisms to reduce carbon asset financing risks and enhance the sustainability of financial support for emission-reduction projects in the real economy.
- We strengthened cooperation among trading institutions in the Greater Bay Area and explored broader carbon market and green finance services.

III Lessons Learned

Guangdong's carbon market shows that a multi-tiered carbon market system supporting the low-carbon transition requires coordinated action across policy, trading, corporate, and financial dimensions. Linking primary and secondary markets with the Carbon Inclusive Mechanism can cover key emitters, small and medium-sized emission-reduction projects, and other participants, broaden market-based revenue channels, and sustain incentives for green innovation. Large compliance entities should demonstrate technology leadership, turning compliance requirements into market incentives for carbon-reduction retrofits and promoting mature low-carbon technologies in high-emitting sectors. Carbon finance innovation and institutional frameworks should advance together through improved ownership confirmation, registration, allowance freezing, and judicial disposal, providing safeguards for carbon asset financing. A tiered incentive system based on technology maturity should use carbon prices and the Carbon Inclusive Mechanism to promote energy substitution, efficiency gains, process optimization, and deployment of mature emission-reduction technologies, while coordinating with green finance and fiscal support to diversify support for low-carbon technology application.

Case provided by CCICED Special Policy Study on Innovation in Green Financial Products and Services to Support Carbon Market Development