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ПРИНЦИПЫ СОЗДАНИЯ И ФУНКЦИОНИРОВАНИЯ РЫНКА ЛЕСНЫХ УГЛЕРОДНЫХ АКТИВОВ: ОПЫТ КИТАЯ

PRINCIPLES OF CREATION AND FUNCTIONING OF THE MARKET FOR FOREST CARBON ASSETS: CHINA'S EXPERIENCE

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Аннотация: Лесные углеродные активы формируют новый вид ресурсов в части симбиоза экологической ценности лесной экосистемы и финансовых средств. В статье рассмотрены базовые принципы создания и функционирования рынка лесных углеродных активов такие как принцип подтверждения права собственности на углеродные активы, принцип ценообразования, принцип экологической ценности активов. Базовые принципы составляют основу эффективного механизма управления рынком лесных углеродных активов, определяющего наличие цифровых и финансовых технологий, позволяющих реализовать приоритетные для данных рынков процессы компенсации выбросов.

Abstract: Forest carbon assets form a new type of resource in terms of the symbiosis of the environmental value of the forest ecosystem and financial resources. The article discusses the basic principles of creating and operating the forest carbon assets market, such as the principle of confirming ownership of carbon assets, the principle of pricing, and the principle of the environmental value of assets. These basic principles form the basis of an effective mechanism for managing the forest carbon assets market, which determines the availability of digital and financial technologies that enable the implementation of emission compensation processes that are priority for these markets.

Ключевые слова: лесные углеродные активы, углеродная нейтральность, компенсационный механизм.

Keywords: forest carbon assets, carbon neutrality, and a compensation mechanism.

Against the backdrop of accelerating global climate governance restructuring, forest carbon assets, as a new type of resource that combines ecological value and financial attributes, are driving structural changes in China's carbon market system.

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This chapter systematically analyzes the construction logic and core operating principles of China's forest carbon asset market from three dimensions: institutional design, operational mechanism, and innovative practice.

The basic framework of market construction.

1. Integration of policy driven and market mechanisms. The Chinese forest carbon asset market follows the construction path of «top-level design guidance, market mechanism driven». After the «dual carbon» target was proposed in 2020, the «Implementation Plan for Establishing a National Unified Carbon Emission Trading Market» clearly included forestry carbon sinks in the market system, forming a dual track structure of «mandatory market (CEA) + voluntary market (CCER)». As of June 2024, the national carbon market has covered 2162 emission control enterprises, and the proportion of forestry carbon trading volume has increased from 5,3% in 2021 to 18,6%, with significant policy guidance effects.

2. Innovation of Property Rights System. Establish the property rights of carbon sink resources through the revision of the Forest Law and establish a «separation of three rights» system:

- ownership: state owned forest rights account for 67,3%, while collective forest rights account for 32,7%;

- operating rights: 12000 forestry carbon sequestration development licenses have been issued nationwide;

- benefit right: sanming pilot project in Fujian province achieves a 45% share of collective dividends for carbon sequestration benefits in villages.

This institutional design has solved the dilemma of difficult pricing and trading of ecological products, increasing the carbon asset value per hectare of forest land from 1200 yuan in 2015 to 5600 yuan in 2024.

Table 1- Establish a four tiered pricing mechanism

Level	Pricing basis	Regulatory measures
benchmark price	industrial emission reduction cost (2024: 68 yuan/ton)	government guided price fluctuation ± 10%
project price	development cost (afforestation category: 35-55 yuan/ton)	cost plus method
market price	supply and demand relationship	carbon quota auction regulation
international anchor pricing	VCS Price Index	cross border transaction price linkage

The core principles of market operation.

1. Principle of priority in property rights confirmation. Establishing a carbon sequestration asset certification system through «blockchain + remote sensing monitoring» technology:

- space demarcation: using high-resolution satellites (with a precision of 0.5 meters) to delineate the boundaries of carbon sink blocks;

- ownership registration: electronic property archives covering 89 million hectares of forest land have been established nationwide;

- dynamic monitoring: Yunnan Pu'er project achieves quarterly update of carbon storage with an error rate of less than 3%.

This principle ensures clear property rights for each ton of carbon credits, resulting in a 62% year-on-year decrease in market dispute cases in 2024.

2. Transparent pricing principle.

This mechanism has reduced the volatility of forestry carbon sink prices from 42% in 2021 to 18% in 2024, significantly enhancing market stability.

3. Principle of ecological integrity.

Implement strict project admission standards:

- additional proof: Require carbon sink increment to exceed the "baseline scenario" by more than 20%;
- leakage control: 10km buffer zone is set for the Habitat of Giant Pandas in Sichuan Province Project;
- permanent guarantee: Zhejiang Anji establishes a century old carbon sink management and protection fund.

By 2023, the third-party verification elimination rate will reach 23%, ensuring the quality of market credit.

Innovative mechanisms for market operation**.**

1. Digital Empowerment Mechanism.

Building a unified national forest carbon asset digital management platform:

- intelligent accounting: Integrating MODIS remote sensing data and AI models, accounting efficiency is increased by 8 times;
- on chain trading: Shenzhen pilot realizes the full process of carbon credit issuance, trading, and cancellation on the chain;
- risk warning: Guizhou has built a real-time monitoring system for carbon sequestration fire risks, with a response time of less than 15 minutes.

This mechanism reduces transaction costs by 38% and drives the daily trading volume to exceed 2 million tons.

2. Financial coupling mechanism.

Table 2- Innovative «Carbon Finance+»

Product type	Classic case	Implementation effect
pledge financing	Jiangxi Fuzhou Carbon Sequestration Pledge Loan	reduce financing costs by 1.2 percentage points
futures hedging	Guangqi Forestry Carbon Sequestration Futures	price fluctuation risk hedging efficiency 73%
insurance coverage	Fujian Carbon Sequestration Loss Insurance	annual average payout ratio of 89%
securitization products	Yunnan Pu'er ABS Project	the issuing interest rate is 45BP lower than that of treasury bond

In 2024, the scale of the carbon finance market will exceed 120 billion yuan, with a capital leverage ratio of 1:8.3.

Regional synergy and international connectivity.

1. Cross regional compensation mechanism.

Establish the «East Carbon West Exchange» trading system:

- quota swap: Guangdong purchases carbon credits from Yunnan to offset 35% of industrial emissions;
- income sharing: 28% of the dividends of herdsmen in Xizang Naqu Project;
- technology Transfer: Zhejiang exports carbon sink monitoring technology to Guizhou, increasing accuracy by 40%.

In 2024, the inter provincial carbon trading volume will reach 120 million tons, accounting for 31% of the national total.

2. International rule alignment.

Integrating into the global carbon market through a dual pathway:

- standard mutual recognition: China's forestry carbon sink methodology has been recognized by six international standard systems, including VCS and GS;
- project cooperation: the development of carbon sink projects along the China Laos railway is expected to produce 20 million tons of international emission reductions.

In 2024, China's forestry carbon sink exports will reach 48 million tons, accounting for 17% of the international market share.

Challenges and Countermeasures of Market Development**.**

Analysis of Existing Contradictions. Measurement accuracy bottleneck: The error rate of carbon sequestration calculation in tree forests still reaches 12% (25% in shrub forests). Single financing channel: 70% of projects rely on policy bank loans. Price inversion risk: CCER price is 38% lower than EU carbon price.

Breakthrough Path Design. Technological breakthrough: Developing a new metrology system that integrates LiDAR and quantum computing. Market Expansion: Incorporating Carbon Sequestration into the Green Electricity Trading System. Institutional Innovation: Pilot Carbon Border Adjustment Mechanism (CBAM) Connection

The construction of China's forest carbon asset market is essentially the market-oriented expression of ecological value through institutional innovation. Its operational principles reflect both the government's wisdom in controlling public resources and the decisive role of the market in resource allocation. With the deepening application of digital technology, continuous innovation of financial instruments, and accelerated convergence of international rules, this market is reshaping the underlying logic of global climate governance. In the future, continuous breakthroughs are needed in improving measurement accuracy, expanding financial scenarios, and enhancing international discourse power, so that forest carbon assets can truly become the core driving force of ecological civilization construction.

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