





## Chief Editor :

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NaaS Technology Inc. (NaaS)

Chengdu "Tianfu Carbon Credits" Platform (Chengdu Data Group Co., Ltd)

China-UK Low Carbon College, Shanghai Jiao Tong University

China Beijing Green Exchange

## Executive Editor :

---

Wuhan "Zero Carbon Together" Platform (Wuhan Carbon Inclusion Management Limited Company)

Shandong Hi-Speed Group Co, Ltd

China United Network Communications Group Co., Ltd.

Automotive Data of China Co.,Ltd. (ADC)

Ant Group

LONGi Green Energy Technology Co., Ltd.

Sungrow iCarbon Technology Co., Ltd.

Asia-pacific Entrepreneurs Annual Forum (APEA)

Altervim Company Ltd.

Jospong Group of Companies

Ecopivot Ltd.

## Academic Partner :

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Global SDGs and Leadership Development Center (Affiliated to UNITAR)

## Contributing Author :

---

Zhen Dai, Yang Wang, Yubo Zhai, Wu Wen, Shuang Wen, Zhuowei Song, Yongkang Zhang, Hongyin Zhou, Liangliang Li, Xianfeng Tan, Gongfeng Xin, Pengfei Zhou, Shu Liu, Xiaoteng Zhou, Chuanyuan Ni, Yashuang Lu, Ying Wei, Qiyu Yang, Yugui Ke, Puchao Li, Qingjia Ma, Bin Xu, Hengchen Liu, Min Wang, Guochen Wang, Cheng Zhai, Yili Ji, Kangkang Tong, Qiong Wang, Zhixiang Cui, Runming He, Zhiqian Wan, Hao Yu, Dingyu Bai, Huohuo Wang, Lan ĭ, Zifu Wang, Xinka Duan, Qinghuan Hou, Somboon Lertsuwannaroj, Gloria Boamah Kusi, Ing. Glenn Gyimah

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## Introduction

As global climate governance enters a period of accelerated action, carbon inclusion has evolved from a localized pilot spark into a nationwide, institutionalized mechanism driving carbon reduction among all citizens in China. Looking back at 2023, carbon inclusion made its first systematic appearance on the international stage through a white paper, revealing a public awareness rate of 53.36% and a green travel participation rate of 66.57%, which together outlined an emerging picture of consumer-side emission reduction. The successful listing of Shenzhen's "national carbon engagement" project on the carbon exchange marked a historic milestone—the transformation of individual emission reductions into tradable carbon assets. In 2024, carbon inclusion was explicitly defined in central government policy for the first time. Twenty-seven provinces incorporated it as a key initiative, and 186 local policy documents together formed a comprehensive institutional framework. The achievements of Chengdu's "Tianfu Carbon Credits" Platform—with over two million participations—and Wuhan's "Zero Carbon Together" Platform—with over one million users—demonstrate how deeply the concept of "participation and benefits for all" has resonated with the public. Meanwhile, the successful monetization of project-based carbon inclusion assets in cities such as Shanghai, Chongqing, and Guangdong has transformed emission reduction mechanisms from simple point redemption systems into diversified channels for value realization.

Standing at the threshold of 2025, carbon inclusion has completed a crucial leap—from "scenario exploration" to "ecosystem construction". On the policy front, the synergistic "1+N" framework formed by central and local coordination has elevated carbon inclusion from a supplementary component of China's multi-tiered carbon market to a central hub linking emission reductions across both production and consumption ends. On the methodology front, provinces and cities including Sichuan, Shaanxi, Shandong, Shenzhen, and Xiamen have successively released methodological guidelines covering both scenario-based and project-based carbon reduction models. On the carbon asset trading front, carbon inclusion emission reductions have been widely applied to carbon neutrality initiatives for large-scale events and ecological restoration projects. On the innovation front, the integration of carbon inclusion with technology, biodiversity, ESG practices, cultural tourism, and RWA (Real World Assets) has further expanded the pathways for realizing its value. Nevertheless, deeper challenges have also emerged. Regional methodological disparities still constrain cross-domain circulation of emission reductions, while the homogenization of incentive mechanisms calls for more precise and diversified benefit structures. Against this backdrop, the *White Paper on Carbon Inclusion Development 2025* builds upon three years of practical experience, systematically mapping policy evolution, market dynamics, and technological innovation. It not only documents China's transformation journey from "national carbon engagement" to "cross-regional decarbonization" but also incorporates international carbon inclusion policies and practices, striving to offer a Chinese solution of "public participation + industrial collaboration" for global climate governance. After all, as the seeds of carbon inclusion have taken root and borne fruit across China, the accumulated experience and wisdom rightfully stand as a valuable asset for humanity to collectively address the climate crisis.

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# Overview of Carbon Inclusion Development



# 1. Overview of Carbon Inclusion Development

## 1.1 Overview of China Carbon Inclusion Development

China's carbon inclusion mechanism has evolved from localized experimentation to nationwide coordination, forming a diversified development framework driven by policy guidance, technological empowerment, market incentives, and public participation. This innovative practice quantifies the value of low-carbon actions taken by individuals and enterprises, thereby establishing an institutional bridge for broad societal engagement in achieving the nation's "dual-carbon" goals—carbon peaking and carbon neutrality. As such, it has become a vital component of China's contribution to global climate governance.

### 1.1.1 Policy Framework Progress

China's carbon inclusion policy framework demonstrates a synergistic pattern of "central guidance and local innovation."

At the national level: the carbon inclusion policy system has progressed from the early stage of local experimentation to a new phase of standardized development under national strategic guidance. Through top-level design, inter-ministerial coordination, and institutional innovation, the central government has established a policy framework that is "clearly defined, well-structured, and strongly supported," providing institutional safeguards for nationwide participation in the low-carbon transition. The year 2024 marked a critical milestone in integrating carbon inclusion into the national strategy. *Guidelines of the Communist Party of China Central Committee and the State Council on Comprehensively Promoting the Construction of a Beautiful China*, issued in January 2024, explicitly proposed—for the first time in a central policy document—to "explore and establish public participation mechanisms such as carbon inclusion." This signified the elevation of carbon inclusion from local innovation to a key institutional arrangement at the national level for advancing green and low-carbon transformation. This policy directive aligns with requirements such as "promoting green and low-carbon lifestyles" and "establishing a green and low-carbon product standard system," thereby affirming carbon inclusion's central role in consumer-side emission reduction. In May of the same year, the State Council released the *2024–2025 Action Plan for Energy Conservation and Carbon Reduction*, further incorporating the carbon inclusion mechanism into the scope of "nationwide action." The document emphasized encouraging green and low-carbon behaviors among the public through incentive policies, forming a synergistic model of carbon reduction driven by government guidance, market leadership, and social participation. Together, these two documents serve as the "main pillars" of the national carbon inclusion policy architecture, providing top-level guidance for local implementation and cross-regional coordination. Meanwhile, various ministries have actively introduced incentive policies related to carbon inclusion. In July 2024, the Ministry of Ecology and Environment clarified in its *Reply on the Proposal to Improve the Carbon Inclusion Mechanism* that it would work jointly with the National Development and Reform Commission (NDRC), the Ministry of Industry and Information Technology (MIIT), and the National Financial Regulatory Administration (NFRA) to "coordinate research on the positioning and role of the carbon inclusion system within the 'dual-carbon' policy framework," and to formulate corresponding standards for its establishment, operation, and management. This response outlined for the first time a clear multi-ministerial division of responsibilities. The MIIT, through its *Implementation Plan for Achieving Carbon Peaking in the Industrial Sector*, strengthened the connection between carbon inclusion and consumer product standards, focusing on the supply of green and low-

carbon products. The NFRA guided financial institutions to develop carbon-reduction-related financial products, providing financial support for the monetization of carbon inclusion assets.

In 2025, the carbon inclusion mechanism has gained a strategic position within China's national policy framework. On May 24, 2025, the General Office of the CPC Central Committee and the General Office of the State Council jointly issued the *Guidelines on Promoting Green and Low-Carbon Transition and Strengthening the Construction of the National Carbon Market* (hereinafter referred to as the Guidelines), which explicitly proposed to “strengthen the coordinated management of national carbon reduction resources and regulate various voluntary emission reduction trading activities.” This document provides policy guidance for advancing the establishment of a national unified voluntary greenhouse gas emission reduction trading market. The Guidelines pointed out that, under the decisions and arrangements of the CPC Central Committee and the State Council, China has established two mechanisms for developing carbon reduction resources: the National Voluntary Greenhouse Gas Emission Reduction Trading Mechanism and the Carbon Inclusion Mechanism. Through the unified voluntary emission reduction trading market, emission reductions generated by domestic construction projects are to be developed into China Certified Emission Reductions (CCERs) in accordance with unified standards, enabling enterprises and industries to obtain emission reduction benefits through market transactions and mobilizing wider participation in emission reduction. Meanwhile, some regions in China have explored the establishment of carbon inclusion mechanisms to encourage individuals, households, and communities to participate in emission reduction according to local conditions. The emission reductions generated by the public can be rewarded through various exchange forms such as point redemption or gift incentives. The Carbon Inclusion Mechanism primarily targets individuals, households, and communities, using daily lifestyle scenarios such as green travel as vehicles to promote low-carbon living among the public. The use of emission reductions generated under the Carbon Inclusion Mechanism should be further studied in light of factors such as emission reduction mechanisms and data quality. It is encouraged that such reductions be utilized—through government, internet, or enterprise platforms—for commercial consumption and public welfare activities, thereby realizing their value and forming a sustainable incentive cycle for the mechanism's long-term development.

In June 2025, the People's Bank of China, the National Financial Regulatory Administration, and the China Securities Regulatory Commission jointly issued the *Green Finance Endorsed Project Catalogue (2025 Edition)*, which calls for expanding financing and incentive channels, broadening the scope of green financial support, and encouraging innovation in green financial products. Among the green financial services included are carbon inclusion and climate investment and financing, as part of the innovation and consulting services in green finance.

On October 23, 2025, Xinhua News Agency released the *Communique of the Fourth Plenary Session of the 20th Central Committee of the Communist Party of China*. The plenary session proposed accelerating the comprehensive green transformation of economic and social development and building a Beautiful China. It emphasized firmly establishing and practicing the philosophy that “lucid waters and lush mountains are invaluable assets,” advancing carbon peaking and carbon neutrality as guiding objectives, and promoting coordinated actions in carbon reduction, pollution control, ecological conservation, and green growth. It also underscored the importance of accelerating the development of a new energy system, promoting and achieving carbon peaking in an active and orderly manner, and fostering green production and lifestyles—the very core of the Carbon Inclusion Mechanism.

Subsequently, on October 29, 2025, the Ministry of Ecology and Environment released the Report on *China's Policies and Actions for Addressing Climate Change (2025)*, which once again highlighted carbon

inclusion as a vital measure to promote nationwide participation in green and low-carbon development. The report underscored that carbon inclusion will serve as a key pillar in building a society-wide momentum for green and low-carbon transformation.

Overall, carbon inclusion policies at the national level have achieved a crucial leap from conceptual introduction to systematic advancement, offering a uniquely Chinese institutional model for public participation in global climate governance.

**Table 1 Policy documents related to carbon inclusion issued at the national level**

Relevant Policy Documents or Reports	Carbon Inclusion Related Content	Release Date
<i>China's Achievements, New Goals and New Measures for Implementing the Nationally Determined Contributions</i>	China promotes the pilot construction of the Carbon Inclusion Mechanism to encourage society-wide emission reduction actions.	October 2021
<i>Implementation Plan for Synergizing Pollution Reduction and Carbon Emission Reduction</i>	Exploring the establishment of public participation mechanisms such as carbon inclusion	June 2022
<i>Opinions of the State Council on Supporting Shandong in Deepening the Transformation of Old and New Driving Forces to Promote Green, Low-Carbon and High-Quality Development</i>	In accelerating the formation of green and low-carbon lifestyles, it is necessary to explore mechanisms such as personal carbon accounts to incentivize green consumption.	September 2022
<i>China's Policies and Actions for Addressing Climate Change (2022)</i>	Exploring the implementation of innovative voluntary emission reduction mechanisms to encourage society-wide participation in carbon reduction.	October 2022
<i>Progress Report on China's Implementation of Nationally Determined Contribution Targets (2022)</i>	Nationwide green and low-carbon initiatives are flourishing. Under government guidance, innovative voluntary emission reduction mechanisms—Carbon Inclusion—are being explored to encourage society-wide participation in carbon reduction.	November 2022
<i>China's Policies and Actions for Addressing Climate Change (2023)</i>	Nationwide green and low-carbon campaigns should attract broad public participation, enhance public engagement in carbon inclusion, and encourage society-wide emission reduction efforts.	October 2023
<i>Guidelines of the CPC Central Committee and the State Council on Comprehensively Promoting the Construction of a Beautiful China</i>	Exploring the establishment of public participation mechanisms such as carbon inclusion.	January 2024
<i>2024–2025 Action Plan for Energy Conservation and Carbon Reduction</i>	Strengthening publicity on energy conservation and carbon reduction, advocating simple, moderate, green, and low-carbon lifestyles, and enhancing public awareness and capabilities for energy conservation and emission reduction.	May 2024
<i>Reply on the Proposal for Improving the Carbon Inclusion Mechanism</i>	Supporting local governments in carrying out research on carbon inclusion incentive mechanisms based on local conditions, exploring innovative practices, optimizing service platforms, expanding emission reduction scenarios, improving data quality, and strengthening public awareness of emission reduction.	July 2024
<i>China's Policies and Actions for Addressing Climate Change 2024</i>	Enhancing public participation in carbon inclusion, continuing the 'Beautiful China, I'm an Actor' campaign, promoting the establishment of an ecological volunteer service system, and preparing for the first carbon-neutral National Games.	November 2024
<i>Guidelines on Promoting Green and Low-Carbon Transformation and Strengthening the Construction of the National Carbon Market</i>	Some local governments in China are exploring the establishment of carbon inclusion mechanisms to encourage individuals, families, and communities to participate in emission reduction, with emission reductions eligible for various reward mechanisms such as point redemption.	May 2025
<i>China's Policies and Actions for Addressing Climate Change 2025</i>	Enhancing public participation in carbon inclusion and continuing the 'Beautiful China, I'm an Actor' campaign.	October 2025

Source: Compiled from publicly available information

At the local level: over the past year, under the guidance of the national carbon inclusion strategic framework, local governments have accelerated policy innovation and practical exploration, developing distinct characteristics of institutional standardization, scenario diversification, and market-based incentives. By introducing dedicated policy documents, building digital platforms, and expanding emission reduction scenarios, various regions have promoted the extension of carbon inclusion from the consumption side to the production side, and from isolated pilot programs to comprehensive regional implementation—providing valuable local experience for the establishment of a unified national carbon inclusion system.

In November 2024, the Hubei Provincial Department of Ecology and Environment issued the *Implementation Plan for the Construction of Hubei Province's Carbon Inclusion System (2024–2027)* (Document No. EHUANFA [2024] 16) (hereinafter referred to as the Plan). As the first provincial-level carbon inclusion system plan in Central China, this document holds significant importance in exploring sustainable public participation mechanisms for carbon inclusion, fostering green and low-carbon production and lifestyles, advancing synergistic effects between pollution reduction and carbon mitigation, and supporting Hubei's goals of carbon peaking and carbon neutrality. The Plan sets two key milestones: by the end of 2025, Hubei aims to strengthen the top-level design of its carbon inclusion system, improve the operational platform, and explore a mechanism of “government guidance, enterprise action, and public participation.” It seeks to expand carbon inclusion application scenarios, advance pilot programs in key cities, and establish the initial framework of the provincial system. By the end of 2027, the system will be further refined, with locally tailored carbon inclusion methodologies developed across areas such as green mobility, green consumption, resource conservation, and energy substitution. This will gradually form a provincial–municipal linkage model characterized by distinctive regional features, creating the “Hubei Model” for Carbon Inclusion. The Plan specifies that Hubei will build upon Wuhan's pilot model of a “government–enterprise–public” integrated carbon inclusion service platform, proposing to optimize the carbon inclusion registration and information systems, improve the enterprise carbon accounting platform, and establish a personal low-carbon lifestyle platform. It also introduces the innovative concept of industry-level carbon inclusion aggregation platforms, to be piloted in sectors such as power grids, transportation, construction, and public institutions. These platforms will be led by relevant industry authorities or major enterprises to coordinate project and scenario development within their sectors. In terms of the carbon inclusion consumption and absorption system, Hubei plans to leverage its existing advantages as a pilot carbon market. The province will strengthen the linkage between carbon inclusion mechanisms and carbon offset frameworks within the Hubei carbon market, and enhance the integration between carbon inclusion and carbon finance, thus promoting effective synergy between carbon reduction incentives and financial innovation.

On December 23, 2024, the Fujian Provincial Department of Ecology and Environment and the Fujian Provincial Development and Reform Commission jointly issued the *Work Plan for the Construction of Fujian Province's Carbon Inclusion System*. The plan sets clear goals: by 2027, the institutional standards and methodological framework for carbon inclusion will be further refined, channels for the utilization of carbon inclusion emission reductions will be expanded, and a comprehensive system of personal carbon accounts will be established. A series of carbon inclusion application scenarios—such as green offices and low-carbon lifestyles—will be created, fostering an atmosphere characterized by government leadership, public participation, and shared benefits. By 2030, the province aims to build a more mature carbon inclusion institutional system, with richer reduction scenarios and diversified utilization channels, ensuring broader coverage of carbon inclusion initiatives and promoting a simple, moderate, green, and low-carbon

way of production and life.

Shandong Province took the lead in launching the first wave of local carbon inclusion policies for 2025. In January 2025, the province issued the *Guiding Opinions on the Pilot Work of Carbon Inclusion* (Document No. LUHUANFA [2025] 2), establishing a three-dimensional framework of “provincial coordination + municipal innovation.” The policy adopts a dual-track management model encompassing both emission reduction projects and emission reduction scenarios. Certified emission reductions can be traded via the provincial public resources trading platform and used for carbon neutrality in large-scale events as well as alternative ecological restoration for environmental damage, while a point-based reward system is employed to encourage public participation. Shandong has also built a unified carbon inclusion comprehensive management system to implement full-process management of emission reduction projects—covering demonstration, disclosure, certification, and issuance—and has established an expert committee composed of domestic and international specialists responsible for methodological evaluation and emission reduction verification.

In February 2025, the Nanchang Municipal Bureau of Ecology and Environment issued a public notice seeking comments on the *Work Plan for the Construction of Nanchang’s Carbon Inclusion System*. The plan advocates for green consumption and promotes the formation of green and low-carbon production and lifestyles, while emphasizing the creation of a carbon inclusion data space to leverage the capital city’s leadership role and advance the city’s carbon inclusion initiatives in a steady and orderly manner. By 2027, Nanchang aims to establish a well-structured, standardized, and exemplary carbon inclusion system. The plan sets out to develop over ten carbon inclusion methodologies and carbon reduction scenario evaluation standards, and to construct more than thirty key carbon reduction projects and application scenarios across major sectors. It also targets achieving a citizen coverage rate of over 30% through the city’s carbon inclusion mini-program, providing services to more than 50 large-scale enterprises and over 500 small and medium-sized enterprises (SMEs). The plan further proposes to establish an effective incentive and promotion mechanism, significantly enhancing public participation, while integrating Nanchang’s carbon inclusion development within the metropolitan regional framework. The ultimate goal is to build a nationally leading pilot zone for carbon inclusion development, foster a new productive force driven by carbon data, and contribute to Nanchang’s green, sustainable development and the realization of its dual-carbon goals.

In March 2025, the Erdos Municipal Bureau of Ecology and Environment and the Erdos Municipal Bureau of Forestry and Grassland jointly issued the *Work Plan for the Construction of Erdos City’s Carbon Inclusion System (Trial)*. The plan states that by the end of 2025, Erdos will complete the top-level design of its carbon inclusion system, establish the corresponding institutional and standard frameworks, and build a unified carbon inclusion platform. The platform will incorporate locally relevant low-carbon lifestyle scenarios across areas such as clothing, food, housing, transportation, and daily consumption, where user data are well-established and easily accessible. It will also create personal carbon accounts to collect, quantify, and record green and low-carbon behaviors, while establishing a commercial incentive mechanism to form a positive and effective carbon inclusion emission reduction model. By 2030, the city aims to refine its carbon inclusion institutional and standard systems, continuously expand the range of emission reduction scenarios, and integrate desertification control, green mining, and forest–grassland carbon sink projects into management. The plan also seeks to explore multi-level utilization channels such as carbon neutrality for large-scale events and alternative compensation for ecological damage, ensuring the effective absorption of carbon inclusion emission reductions. Ultimately, Erdos will develop a carbon inclusion system characterized by clear regulatory processes, diverse application scenarios, robust system

platforms, and sustainable business models, setting an exemplary model known as the “Erdos Carbon Inclusion Prototype.”

In April 2025, the Shanxi Provincial Department of Ecology and Environment issued the *Work Plan for the Construction of Shanxi Province’s Carbon Inclusion Public Participation Mechanism*. The plan emphasizes that, guided by the goals of achieving carbon peaking, carbon neutrality, and high-quality development, Shanxi will adhere to the principles of “government guidance, market operation, public participation, and inclusive sharing.” It calls for the establishment and improvement of a carbon inclusion public participation platform in Shanxi Province, along with the formulation of relevant rules and regulations on carbon inclusion quantification, trading, and operation. The plan also aims to expand the coverage of carbon inclusion scenarios, explore the creation of personal carbon reduction accounts, and enrich the incentive mechanisms encouraging the public to engage in green and low-carbon behaviors. By fully mobilizing society’s enthusiasm for practicing low-carbon lifestyles, Shanxi seeks to gradually build a carbon inclusion public participation mechanism that is distinctive in character and orderly in operation.

In July 2025, Beijing issued the *Administrative Measures for Carbon Inclusion (Trial)*, which are scheduled to take effect on September 1. The measures introduce an innovative policy by incorporating carbon inclusion emission reductions into the municipal carbon emission trading market, allowing key emitting entities to use these reductions for quota compliance and offsetting, thereby achieving mechanism linkage with the mandatory carbon market. Local policies across China are increasingly emphasizing the improvement of methodological systems and trading mechanisms, driving carbon inclusion to advance from a model based on point-based incentives toward one centered on asset monetization.

On October 30, 2025, the Shanghai Municipal Bureau of Ecology and Environment issued the *Administrative Measures for Carbon Inclusion in Shanghai*. The measures introduce new provisions on behavioral scenarios and incentive mechanisms. Regarding behavioral scenarios, the measures quantify and assign contribution values to widely recognized low-carbon behaviors within daily life contexts—such as clothing, food, housing, transportation, and consumption—including socially endorsed actions like the Clean Plate Campaign and waste sorting. These quantified behaviors are calculated annually and incorporated into individuals’ carbon inclusion credit evaluation system. The introduction of behavioral scenarios further broadens the application of carbon inclusion in everyday life, promoting a dual-track model that enables both the closed-loop utilization of emission reductions and the integration of the credit evaluation system, thereby enhancing the engagement and appeal of carbon inclusion. Regarding incentive measures, the policy supports the establishment of district-level platforms to attract more enterprises to participate in the development of application scenarios and utilization channels. It also explores the creation of a carbon inclusion credit evaluation system, under which enterprises and individuals with strong credit performance may receive preferential lending limits, interest rates, and value-added financial services, within the bounds of regulatory compliance. These measures aim to guide social capital investment toward low-carbon sectors, fostering greater synergy between financial innovation and green development.

These local explorations not only respond to the national requirement of “establishing unified national standards” but also preserve room for regional innovation, jointly advancing China’s carbon inclusion mechanism through a crucial transformation—from local experimentation to nationwide coordination. Together, they provide a vivid Chinese example of how public participation can be effectively integrated into global climate governance.

### 1.1.2 Progress in Methodologies and Related Standards

As a technical standard governing the accounting of carbon emission reductions from low-carbon

behaviors by individuals, households, and small and medium-sized enterprises (SMEs), the carbon inclusion methodology provides the theoretical foundation for identifying baselines, demonstrating additionality, calculating emission reductions, and formulating monitoring plans for specific types of carbon reduction projects and actions. In recent years, carbon inclusion methodologies in China have developed rapidly, showing a clear trend of expanding coverage across an increasing number of sectors and application areas.

In terms of methodology-related policies, since the beginning of this year, regions such as Hubei, Beijing, Tianjin, and Huzhou have issued public notices soliciting carbon inclusion methodologies. From March to April 2025, the Hubei Provincial Department of Ecology and Environment conducted an open call for carbon inclusion methodology submissions and development intentions, receiving 27 methodology proposals and 16 development intentions. This solicitation demonstrated distinctive features of broad coverage, strong application orientation, and notable innovation highlights. The submitted methodologies not only comprehensively covered key areas such as forestry carbon sinks (e.g., urban micro-forests, integrated forest management), agricultural emission reduction (e.g., biogas power generation from livestock and poultry manure, microalgae-based fertilizers for rice fields), resource recycling (e.g., plastic and kitchen waste recycling), and clean energy (e.g., integrated PV-storage-charging systems, distributed photovoltaic power generation), but also extended into unique scenarios such as bamboo-for-plastic substitution, optimization of takeaway packaging, oxygen-enriched coal combustion with carbon capture, and hydrogen substitution in mining machinery. The development intentions further expanded these efforts, focusing on subfields such as new energy vehicle travel, urban wet waste treatment, university second-hand book recycling, and phosphogypsum mineral carbonation. This solicitation systematically established a reserve system for Hubei Province's carbon inclusion methodologies, laying a solid foundation and providing diversified pathways for precise development and the creation of a carbon inclusion system with Hubei characteristics. In June 2025, to encourage broad participation in greenhouse gas reduction and to advance the construction of the carbon inclusion system, the Changchun Municipal Bureau of Ecology and Environment, in accordance with the *Implementation Plan for the Construction of Changchun's Carbon Inclusion System* (Document No. CHANGHUANLIAN [2024] 6), issued the Letter on the Public Solicitation of Carbon Inclusion Methodologies, opening submissions to the public. The solicitation fields covered energy, industry, transportation, construction, agriculture, carbon sinks, waste treatment, resource recycling, and energy-saving technology applications. In July 2025, the Tianjin Municipal Bureau of Ecology and Environment issued the *Notice on Soliciting Suggestions for Carbon Inclusion Methodologies and Projects*, inviting input from all sectors of society. In September 2025, the Huzhou Municipal Bureau of Ecology and Environment released the *Administrative Measures for Carbon Inclusion Methodologies in Huzhou*. In the same month, the Beijing Municipal Bureau of Ecology and Environment issued the *Public Notice on Soliciting Carbon Inclusion Methodologies for Beijing*, aiming to improve the city's carbon inclusion methodology system and expand application scenarios, in accordance with the *Administrative Measures for Carbon Inclusion in Beijing (Trial)* (Document No. JINGHUANFA [2025] 11), and invited public participation in the development of carbon inclusion methodologies.

In terms of officially released methodologies, the *White Paper on Carbon Inclusion Development 2024* introduced methodologies issued last year by cities such as Shanghai, Wuhan, Yinchuan, and Shijiazhuang, which covered a variety of categories and application scenarios. Since then, more local governments have successively launched carbon inclusion methodologies with broader coverage for public adoption and participation.

In November 2024, under the guidance of the Military-Civil Fusion Development Committee of the

CPC Hubei Provincial Committee and the Hubei Provincial Department of Ecology and Environment, the Hubei Emission Exchange and Wuhan Carbon Inclusion Co., Ltd., together with relevant institutions, developed China's first carbon inclusion methodology for the shipping industry — *the Carbon Inclusion Methodology for the Application of Green Energy in Hubei Inland Vessels*. This methodology aims to quantify the emission reduction achieved by replacing conventional fuels with green energy sources such as electricity, liquefied natural gas (LNG), biodiesel, methanol, ethanol, hydrogen, and ammonia in inland waterway vessels. It has been reviewed and approved by the Hubei Provincial Department of Ecology and Environment and officially released as a provincial-level carbon inclusion methodology, applicable to Hubei-registered green energy passenger and cargo vessels operating on inland waterways and river–sea direct routes.

In May 2025, Sichuan Province released three major carbon inclusion methodologies for the forestry and grassland sectors, covering giant panda habitat protection and restoration, forest management, and grassland ecological restoration. Among them, the Giant Panda Habitat Protection Methodology pioneered the model of “ecological conservation + carbon inclusion”, incorporating biodiversity conservation into carbon asset development. For instance, one nature reserve can achieve and certify tens of thousands of tons of emission reductions annually by restricting commercial logging in artificial forests. On May 15, the Chengdu Municipal Bureau of Ecology and Environment issued the fourth batch of methodologies under the city's Tianfu Carbon Credits mechanism, including the *Carbon Inclusion Methodology for Waste Plastic Recycling and Utilization* and the *Carbon Inclusion Methodology for Waste Electrical and Electronic Product Recycling and Utilization*.

On May 6, 2025, two methodologies organized and evaluated by the Shenzhen Municipal Bureau of Ecology and Environment were officially released: the *Shenzhen Distributed Photovoltaic Power Generation System Carbon Inclusion Methodology (Trial)*, *Shenzhen Paperless Financial Scenarios (Banking Industry) Carbon Inclusion Methodology (Trial)*.<sup>27</sup> The *Shenzhen Distributed Photovoltaic Power Generation System Carbon Inclusion Methodology (Trial)* quantifies the carbon inclusion emission reductions achieved by replacing grid electricity with photovoltaic power. It supports distributed photovoltaic projects below 1 MW to participate in the program, aiming to provide carbon-related benefits to small-scale photovoltaic projects with limited financial returns. To better serve project applicants, the methodology features a concise and transparent accounting process and a clear allocation mechanism, offering strong technical support for realizing the emission reduction value of clean energy. The *Shenzhen Paperless Financial Scenarios (Banking Industry) Carbon Inclusion Methodology (Trial)* focuses on emission reductions generated by replacing traditional offline processes with digital financial services, including electronic debit and credit cards, e-billing, online payments, online lending, online repayments, and online transfers. It precisely calculates emission reductions from paper use, card production, and logistics, thereby innovatively quantifying the emission reduction contributions of individuals' online financial behaviors.

In June 2025, Wuhan released three Carbon Inclusion Methodologies, all of which represent the first of their kind in their respective fields: the *Carbon Inclusion Methodology for the Recycling and Utilization of End-of-Life Vehicles (Trial)*, the *Carbon Inclusion Methodology for Low-Carbon Building Operations Using Green and Efficient Refrigerants (Trial)*, and the *Carbon Inclusion Methodology for Pipeline Direct Drinking Water Systems (Trial)*. These methodologies inject new momentum into green value transformation across sectors such as industrial solid waste recycling, low-cost energy-saving retrofits for existing buildings, and public health-oriented drinking water projects. Through measures such as standardizing dismantling procedures, filling the methodological gap in building operational energy efficiency, and guiding residents

toward greener and healthier lifestyles, they mark Wuhan's carbon inclusion mechanism moving beyond encouraging individual actions to driving systematic and sector-wide deep emission reductions. By October 2025, Wuhan's carbon inclusion methodology system had achieved remarkable progress, with a total of 13 methodologies issued in three batches, establishing a comprehensive and well-structured methodology repository. This system includes nine methodologies focused on individual low-carbon behaviors and four methodologies targeting voluntary emission reduction projects, reflecting an increasingly diversified set of emission reduction pathways.

On June 25, 2025, at the launch ceremony of the National Low-Carbon Day main event in Shaanxi Province, two methodologies—*Shaanxi Province Carbon Inclusion Methodology: Metro and Shaanxi Province Carbon Inclusion Methodology: Bus*—were officially released. These methodologies establish quantitative standards for carbon emission reductions in metro and bus travel, forming a “reduction–accounting–incentive” closed-loop system. Users earn carbon points by taking the metro or bus, which can then be redeemed on the platform for goods or services. On the same day, the Xiamen Municipal Bureau of Ecology and Environment and the Xiamen Municipal Bureau of Parks and Landscaping jointly issued the local regulatory document *Carbon Inclusion Methodology for Waste Sorting in Residential Communities in Xiamen*, officially implemented under the code XM CER-02-V1-2025. This document is the first in China to establish a carbon reduction accounting system for waste sorting with residential communities as the primary participants. By scientifically defining accounting boundaries and applying IPCC models combined with localized adjustment methods, the methodology enables the quantification of emission reductions achieved through waste sorting and facilitates the conversion of these reductions into carbon assets.

In August 2025, Shandong Province released two methodologies — the *Carbon Inclusion Methodology for Carbon Sink from Medium- and Deep-Geothermal Energy Utilization* and the *Carbon Inclusion Methodology for Carbon Sink from Shallow-Geothermal Energy Utilization*. These methodologies integrate geothermal resource utilization with carbon sink value accounting, providing geothermal-rich regions with a dual-drive model of “low-carbon energy supply + carbon sink revenue.” For example, under these methodologies, a geothermal project can obtain certified emission reductions while also generating indirect ecological benefits through improved air quality, thereby creating a virtuous eco-economic cycle.

In September 2025, the *Carbon Inclusion Methodology for Forest Quality Improvement in Hubei Province*, compiled by the Hubei Academy of Forestry, passed expert review organized by the Hubei Provincial Department of Ecology and Environment, becoming the first forestry-related carbon inclusion methodology in the province.

On September 30, 2025, Guangzhou Water Investment Group, together with the Guangzhou Municipal Bureau of Ecology and Environment, the Municipal Water Affairs Bureau, the Municipal State-owned Assets Supervision and Administration Commission, and the Executive Committee of the 15th National Games and the Paralympic Games Guangzhou Division (hereinafter referred to as the “Municipal Executive Committee”), held a ceremony for the release of the *Carbon Inclusion Methodology for Reuse of Treated Effluent from Wastewater Treatment Plants in Guangzhou* and a carbon donation event. This initiative produced China's first carbon inclusion methodology linking “treated effluent reuse” with “carbon emission reduction” in the wastewater industry, marking Guangzhou as the first city in the country to register a carbon inclusion methodology in the field of municipal wastewater treatment. The “low-carbon value” of treated effluent has thus transformed from being “invisible” to “measurable, reportable, and verifiable,” providing crucial technical support for the development of carbon assets in urban water management.

**Table 2 Provinces and cities that have formulated carbon inclusion methodologies**

Region	Methodologies
Guangdong Province	"Forestry Carbon Sink Carbon Inclusion Methodology," "High-Efficiency Air Conditioner Carbon Inclusion Methodology," "Household Air-Source Heat Pump Water Heater Carbon Inclusion Methodology," "Waste Textile Recycling Carbon Inclusion Methodology," "Guangdong Mangrove Forest Carbon Inclusion Methodology (2023 Edition)," "Guangdong Distributed Photovoltaic Power Generation System Carbon Inclusion Methodology (2024 Revised Edition)."
Guangzhou City	"Carbon Inclusion Methodology for Internet Bicycle Rental Riding in Guangzhou (Trial)," "Carbon Inclusion Methodology for Reuse of Treated Effluent from Wastewater Treatment Plants in Guangzhou."
Shenzhen City	"Shenzhen Low-Carbon Public Transport Carbon Inclusion Methodology (Trial)," "Shenzhen Residential Low-Carbon Electricity Use Carbon Inclusion Methodology (Trial)," "Shenzhen Forest Management Carbon Inclusion Methodology (Trial)," "Shenzhen High-Efficiency Refrigeration Data Center Carbon Inclusion Methodology (Trial)," "Shenzhen Milk Carton Recycling Emission Reduction Carbon Inclusion Methodology (Trial)," "Shenzhen Distributed Photovoltaic Power Generation System Carbon Inclusion Methodology (Trial)," "Shenzhen Paperless Financial Scenarios (Banking Industry) Carbon Inclusion Methodology (Trial)."
Hainan Province	"Hainan Mangrove Afforestation/Reforestation Carbon Sink Project Methodology."
Sichuan Province	"Giant Panda Habitat Protection and Restoration Carbon Inclusion Project Methodology," "Sichuan Forest and Grassland Carbon Inclusion Project Methodology – Giant Panda Habitat Protection and Restoration (SCER-LY-001-V01)," "Sichuan Forest and Grassland Carbon Inclusion Project Methodology – Forest Management (SCER-LY-002-V01)," "Sichuan Forest and Grassland Carbon Inclusion Project Methodology – Grassland Ecological Restoration (SCER-LY-003-V01)."
Chengdu City	"Chengdu 'Tianfu Carbon Credits' Mechanism Carbon Reduction Project Methodology (First Batch)," "Chengdu 'Tianfu Carbon Credits' Mechanism Carbon Reduction Project Methodology (Second Batch)," "Chengdu 'Tianfu Carbon Credits' Mechanism Carbon Reduction Project Methodology (Third Batch)," "Chengdu 'Tianfu Carbon Credits' Mechanism Carbon Reduction Project Methodology (Fourth Batch)."
Chongqing City	"Chongqing 'TanHuiTong' Methodology."
Beijing City	"Beijing Low-Carbon Travel Carbon Reduction Methodology (Trial Version)," "Beijing Passenger Vehicle (Fuel-to-Electric) Carbon Reduction Methodology (Trial Version)," "Beijing Hydrogen Fuel Cell Vehicle Carbon Inclusion Methodology (Trial)."
Shandong Province	"Shandong Seagrass Bed Carbon Sink Carbon Inclusion Methodology," "Carbon Inclusion Methodology for Carbon Sink from Medium- and Deep-Geothermal Energy Utilization", "Carbon Inclusion Methodology for Carbon Sink from Shallow-Geothermal Energy Utilization."
Qingdao City	"Qingdao Low-Carbon Travel Carbon Inclusion Methodology (Trial)."
Wenzhou (Yueqing)	"Yueqing Distributed Photovoltaic Power Generation System Carbon Inclusion Methodology."
Shanghai City	"Shanghai Distributed Photovoltaic Power Generation Carbon Reduction Project Methodology (shcer01010012024i)," "Shanghai Surface Bus Carbon Reduction Scenario Methodology (shcer02020012024i)," "Shanghai Rail Transit Carbon Reduction Scenario Methodology (shcer02020022024i)," "Shanghai Internet Bicycle Rental Carbon Reduction Scenario Methodology (shcer02020032024i)," "Shanghai Residential Low-Carbon Electricity Use Carbon Reduction Scenario Methodology (shcer02010022024ii)," "Shanghai Pure Electric Passenger Vehicle Carbon Reduction Scenario Methodology (shcer02020042024ii)."
Wuhan City	"Wuhan Distributed Photovoltaic Power Generation Project Operation Carbon Inclusion Methodology (Trial)," "Wuhan Large-Scale Poultry Manure Resource Utilization Carbon Inclusion Methodology (Trial)," "Wuhan Residential Low-Carbon Electricity Demand Response Carbon Inclusion Methodology (Trial)," "Wuhan Bus Travel Carbon Inclusion Methodology (Trial)," "Wuhan Rail Transit Travel Carbon Inclusion Methodology (Trial)," "Wuhan Shared Bicycle Travel Carbon Inclusion Methodology (Trial)," "Wuhan Carpooling Travel Carbon Inclusion Methodology (Trial)," "Wuhan New Energy Vehicle Travel Carbon Inclusion Methodology (Trial)," "Wuhan Takeout Scenario Non-Disposable Tableware Carbon Inclusion Methodology (Trial)," "Wuhan Used Mobile Phone Trading Carbon Inclusion Methodology (Trial)," "Carbon Inclusion Methodology for the Recycling and Utilization of End-of-Life Vehicles (Trial)," "Carbon Inclusion Methodology for Low-Carbon Building Operations Using Green and Efficient Refrigerants (Trial)," "Carbon Inclusion Methodology for Pipeline Direct Drinking Water Systems (Trial)."
Yinchuan City	"Yinchuan Distributed Photovoltaic Project Carbon Inclusion Methodology."
Shijiazhuang City	"Shijiazhuang Low-Carbon Travel Carbon Inclusion Methodology."
Hubei Province	"Carbon Inclusion Methodology for the Application of Green Energy in Hubei Inland Vessels," "Carbon Inclusion Methodology for Forest Quality Improvement in Hubei Province."
Shaanxi Province	"Shaanxi Province Carbon Inclusion Methodology: Metro," "Shaanxi Province Carbon Inclusion Methodology: Bus."
Xiamen City	"Carbon Inclusion Methodology for Waste Sorting in Residential Communities in Xiamen."

Source: Compiled from publicly available information. Items marked with an asterisk, indicate new or revised content compared with the 2024.

In terms of standards, there has been no new progress in local standards, while group standards have seen significant advancements. In recent years, the All-China Environment Federation (ACEF), together with companies such as NaaS Technology and Green Inclusive Science and Technology (Beijing) Co., Ltd. has successively issued several Carbon Inclusion-related group standards focusing on green behaviors in daily life—covering clothing, food, housing, and transportation. These include the *Guidelines for Quantifying Green and Low-Carbon Citizen Behaviors in Terms of Greenhouse Gas Emission Reduction—Transportation* and the *Guidelines for Quantifying Green and Low-Carbon Citizen Behaviors in Terms of Greenhouse Gas Emission Reduction—Office Work*. The standards specifically address low-carbon scenarios such as walking, cycling, metro commuting, bus riding, non-stop toll payment, vehicle parking and idling reduction, hybrid vehicle use, and electric vehicle charging, as well as paperless office operations and online meetings for low-carbon workplaces. The China Electricity Development Promotion Association, in collaboration with State Grid Corporation of China and XJ Group Corporation, issued the *Functional Specification for Carbon Inclusion Platforms (T/CEPPC 15—2023)*, which stipulates the functional requirements for Carbon Inclusion Platforms in terms of user management, data collection, and emission reduction accounting, thereby promoting data interconnection and cross-regional mutual recognition among platforms. Additionally, the Zhejiang Sustainable Development Research Association released the group standard *T/ZSSD 0005—2023: Specification for Operation Management and Service of Carbon Inclusion Digital Intelligence Platforms*.

**Table 3 Selected released group standards on carbon inclusion**

Standard Title	Issuing Organization
<i>Guidelines for Quantifying Green and Low-Carbon Citizen Behaviors in Terms of Greenhouse Gas Emission Reduction—Transportation</i>	All-China Environment Federation and others
<i>Guidelines for Quantifying Green and Low-Carbon Citizen Behaviors in Terms of Greenhouse Gas Emission Reduction—Office Work</i>	All-China Environment Federation and others
<i>Functional Specification for Carbon Inclusion Platforms (T/CEPPC 15—2023)</i>	XJ Group and others
<i>Specification for Operation Management and Service of Carbon Inclusion Digital Intelligence Platforms. (T/ZSSD 0005—2023)</i>	Zhejiang Sustainable Development Research Association and others

Source: Compiled from publicly available information

### 1.1.3 Progress of Carbon Inclusion Platforms

In the *White Paper on Carbon Inclusion Development 2024*, China's provincial and municipal governments' carbon inclusion platforms for public participation were systematically documented for the first time. If last year the progress of China's carbon inclusion platforms development could be described as "a hundred flowers blooming," then this year the construction of such platforms can be characterized as "advancing at full speed."

In December 2024, the "TanHuiYanZhao" platform was officially launched, becoming the first carbon inclusion mini-program in Hebei Province aimed at encouraging low-carbon travel. The mini-program automatically records and collects users' travel data and issues carbon points, which can be redeemed for public transport e-tickets, shared bicycle coupons, green finance benefits, and discounts on eco-friendly products. The launch of the platform has enabled the value transformation of carbon emission reductions in travel scenarios and established a green incentive mechanism, motivating more citizens to actively

participate in urban carbon inclusion initiatives.

On June 25, 2025, Shanghai officially launched its carbon inclusion platform, built upon the “Suishenban” mini-program and featuring a closed-loop system of “behavior recording–point accumulation–benefit redemption.” In its initial phase, the platform covered four major travel scenarios—surface buses, rail transit, online bicycle rentals, and pure electric passenger vehicles. Once users grant authorization, the system automatically records their emission reductions, and carbon points can be redeemed for digital RMB, shopping vouchers, and IP-related merchandise. Shanghai’s innovation lies in deeply integrating Carbon Inclusion with urban digital governance. Through the sharing of government data, the platform achieves automated emission reduction accounting, and from the first phase, it realized seamless data integration with six interfaces, including transportation cards and shared bicycle services, thereby laying a technological foundation for future scenario expansion.

On June 25, 2025, at the launch ceremony of the National Low-Carbon Day main event in Shaanxi Province, the provincial “TanHuiSanQin” Carbon Inclusion Platform was officially launched. Guided by the Shaanxi Provincial Department of Ecology and Environment, the “TanHuiSanQin” platform serves as the province’s only official Carbon Inclusion platform, designed around the core technologies of “Internet + Big Data + Carbon Finance.” It aims to establish a multi-stakeholder participation model involving government, enterprises, and individuals, thereby building a carbon inclusion system with distinct Shaanxi characteristics. According to officials from the provincial Department of Ecology and Environment, the platform connects various low-carbon scenarios in residents’ daily lives, enabling individuals’ low-carbon actions to be converted into carbon points. These points can be redeemed in the platform’s benefit marketplace for a variety of reward products, offering the public an engaging and enjoyable low-carbon lifestyle experience.

In July 2025, the Hubei Provincial Public Institution Carbon Inclusion Platform was officially launched. The platform will establish a three-tier database covering provincial, municipal, and county-level public institutions to achieve three core functions: precise accounting of greenhouse gas emissions, quantitative incentives for low-carbon behaviors among officials and staff, and centralized collection and trading of carbon assets. This will form a low-carbon management model for public institutions characterized by traceable data, quantifiable emission reductions, and a closed-loop incentive mechanism, creating the “Hubei Model” for low-carbon public institutions. The Hubei Provincial Administration of Government Affairs has already initiated pilot programs of the Carbon Inclusion Mini-Program within the Provincial Government Office, its own system, and Wuchang District government agencies. By the end of the year, the application of the Carbon Inclusion Mini-Program for Public Institutions will be fully implemented across Hubei Province.

On August 17, 2025, the Pu’er Carbon Account Platform was launched for trial operation, accompanied by the simultaneous release of the “TanHuiPu’er” Mini-Program, a public low-carbon lifestyle service platform. The Carbon Account Platform spans seven major sectors—industry, energy, forestry and grassland, transportation, construction, agriculture, and residential life—enabling the province to assess its carbon baseline, monitor carbon dynamics, and activate carbon value. It provides robust data support for precise government regulation and green enterprise transformation. The “TanHuiPu’er” Mini-Program focuses on clothing, food, housing, transportation, and consumption, aiming to inspire broad public participation and transform low-carbon living from a concept into concrete action, thereby building an ecosystem of collaborative emission reduction among government, enterprises, and the public.

In August 2025, under the guidance of relevant municipal departments, Nanchang Carbon Inclusion Technology Development Co., Ltd.—jointly established by Nanchang Forestry Investment and

Development Co., Ltd. and leading domestic enterprises—officially launched and began operating China's first “Carbon Inclusion+” integrated service platform centered on high-quality carbon credits. The platform innovatively built a “1-3-4-N” carbon inclusion system featuring a three-in-one model of “government-led carbon control, enterprise-driven carbon reduction, and individual low-carbon action.” Its goal is to establish a closed-loop mechanism connecting low-carbon incentives, transactions, and emission reductions, providing a replicable “Nanchang Model” for exploring pathways toward green, low-carbon, and high-quality development. In September, Nanchang Carbon Inclusion Company reached a strategic partnership with KuaiDian, a well-known domestic third-party charging service provider, to jointly create Jiangxi Province's first new energy vehicle charging emission reduction scenario. The implementation of this project marked a significant breakthrough in Nanchang's carbon inclusion development—transforming the concept from theory to practical application—and offered the public a viable new channel for participating in carbon reduction. At the same time, the project introduced an innovative full-chain closed-loop mechanism linking “low-carbon behavior – emission reduction – incentive feedback.”

**Table 4 Summary of major carbon inclusion platforms in different regions of China**

Platform Name	Province / City / Autonomous Region
Northeast China	
“Carbon Benefit for Ice City” Platform	Harbin City
North China	
“Green Life Season” Platform	Beijing City
“Sanjin Green Life” Platform	Shanxi Province
“JinTanXing” Platform	Tianjin City
“NuanChengTanHui” Platform	Erdes City
“TanHuiYanZhao” Platform	Hebei Province
East China	
*Shanghai Carbon Inclusion Platform	Shanghai City
Shanghai Huangpu District Carbon Inclusion Platform	Huangpu District, Shanghai
“Zhejiang Carbon Inclusion” Platform	Zhejiang Province
“Carbon Fashion” Platform	Wuxi City
Jiaxing Carbon Inclusion Platform	Jiaxing City
“Jiangxi Low-Carbon Life” Platform	Jiangxi Province
“TanHuiLuZhou” Platform	Hefei City
Jiangsu Public Institution Carbon Inclusion Management Information Platform	Jiangsu Province
“QingTanXing” Platform	Qingdao City
**TanHuiShanDong” Platform	Shandong Province
*Nanchang Carbon Inclusion Platform	Nanchang City
Central China	
“Zero Carbon Together” Platform	Wuhan City
“TanHuiHuangShi” Platform	Huangshi City
*Hubei Public Institution Carbon Inclusion Platform	Hubei Province
South China	
“Guangzhou Carbon Inclusion” Platform	Guangzhou City
“Low-Carbon Planet” Platform	Shenzhen City
“GuiTanBao”	Guangxi Zhuang Autonomous Region

Platform Name	Province / City / Autonomous Region
Southwest China	
"Tianfu Carbon Credits" Green Public Welfare Platform	Chengdu City
Chongqing Carbon Credit Platform	Chongqing City
"Green Bud Point" Platform	Luzhou City
**TanHuiPu'er" Platform	Pu'er City
Northwest China	
Ningxia Carbon Inclusion Platform	Ningxia Hui Autonomous Region
"LvJiangTanHui" Platform	Xinjiang Uygur Autonomous Region
**TanHuiSanQin" Platform	Shaanxi Province
Hong Kong, Macao and Taiwan	
Macao Carbon Inclusion Platform	Macao Special Administrative Region

Source: Compiled from public data

At the operational level of carbon inclusion platforms, as of October 2025, the Chengdu "Tianfu Carbon Credits" Platform had surpassed 3.6 million users, with more than 30 million recorded individual emission reduction actions. The platform now covers six categories of low-carbon scenarios, including 104 offline and 45 online low-carbon activity types. These encompass shared bicycle riding, public transit and metro travel, new energy vehicle charging, Tianfu Greenway participation, urban cultural experiences, youth volunteer services, low-carbon reading, water conservation, zero-carbon meeting rooms, and household waste sorting, among others. The platform is connected to 28 internet data sources, including WeChat, Alipay, Meituan, Hello Bike, Kuaidian, Tuanyou, T3 Mobility, QingJuJinGuanCheng, Chengdu Library, TanShiGuang, YinGu TanHui, and Milibox, enabling automatic transmission of users' low-carbon behavior data and real-time synchronization of carbon points. Meanwhile, the "Zero Carbon Together" Platform, launched in 2023, has achieved remarkable results within just two years—surpassing 1.92 million users, accumulating 38,000 tons of individual emission reductions, and recording 18.16 million low-carbon actions. The platform covers 11 categories of low-carbon lifestyle scenarios, including buses, metro, cycling, new energy charging, new energy travel, carpooling/ride-sharing, residential electricity use, recyclable collection, reusable shopping bags, green governance, and green healthcare. It is integrated with 17 internet data platforms, such as WeChat, Alipay, Kuaidian, eCharging, HuiJieDian, Meituan, Didi, AiFenLei, AiHuiShou, realizing batch transmission, automatic calculation, and online registration of users' low-carbon behavior data.

Overall, China's carbon inclusion platforms are accelerating their transition from "single-point exploration" to "comprehensive deep integration." Across regions, the platforms are demonstrating diverse innovations in user operation, scenario expansion, and incentive design. However, there are still issues such as uneven development, inconsistent evaluation standards, and unclear optimization directions, as well as the absence of a scientific and systematic indicator framework to quantitatively evaluate the quality of construction and operational effectiveness. To address this, we have pioneered the establishment of a "Five-Star Evaluation System" for carbon inclusion platforms, which provides a comprehensive and multidimensional assessment based on five core dimensions—user scale and activity level, breadth of scenario coverage, value of incentive products, user experience and product design, and effectiveness of the transaction closed-loop. This system aims to create a quantifiable, benchmarkable, and iterative model for industry development, compelling each platform to accurately identify weaknesses and continuously optimize and upgrade.

Specifically, the five evaluation dimensions focus not only on the “user core” but also take into account “functional effectiveness” and “value transformation.”

- **User Scale:** This dimension not only considers the total number of registered users as the “foundation” but places greater emphasis on “quality indicators” such as the proportion of active users, weekly or monthly participation frequency, and user retention rate, directly reflecting the platform’s public appeal and the authenticity of user engagement.

- **Breadth of Scenario Coverage:** Centered on the full spectrum of daily life scenarios—“clothing, food, housing, and transportation”—this evaluates the completeness of scenario coverage, its alignment with users’ high-frequency behaviors, and whether the platform enables “seamless data collection and automatic accounting” of low-carbon actions, demonstrating its capability to activate everyday emission reduction potential.

- **Value of Incentive Products:** Assessed through three dimensions—diversity of incentive categories (e.g., consumption discounts, public service exchanges, digital rewards), actual redemption value, and convenience of the redemption process—this reflects how attractive the incentive mechanism is to users and ensures a strong correlation between “emission reduction behaviors” and “tangible benefits.”

- **Product Design and User Experience:** Focused on “functional simplicity” (e.g., streamlined operations, clear onboarding guidance) and “aesthetic appeal” (e.g., user-friendly visual design, smooth interaction logic), this dimension evaluates the overall user experience to lower participation barriers and enhance platform usability.

- **Transaction Closed Loop Efficiency:** This primarily assesses the efficiency of emission reduction certification and issuance, the smoothness of carbon asset trading channels, and the monetization capacity of individual or enterprise carbon assets, highlighting the platform’s ability to transform “intangible emission reduction actions” into “tangible carbon assets” and to complete the full-cycle closed-loop of “reduction–certification–trading–incentive.”

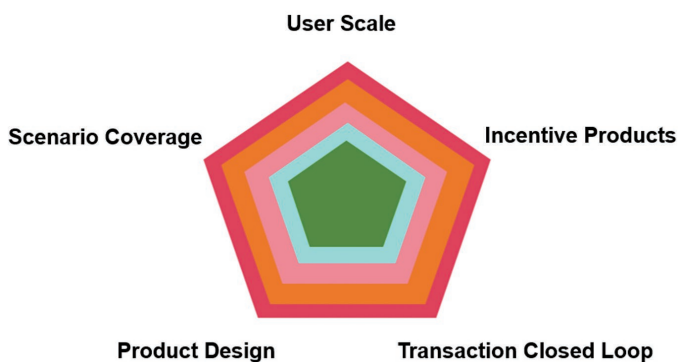


Figure 1.1 The “Five-Star Evaluation System” of carbon inclusion platforms

The introduction of this innovative evaluation system not only fills the existing gap in standards for assessing carbon inclusion platforms but also provides an objective and impartial quantitative framework to guide platforms in clarifying their optimization directions—expanding the user base while enhancing engagement, enriching scenarios while improving practicality, refining incentive systems while increasing

attractiveness, optimizing user experience through meticulous design, and unlocking carbon asset value by streamlining transaction chains. Ultimately, it aims to drive the carbon inclusion industry's transformation from "scale expansion" to "quality enhancement," further stimulating low-carbon participation from both the public and enterprises, and injecting sustained momentum into the realization of China's dual-carbon goals.

## 1.2 Overview of International Carbon Inclusion Development

### 1.2.1 Europe and North America

In Europe, the European Commission (EC) in recent years has established more ambitious climate targets and enshrined them into law. *The European Climate Law of 2021* transforms the goal of achieving net-greenhouse-gas reductions of at least 55 % by 2030 (relative to 1990) and climate neutrality by 2050 into legally binding obligations. To realise these goals, the EC in 2021 put forward the "*Fit for 55*" package, strengthening emission-reduction policies across sectors. One key initiative is the expansion of carbon pricing coverage: beyond the existing EU Emissions Trading System (EU ETS), a new carbon market was designed for building heating and road-transport fuels, obliging fuel suppliers to purchase allowances for emissions from residential gasoline and heating fuels. This means that carbon costs are indirectly passed on to citizens, extending the "polluter pays" principle into everyday life. Simultaneously, to avoid disproportionately impacting low-income households, the EU innovatively proposed the establishment of a "Social Climate Fund". This Fund is to invest about €72.2 billion during 2026–2032 (roughly 25 % of the revenue from the new fuel carbon market) to help Member States support vulnerable households, micro-enterprises and transport users in the low-carbon transition.

National governments across Europe have also introduced policies to incentivise low-carbon consumption by households. For example, many EU Member States offer subsidies or tax breaks for electric vehicles (EVs) and energy-efficient home appliances to encourage individual emission-reduction behaviour. Reports indicate that in Italy in 2025 a new subsidy scheme offers individuals up to approximately €11,000 for purchasing an EV (with low-income households covered up to 30 % of vehicle cost), and in Spain pure-electric vehicles are eligible for a subsidy of €4,500–7,000 plus purchase-tax and road-tax exemption. Such policy tools—combining price signals and positive incentives—guide a broad public participation in emission reduction, thereby laying the institutional foundation for carbon inclusion.

In North America, the United States rejoined the Paris Agreement in 2021 and set an unprecedented 2030 national-determined contribution: 50%–52% emissions reduction relative to 2005, and aiming for economy-wide net-zero by 2050. *The Inflation Reduction Act of 2022 (IRA)* launched a large-scale incentive programme, allocating about US\$370 billion to clean-energy and climate projects emphasising benefits to households and individuals. IRA includes numerous tax credits and subsidies: for example, homeowners receive a 30% credit for green retrofits (up to US\$1,200 annually, additional US\$2,000 for high-efficiency heat-pumps), plus direct discounts (up to US\$14,000) for low-income households energy-efficiency upgrades; for clean mobility, the EV purchase tax-credit was reinstated/enhanced (up to US\$7,500 new EV, US\$4,000 used EV) and a 30% credit for home EV charging infrastructure. These policies significantly lower the threshold for individuals adopting low-carbon technologies. Moreover, through federal and state-level funds, community-based emission-reduction actions are supported (e.g., creation of green banks, environmental-justice grants). The *Justice40 Initiative* requires that 40% of certain federal clean-energy/clean-transport investments flow to disadvantaged communities. In Canada, since 2019 a nationwide carbon-pricing mechanism has been in place, emphasising the concept of

carbon inclusion: most of the carbon tax revenue is returned to the public. The federal government returns approximately 90 % of carbon-tax revenue as “Climate Action Incentive” payments, distributed quarterly since 2022, with extra 10% for remote rural residents to offset basic-necessity emissions. As a result, roughly 80% of Canadian households receive rebates greater than their incremental carbon tax cost. This “carbon dividend” model improves policy acceptability and provides economic incentives for individuals to choose lower-carbon lifestyles because energy-efficient households stand to net-gain. Overall, the North American region integrates legislative long-term decarbonisation vision with fiscal incentives and revenue-recycling mechanisms, embedding individual emission-reduction behaviour into climate policy architecture and exemplifying a carbon inclusion orientation.

### 1.2.2 East Asia & Southeast Asia

Asia, as the world’s fastest-growing economic region and concentrated energy-consumption zone, has a critical role in achieving the *Paris Agreement*’s goals via carbon-market construction and public-participation mechanisms. In recent years, major Asian economies, under their net-zero strategies, have introduced emissions-trading systems (ETS), carbon taxes and voluntary-carbon markets (VCM), and are progressively exploring personal carbon accounts and public-behaviour incentives for carbon inclusion—thereby offering operational experience for multi-layer, multi-actor low-carbon transition.

In East Asia, Japan is among the earliest economies in Asia to elevate “carbon neutrality” into national statutory commitment. In 2020 the government announced a commitment to net-zero greenhouse-gas emissions by 2050; in 2021 it amended the *Act on Promotion of Global Warming Countermeasures* to embed the carbon-neutrality goal within law and clearly specify the division of responsibility between central and local government, with the Japan’s Ministry of the Environment (MOEJ) coordinating national climate policy and emissions regulation, and the Ministry of Economy, Trade and Industry (METI) responsible for energy transition and industrial support. In the sphere of carbon inclusion, Japan’s system features strong social mobilisation. As early as 2005, MOEJ launched the “Cool Biz” campaign, encouraging office settings at 28°C in summer and light clothing, achieving about 2 million tonnes of CO<sub>2</sub> annual reduction and becoming a classic public-behaviour mitigation programme. In 2015 Japan launched the national “COOL CHOICE” initiative, promoting citizens to reduce personal carbon footprints via appliance replacement, green transportation, and electricity-use reduction. That initiative established a national personal carbon-account database and an online platform logging behavioural data which converts into emission-reduction credits. By 2024 the participation rate exceeded 80% of enterprises and over 50% of households; public behavioural actions thus became an important social pillar of national emission-reduction. These policies merge energy-saving culture with digital-management systems, transforming low-carbon action from governmental advocacy into social consciousness—a signature feature of Japan’s carbon governance.

In the Republic of Korea, the country was the first in Asia to establish a national ETS (K-ETS) and among the earliest to enshrine a statutory net-zero target. The *Framework Act on Carbon Neutrality and Green Growth of 2021* explicitly targets net-zero by 2050 and a 2030 reduction of 40% relative to 2018, elevating “carbon neutrality” into the national legal development strategy. On carbon inclusion and public participation, Korea instituted from 2009 the “EcoMileage Program” (Seoul city) which uses personal carbon-accounts to record resident savings in electricity, gas or water consumption of 10%+, and awards carbon credits redeemable for transit card top-ups, vouchers or tax-deductions. The data are jointly audited by utilities and city government to ensure transparency and credibility. As of 2024, national participation exceeds 2.5 million residents and cumulative reduction equals about 1.4 million tonnes

CO<sub>2</sub>e—making it one of the world’s most representative public-carbon-incentive programmes.

Characteristic	Phase I	Phase II	Phase III
<b>Major Goal</b>	<ul style="list-style-type: none"> <li>Building up operational capacity</li> <li>Ensuring the smooth launch of the system</li> </ul>	<ul style="list-style-type: none"> <li>Considerable emission reduction</li> </ul>	<ul style="list-style-type: none"> <li>Meeting the emission reduction target</li> </ul>
<b>Institutional Operation</b>	<ul style="list-style-type: none"> <li>Enhancing the flexibility of the system (e.g., offset credits use)</li> <li>Establishing the basis for accurate MRV</li> </ul>	<ul style="list-style-type: none"> <li>Expanding the scope of the system</li> <li>Increasing the emission reduction target</li> <li>Upgrading standards for emissions reporting and verification</li> </ul>	<ul style="list-style-type: none"> <li>Encouraging all entities to reduce emissions voluntarily</li> <li>Increasing flexibility in supply of credits through participation in third-party trading</li> </ul>
<b>Allowances</b>	<ul style="list-style-type: none"> <li>100% free allocation</li> <li>Utilizing experiences from Energy and Greenhouse Gas Target Management System</li> </ul>	<ul style="list-style-type: none"> <li>97% of allowances distributed for free, 3% auctioned</li> <li>Improving allowance allocation approach</li> </ul>	<ul style="list-style-type: none"> <li>Less than 90% of allowances distributed for free, more than 10% auctioned</li> <li>Implementing improved allowance allocation approach</li> </ul>

MRV = monitoring, reporting, and verification.

Source: Korean government website

**Figure 1.2: Residents’ energy-saving/water-saving behavior is quantified into points and exchanged for incentives in Eco-Mileage.**

Beyond that, the Ministry of Environment has also created a national “Carbon Point System” covering households and micro-enterprises, integrated via mobile App with city-data platforms. Residents can view their personal footprint across transport, home energy use and other domains, forming a “behaviour visualisation - credit monetisation - social incentive” cycle—an archetypal carbon inclusion model.

In Southeast Asia, Singapore is the first country in the region to implement a carbon-tax system, anchoring its climate policy on “sustainable development and economic competitiveness”. *The Carbon Pricing Act 2018 (CPA)* operationalised on 1 January 2019 a national carbon-pricing framework. As a resource-limited small island state, Singapore attaches great importance to public-level carbon inclusion and promotion of low-carbon lifestyles. The government’s national climate policy emphasises “society-wide climate action” via education, digital platforms and incentive measures. For example, the utilities group SP Group launched the “GreenUP” and “My Carbon Footprint”. platforms—typical personal carbon-account mechanisms. Residents connect their electricity accounts, transport and daily-consumption data; the platform automatically computes individual emissions, and rewards low-carbon challenges (e.g., energy-use reduction, public-transport use, purchase of green electricity) with points redeemable for e-vouchers or donations to charity.

Thailand is an early mover in voluntary-carbon-market mechanisms within the region. Its voluntary scheme, the Thailand Voluntary Emission Reduction Programme (TVER), overseen by the Thailand Greenhouse Gas Management Organization (TGO), articulates a full-chain rule set: project - certification - issuance - cancellation. Community-based projects in forestry, agricultural residue utilisation and waste-to-resource have been certified under T-VER, which also enables “community action → emission-reduction volumes → benefit-sharing”—laying the groundwork for individual carbon-account productisation. Moreover, TGO’s “Net Zero Champion” App helps individuals quantify their environmental footprint.

Collectively, Thailand is expanding the space for carbon inclusion on the individual and community end.

### 1.2.3 Africa and Latin America

In Africa, the *Africa Carbon Markets Initiative (ACMI)* launched at COP27 in 2022 aims to bring Africa's voluntary-carbon-market trading volume to 300 million tonnes CO<sub>2</sub> by 2030, and expand by a further 150–250 million tonnes by 2050. The initiative enjoys support from multilateral financial institutions and regional bodies, and seeks to scale regenerative agriculture, afforestation, blue-carbon and renewables via standardised project certification, regional credit registries and local-climate funds. *ACMI* also promotes advanced financial instruments such as *Advance Market Commitments (AMC)* to provide early-stage cash-flow to small-scale developers. In East and West Africa the pathways diverge: East Africa (e.g., Kenya, Uganda, Tanzania) with relative political stability and strong green-power/forest potential tends to prioritise community-based forestry and agricultural-carbon-sink projects. Kenya's 2024-issued *Climate Change (Carbon Market) Regulations* mandate that land-based projects return 40% of revenues to communities and non-land-based projects 25%, and require community-development agreements to secure local benefit-sharing. West Africa (e.g., Nigeria, Ghana) relies more heavily on oil-&-gas and agricultural exports; policy emphasis is on attracting private capital and building carbon-credit export chains. Some states are partnering with international standards organisations and registries to establish national registries to draw overseas buyers and climate investment.

In Latin America, decarbonisation goals are also explicit. Costa Rica's 2019 national *decarbonisation plan* sets the 2050 net-zero target, and via carbon-neutral certification, green bonds and industrial support attracts capital for ecological restoration and low-carbon transition. Mexico and Chile are regional frontrunners in carbon pricing and forest-carbon mechanisms: Mexico launched an *ETS* pilot in 2020 covering power generation and heavy industry, establishing allowance allocation, compliance offsets and trading mechanisms; Chile, via joining the *Forest Carbon Partnership Facility (FCPF)* and developing a domestic carbon-footprint platform, promotes *REDD+* and community incentives. Brazil has promoted industry self-regulation (e.g., "carbon-neutral beef") combining satellite- and ground-verification to reduce livestock methane and deforestation. Colombia's voluntary-carbon-market has grown rapidly since 2016, and its *Green Growth Policy (20182030)* and 2022 National Climate Financing Strategy embed mechanisms to return part of carbon-market revenues to indigenous and rural communities, and via international partnerships promote large-scale *REDD+* programmes such as "REDD+ Vision 2030". Thus, the Latin-American model combines ecosystem protection, social inclusion and market-orientation.

In summary, across Africa and Latin America the policy and practice of carbon inclusion are gradually forming regional identities. While development stage and implementation depth vary, their shared objective is to reconcile economic growth and carbon-emission reduction, and engage enterprises, citizens and governments in climate action. Regionally speaking, Africa emphasises carbon-credit-driven economic development and treats climate governance as a new industrial and international-cooperation opportunity; Latin America centres on ecosystem protection and social equity, emphasising the synergy of forestry, agriculture and community-based decarbonisation.

2

# Carbon Inclusion Asset Trading Mechanism



## 2. Carbon Inclusion Asset Trading Mechanism

The Carbon Inclusion asset-trading mechanism is designed as a closed-loop system of “behaviour quantification - verification and rights issuance - value circulation”, converting the public’s everyday low-carbon choices into economic returns. It fills the gap left by traditional carbon-markets and offers a market-based pathway for all-participant attainment of “net-zero”. Currently this mechanism is primarily applied in five scenarios: Emissions-trading via exchanges, Carbon neutrality of large-scale events, Corporate-operational carbon neutrality, Product-carbon neutrality, Ecological restoration via “carbon-compensation”.

### 2.1 Emissions-Trading on Exchanges

Since 2023, the province of Hubei (pilot in Wuhan) initiated a carbon inclusion system. According to provincial and municipal ecology/environment authorities, verified carbon inclusion emission reductions reached 36,000 tonnes, primarily from distributed photovoltaics (88.5%), individual low-carbon behaviour (6.7%) and green shipping (4.8%). As of October 2025, two local regulated emitters cumulatively surrendered 9,609 tonnes of Carbon Inclusion reductions to offset their 2022/2023 emission-allowance shortfalls—marking the formal inclusion of carbon inclusion reductions into the quota offset mechanism in pilot carbon markets. In December 2024, Shushi Group purchased 2,000 tonnes of carbon inclusion reductions traced to new-energy-vehicle travel and individual rail-transport behaviour via the Kuaidian & Alipay platforms, to offset its 2023 allowance shortfall. This first-in-province transaction validated a closed-loop commercial model of “public emission reduction - platform aggregation - enterprise offset - market empowerment”, and provides a critical demonstration of sustainable operation and value-circulation of the carbon inclusion system.

In May 2025, the Forestry Carbon Inclusion Project (be affiliated with PHCER) in 11 villages of Potoutown, Lianping County, Heyuan City (Guangdong Province) was auctioned on the Guangzhou Emissions-Trading Centre Platform; Guangdong Energy Group Energy-Saving & Carbon-Reduction Co. Ltd. successfully bid CNY 1.7145 million, benefiting village collectives and villagers. The volume of forestry carbon-sink reductions was 47,350 tonnes. In June 2025 a similar PHCER project in five villages of Xichang Town, Dongyuan County was auctioned on the same platform; Guotai Haitong Securities Co., Ltd. won 43,474 tonnes at CNY 34 per tonne, providing approximate CNY 1.47 million income, each village obtaining CNY 100,000–500,000.

In August 2025, Sichuan YingGuTanHui & Renewable Resources Co., Ltd. completed the first waste-plastics recycling carbon inclusion trade (CDCER) on the Sichuan United Environment Exchange in Chengdu under the “Tianfu Carbon Credits” mechanism—marking a breakthrough in integrating resource-circularity and carbon inclusion. This transaction enabled conversion of recycling-industry “ecological value” into quantifiable “economic value”, explored a replicable path for resource-recovery firms to participate in carbon-market trading, and activated their intrinsic motivation for decarbonisation.

### 2.2 Large-Scale Events Carbon Neutrality

Carbon inclusion emission reductions were applied for the first time to large-scale event carbon-neutrality in 2025. To support the 9th Asian Winter Games Harbin 2025 achieving carbon-neutral status, the Harbin Ecology & Environment Bureau coordinated with the Games’ Executive Committee, several

peer cities, provincial ecology/forestry agencies to undertake inter-regional carbon inclusion credit-recognition and donation. On 3 January they held the "Regional Carbon Inclusion Donation & Recognition Symposium: Two Provinces-Four Regions for the Asian Winter" to advance mutual recognition and donation of carbon inclusion reductions. On 23 May 2025 the World Gas Conference 2025 (WGC2025) concluded in Beijing with 30,000+ participants from 70+ countries. As an authoritative institution engaged in comprehensive work in the "dual carbon" field in Beijing, the Beijing Energy Conservation and Environmental Protection Center has taken the lead in practicing the low-carbon concept. It has given full play to its role as an industrial link, actively conducted in-depth communication with the conference organizer, Capital Conference & Exhibition (Group) Co., Ltd., integrated multi-party resources with innovative thinking, and strived to build a full-process system of "pre-conference emission reduction, in-conference control, and post-conference neutralization". It has coordinated and solved multiple key and difficult issues such as mismatched data interfaces and cross-regional certification of emission reductions, and finally successfully promoted the conference to achieve the carbon neutrality goal. In the carbon accounting link, a professional technical team was involved in the preparation work in advance to carefully inventory the emissions generated from conference venue rental, equipment energy consumption, transportation, accommodation and catering of participants, including embodied carbon emissions of event supplies and emissions from waste disposal. The total carbon emissions of the conference were calculated at 4,544.76 tons of carbon dioxide equivalent, and an accounting report was formed, laying a data foundation for the precise implementation of carbon offset. In the carbon inclusion donation link, it took the lead in building a two-wheel drive mechanism of "professional accounting + targeted donation". By using the EV charging carbon emission reductions accumulated by NaaS Technology, the Carbon Inclusion Professional Committee of All-China Environmental Protection Federation completed the carbon neutrality evaluation and offset confirmation. Finally, the carbon neutrality of the conference was achieved through equivalent offset using the carbon inclusion emission reductions generated from the "2024 Beijing Green Life Season Platform - Kuaidian EV Charging Carbon Reduction Scenario".



Figure 2.1 Carbon neutral certificate of the 29th World Gas Conference

The "Zero Carbon Together" platform has helped the Wuhan Marathon (referred to as "Hanma") achieve the goal of a "zero-carbon event" for three consecutive years. As a Gold Label Event certified by World Athletics, Hanma has deeply integrated the low-carbon concept into all links of event operation,

transforming the sports gala into a green initiative involving all people through systematic low-carbon management. During the preparation and holding of the 2025 Hanma, the Event Organizing Committee not only used new energy vehicles and participant bags made of waste PET bottles, but also innovatively introduced L4-level pure electric driverless logistics vehicles for distributing supplies such as water and food, reducing the event's carbon footprint from multiple dimensions. Meanwhile, under the guidance of the Wuhan Municipal Bureau of Ecology and Environment, Hanma launched a campaign through the "Zero Carbon Together" platform, inviting runners and citizens to donate their personal carbon inclusion emission reductions to the event. These emission reductions come from citizens' daily low-carbon behaviors such as taking the subway, saving electricity, and classifying and recycling waste. With the public emission reductions collected by the "Zero Carbon Together" platform and the Chinese Certified Emission Reductions (CCER) donated by Wuhan Iron and Steel Co., Ltd., Hanma successfully completed carbon offsetting and achieved the goal of a "zero-carbon marathon" with multi-party participation.

On September 26, 2025, the Sponsorship and Donation Appreciation Ceremony for the Marketing and Development of the 12th World Games was held at the Tianfu Roadshow Art Center. With the joint support of 11 low-carbon energy enterprises, the Chengdu World Games became the first "Carbon-Neutral World Games". Among them, Chengdu Data Group, affiliated to Chengdu Industry Group, donated 6,000 tons of carbon emission reductions under the "Tianfu Carbon Credits" mechanism to the World Games Executive Committee. At the same time, a "Low-Carbon World Games" special zone was launched on the "Tianfu Carbon Credits" mini-program, inviting the public to participate in five major activities including collecting puzzle pieces of World Games venue posters and challenging World Games knowledge quizzes. The initiative encourages the public to donate carbon emission reductions through the "Tianfu Carbon Credits" platform and the "Diandian" Carbon Neutrality Service Platform to offset personal carbon footprints and achieve individual carbon neutrality. In addition, communities across Chengdu took environmental protection themed days as carriers, skillfully integrated World Games elements, and organized various and rich green and low-carbon activities. These activities effectively guided citizens, teachers and students to actively participate, rooted the lifestyle of civilized health, energy conservation and environmental protection in people's hearts, and gathered extensive social forces for building a green and low-carbon World Games.



Figure 2.2 Certificate of charity donation unit for the 12th World Games in 2025

### 2.3 Corporate-Operational Carbon Neutrality

Under the national dual-carbon strategy, China Unicom explored green-transformation of its offline service outlet and created its first carbon-neutral branch: Wuhan Zhongnan Road Service Hall. The 600 m<sup>2</sup> outlet adopted the “low-carbon operation + carbon offset” core logic and built a replicable zero-carbon-operation model. On the technical side: the air-conditioning system replaced with new eco-refrigerant plus AI smart-control (physical energy-saving rate 15%–35% without replacing the main unit); lighting systems were comprehensively upgraded to first-class energy-efficiency LED with presence and light sensors—60% energy savings and more than triple lamp lifetime; a direct-drink RO system replaced bottled-water equipment and first-class water-efficiency ,reducing water waste and secondary pollution at the source.

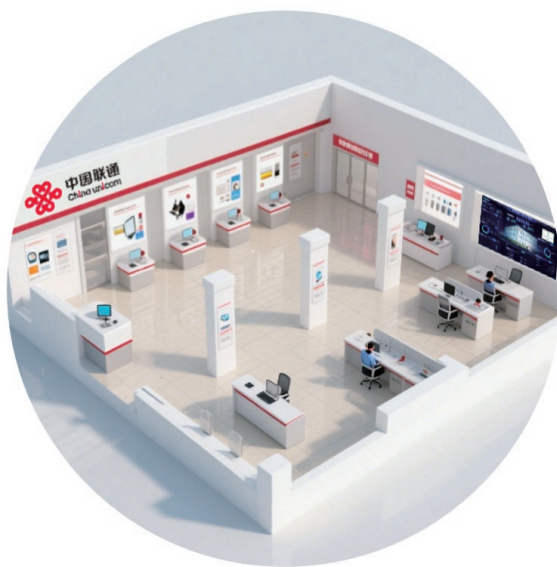


Figure 2.3 Schematic diagram of the carbon neutral transformation of China Unicom Wuhan Zhongnan Road Service Hall

On the carbon inclusion innovation side: by connecting to the “Zero Carbon Together” mini-programme, an employee-reduction-donation channel was established to encourage green commuting, paperless office, etc. Combined with recycling, low-carbon rest-areas and user-incentive campaigns, the ecosystem captured “enterprise-led + employee participation + user interaction”. For digital-enabling: MRV (monitoring-reporting-verification) carbon-dashboard screens were deployed to monitor real-time energy and emission data; carbon accounting and third-party verification enabled the purchase of provincial carbon allowances and carbon inclusion reductions to complete offsets and attain certification. Post-upgrade annual energy-saving rate reached 16.89%, annual electricity saved ~16,000 kWh, carbon reduced ~12.5 t CO<sub>2</sub>e, equivalent to planting 68 broad-leaf trees per year.



Figure 2.4 Carbon neutral certificate of China Unicom Wuhan Zhongnan Road Service Hall

On June 13, 2025, Suzhou WoCi Co., Ltd. (located in Jiangsu Province) purchased 1,000 tons of carbon emission reductions from the smart microgrid project of Xinyi PV (Suzhou) Co., Ltd. through Suzhou's "One-stop" Carbon Neutrality and Carbon Inclusion Service Center. This marks the first microgrid user transaction since the establishment of Suzhou's carbon inclusion system. The Xinyi PV microgrid project in Zhangjiagang was put into operation in early March this year. Its 41-megawatt distributed photovoltaic system generates over 180 million kilowatt-hours of electricity annually, equivalent to reducing carbon dioxide emissions by approximately 179,000 tons. Driven by State Grid Suzhou Power Supply Company, the enterprise converted its photovoltaic power generation into carbon assets and listed them for sale through the one-stop carbon neutrality and carbon inclusion service center, ultimately reaching a transaction with Suzhou WoCi Co., Ltd., which has a strong demand for carbon reduction. On July 16, 2025, Shandong Liaocheng Transportation Group relied on Suzhou's One-stop Carbon Neutrality and Carbon Inclusion Service Center, used the *Carbon Inclusion Methodology for Special-purpose Vehicle Charging Piles* to accurately quantify the low-carbon behaviors of its new energy buses, and verified 904 tons of carbon assets. Subsequently, on Suzhou's Carbon Neutrality and Carbon Inclusion Service Platform, it completed a transaction of 200 tons of carbon emission reductions with a local Shandong buyer, Heruide (Shandong) Intelligent Technology Co., Ltd.

In September 2025, Sifang Street Sub-branch, Mohan Sub-branch under Industrial and Commercial Bank of China (ICBC) Yunnan Branch (hereinafter referred to as "ICBC Yunnan Branch"), as well as the Business Office of Kunming Branch, successfully obtained carbon neutrality evaluation certificates issued by China Classification Society Quality Certification Company. As a key branch of the bank's first batch of carbon neutrality network construction, Pu'er Ning'er Sub-branch has completed the listing of "Carbon Neutrality Network". The greenhouse gas emissions and offset processes of the certified and listed bank branches during the operation stage comply with strict standards. From January 1 to December 31,

2024, the greenhouse gas emissions of ICBC Lijiang Sifang Street Sub-branch were 2.62 tons of carbon dioxide, and carbon neutrality was achieved through ICBC Yunnan Branch's purchase of 3 tons of carbon dioxide equivalent of "NingTanHui" (NCER). Similarly, ICBC Mohan Sub-branch and the Business Office of Kunming Branch offset 7.19 tons and 9.23 tons of carbon dioxide emissions respectively in the same way.



Figure 2.5 Ning'er Carbon Inclusion (NCER) carbon sink certification

## 2.4 Product Carbon Neutrality

In January 2025 the Suzhou Industrial Park Green Innovation Space Enterprise Management Co., Ltd. ordered 2.5 tonnes of “carbon-neutral” rice from Donglin Village, Taicang—this is the first “carbon-neutral rice” product launched nationwide by the Suzhou One-Stop Carbon-Neutral Inclusion Service Centre. By promoting this “carbon-neutral rice” product, Donglin Village successfully increased the added-value and competitiveness of its agricultural produce, thereby bringing higher economic returns to villagers—and raising public awareness of green low-carbon agriculture and more sustainable lifestyles.



Figure 2.6 “Carbon-Neutral Rice” certificate

In the exploration of promoting green transformation on the consumer side, the "Zero Carbon Together" platform has applied the carbon inclusion mechanism to the cultural and creative product field. It has conducted carbon footprint accounting and achieved carbon neutrality for all peripheral products of its official IP image "Dundun Duck" (including eco-friendly bags, dolls, stationery, etc.), creating a series of zero-carbon cultural and creative products. Based on the carbon footprint accounting of the products, this practice uses the emission reductions from platform users' low-carbon behaviors such as new energy vehicle charging via Kuaidian and Alipay Travel to offset the carbon emissions of these cultural and creative products. This initiative not only endows "Dundun Duck" peripherals with solid green connotations, but also builds a closed-loop model of "public emission reduction - platform aggregation - product neutralization - value transmission", directly linking individuals' scattered low-carbon behaviors with the carbon neutrality process of specific products for the first time. The case provides a replicable path for the consumer goods industry to drive green supply chain construction and shape a brand's environmental image through the carbon inclusion mechanism.



Figure 2.7 "Dundun Duck" doll and its product carbon footprint

## 2.5 "Carbon Compensation" to Support Ecological Restoration

Hubei Province has taken the lead nationwide in exploring the "carbon compensation" mechanism, promoting the use of carbon inclusion emission reductions for alternative restoration of ecological and environmental damage compensation. This provides an innovative practice for building a diversified path to fulfill ecological responsibilities. As of October 2025, two typical cases have been implemented in the province, with a total absorption of 180 tons of carbon inclusion emission reductions, involving a total compensation fund of 12,597 yuan. The first case was the air pollution incident at Luojia Mountain Gas Station in September 2023. The compensator purchased 80 tons of personal emission reductions collected by the Alipay platform for 4,604 yuan to make up for the atmospheric environmental damage caused by its actions. The second case was a water and soil pollution incident caused by illegal discharge of garbage waste liquid by an urban operation company in April 2025. Based on the identification and evaluation results of ecological and environmental damage, the obligor fulfilled the restoration responsibility through the "carbon inclusion emission reduction compensation" method, subscribed to carbon inclusion emission reductions worth no less than 7,993 yuan, and entrusted Hubei China Carbon Asset Management Co., Ltd. to complete the cancellation to ensure the authenticity and traceability of environmental benefits.

Innovatively, this case directed the compensation funds to subscribe to the emission reductions accumulated by Wuhan citizens on the "Zero Carbon Together" mini-program, achieving the dual goals of "damage compensation" and "public incentive". The "carbon compensation" mechanism expands ecological restoration from the traditional "government-led" model to "national co-governance", providing a low-cost and efficient alternative restoration path for small and medium-sized environmental damage cases. It also injects sustainable social momentum into the carbon inclusion system, marking an important breakthrough in the collaborative innovation of ecological justice and the carbon inclusion mechanism.

In July 2025, with the joint promotion of the Shanghai Qingpu District Bureau of Ecology and Environment and the Qingpu District People's Procuratorate, an enterprise in the district penalized for illegal emission of waste gas successfully purchased the Shanghai Greenhouse Gas Voluntary Emission Reduction Trading Product (SHCERCIR2) on the Shanghai Environment and Energy Exchange Platform for ecological and environmental damage compensation. This is also Shanghai's first transaction using the purchase of Category II carbon inclusion emission reductions to replace ecological restoration. The case originated from the Qingpu District People's Procuratorate discovering that an enterprise illegally discharged atmospheric pollutants during the performance of public interest litigation duties at the end of 2024. With the supervision and support of the procuratorial organ, the Qingpu District Bureau of Ecology and Environment reached an ecological and environmental damage compensation agreement with the involved enterprise. After judicial confirmation by the court, the enterprise was required to bear more than 160,000 yuan in environmental restoration costs. After professional evaluation by the Shanghai Academy of Environmental Sciences, the enterprise ultimately purchased a total of 2,372 tons of Category I and Category II carbon inclusion emission reductions through the Shanghai Carbon Emission Trading Platform, including photovoltaic power generation and pure electric passenger car emission reduction scenario projects, and completed the cancellation of emission reductions on the Shanghai Carbon Inclusion Management Platform to fulfill the alternative restoration responsibility.

In September 2025, Qinshan Nuclear Power under China National Nuclear Power Co., Ltd., in conjunction with local environmental protection departments, promoted the formal signing of a carbon inclusion verified emission reduction trading agreement between Zhejiang Zero-Carbon Heating Co., Ltd. and a company in Haiyan. Zero-Carbon Heating Co., Ltd. transferred 104 tons of verified carbon dioxide emission reductions to the Haiyan-based company, which will be used for ecological and environmental damage compensation. This transaction is not only the first exploration by Qinshan Nuclear Power and local governments to replace ecological and environmental damage compensation with carbon inclusion verified emission reductions, but also marks the official landing of the first carbon inclusion verified emission reduction transaction in the nuclear heating field. It sets an industry benchmark for the conversion of emission reduction value in nuclear heating and has a far-reaching impact on the improvement of the carbon inclusion market ecology and the upgrading of the nuclear heating industry.

In October 2025, with the active planning and promotion of the Shanwei Municipal Bureau of Ecology and Environment and its Lufeng Sub-bureau, a livestock breeding company in Lufeng penalized for excessive odor concentration subscribed to 250 tons of carbon emission reductions (PHCER) through the Guangdong Carbon Inclusion Innovation and Development Center. These emission reductions will be used to offset the carbon emissions of the Shanwei Division of the 15th National Games, thereby fulfilling the ecological and environmental damage compensation responsibility. This is also Shanwei's first innovative practice of purchasing carbon inclusion emission reductions to replace traditional ecological restoration, pioneering an innovative path for carbon neutrality of major events to assist ecological and environmental governance.

3

# Analysis of Public Participation in Carbon Inclusion Mechanisms



### 3. Analysis of Public Participation in Carbon Inclusion Mechanisms

This year's white paper will conduct an analysis from three dimensions: public awareness of carbon inclusion mechanisms, public participation in carbon inclusion scenarios, and rights and interests redemption on carbon inclusion platforms.

#### 3.1 Research and Analysis on Public Awareness of Carbon Inclusion

To fully investigate and analyze the public's willingness and forms of participating in carbon inclusion activities, a broader and more segmented survey was conducted this year. Carbon inclusion awareness statistics were collected targeting different user groups, mainly including carbon inclusion platform users, Internet scenario-based enterprise users, employees of large enterprises, and college student groups. A total of 2,631 valid questionnaires were collected in this survey: 1,068 from carbon inclusion platform users (hereinafter referred to as platform users), 722 from employees of large enterprises (hereinafter referred to as enterprise employees), 565 from scenario-based enterprise users (hereinafter referred to as scenario users), and 276 from college student groups. On the basis of retaining the main questions from last year, additional questions were added, covering regional research, personal data security, and specific suggestions.<sup>[1]</sup>

In the survey on "participants' living regions", scenario users were mainly surveyed through online questionnaires. The results show that 38.11% of users are from East China, 23.4% from North China, 12.45% from Central China, 9.81% and 9.43% from South China and Southwest China respectively, while users from Northeast China and Northwest China account for only 5.28% and 1.51%. This result also reflects that factors such as policies, population, economy, environment, and the development level of urban infrastructure determine the extent of users' participation in carbon inclusion activities. East China, which has the largest proportion, leads in carbon inclusion policies, methodology development, platform construction, population, and economy.

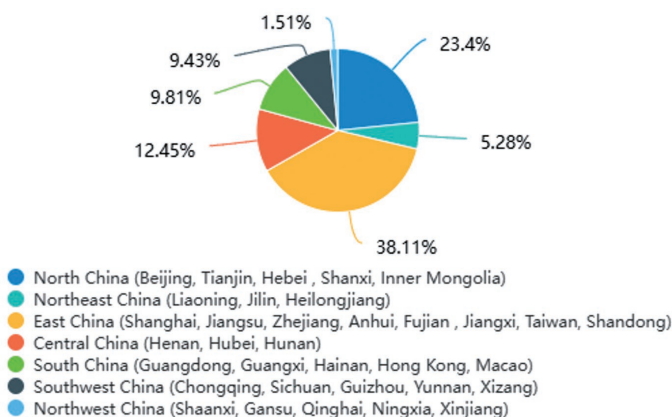


Figure 3.1 Statistics on the distribution of living regions of survey participants

In the survey statistics on "public participation age", the results of scenario users and enterprise

[1]Considering that this questionnaire survey was conducted online, the survey results may have certain deviations from the actual results.

employees are similar, with users aged 31-45 as the main group, accounting for about 56%. Users aged 46-60 and 18-30 account for 25% and 18% respectively. The proportion of users under 18 and over 60 is very small. Among platform users, the 18-30 age group has the largest proportion at 44.66%. Overall, the popularization of carbon inclusion concepts and the promotion of related activities still need to be strengthened among the public under 18 and over 60.

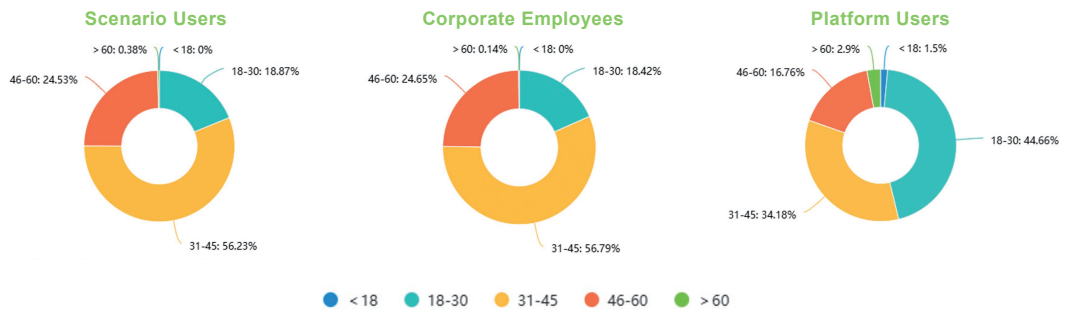


Figure 3.2 Statistics on the age distribution of survey participants

In the statistics on "gender of public participants", there are significant data differences among different public groups. Among scenario users, male users account for as high as 91.7%, while female users only account for 7.17%. Among platform users, male users account for 39.61%, which is much lower than 59.74% of female users. In the statistics of enterprise employees, male users account for 67.04%, higher than 32.69% of female users, while among college student groups, male students account for 40.79% and female students account for 56.58%. From the statistical results, scenario-based user groups are more inclined to males. In addition, the proportion of users of other genders exceeds 0% for the first time this year.

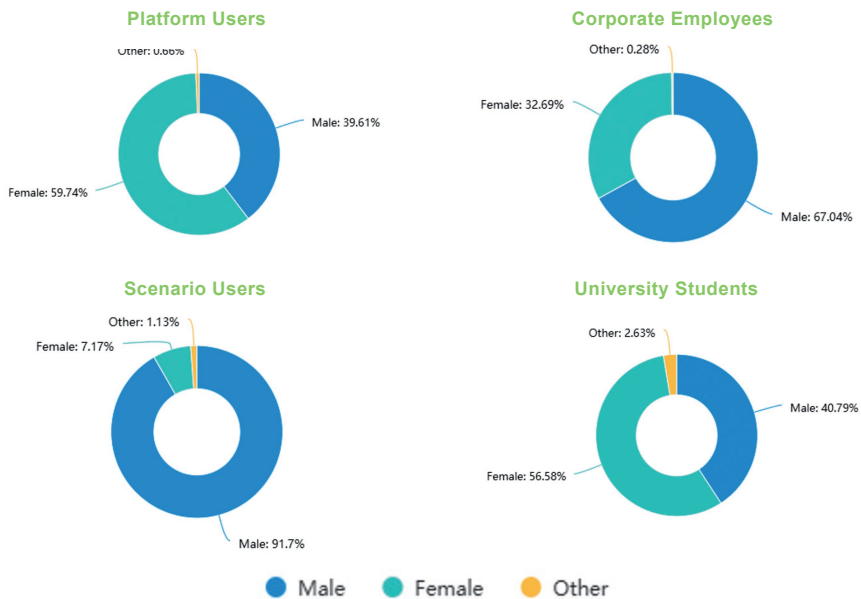
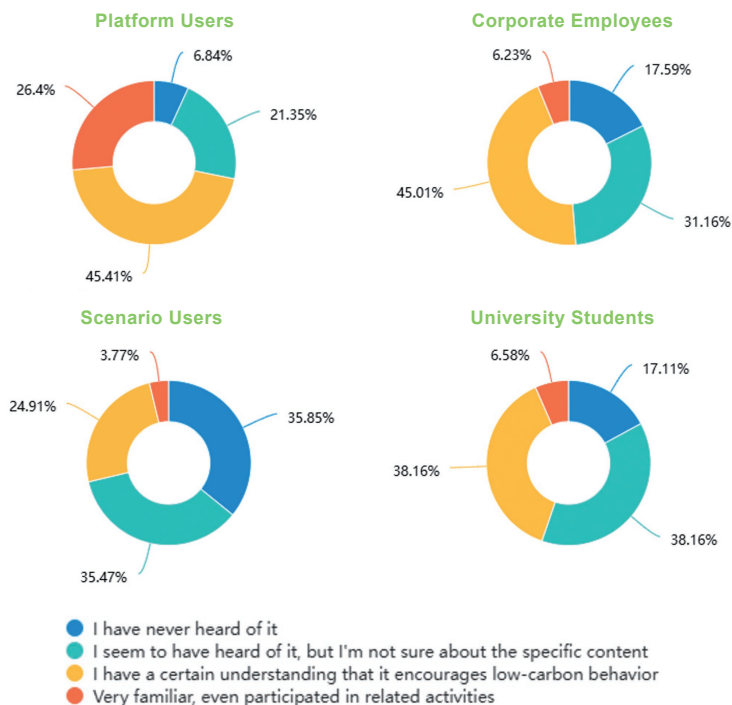


Figure 3.3 Statistics on the gender distribution of survey participants

In the question "Have you heard of the concept of 'carbon inclusion' or participated in carbon inclusion activities?", the options were refined in this year's survey. Among platform users, 92.16% have awareness and understanding of carbon inclusion, and some have even directly participated in related activities, while only 6.84% have never heard of it. Among enterprise employees, the proportion of users who have never heard of the carbon inclusion concept rises to 17.59%. For scenario users, the proportion of those who have never heard of it reaches 35.85%, and only 3.77% are very familiar with it or have participated in related activities. Among college student groups, the cumulative proportion of users who have an understanding of carbon inclusion or have participated in relevant activities is 82.89%.



**Figure 3.4 Statistical results on whether respondents have heard of the "carbon inclusion" concept or participated in carbon inclusion activities**

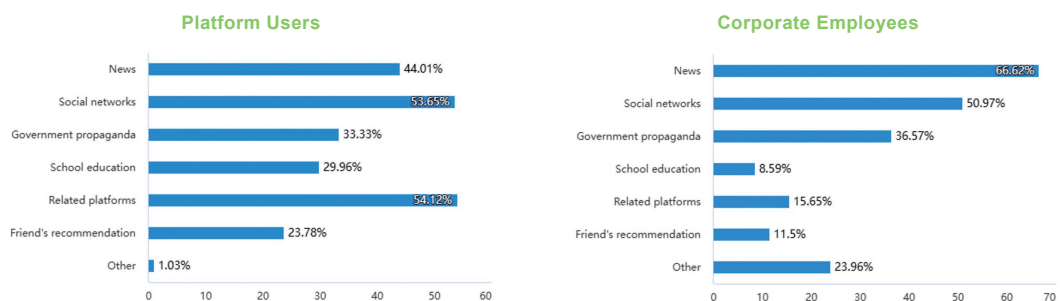
In the question "Through which channels have you participated in carbon inclusion activities?", 92.88% of platform users have participated via WeChat Mini Programs. This is mainly because the vast majority of government-led carbon inclusion platforms in China currently exist in the form of WeChat Mini Programs. Among enterprise employees, 37.67% have participated through WeChat Mini Programs, while the proportion of users who have never participated is 39.89%. For scenario users, 37.67% and 32.45% have participated via WeChat Mini Programs and Apps respectively, with the proportion of non-participants as high as 47.17%. Among college student groups, 59.21% have never participated in carbon inclusion activities. Compared with the statistical results of the previous question, it indicates that a large proportion of users who have heard of the carbon inclusion concept have not yet participated in relevant activities. Alternatively, some of these people may have actually engaged in qualifying behaviors (such as shared bike rides, new energy vehicle charging, or ordering takeout without disposable tableware) but selected

"never participated" due to insufficient understanding of carbon inclusion. This also shows that more efforts are needed to enhance public awareness of carbon inclusion, especially to popularize participation channels and scenarios among the public.



Figure 3.5 Statistical results on channels for participating in carbon inclusion activities<sup>[2]</sup>

In the question "Through which channels did you learn about carbon inclusion?", the top two channels for platform users are related carbon inclusion platforms and social networks, accounting for 54.14% and 53.65% respectively. For enterprise employees, news has the highest proportion at 66.62%. Among scenario users, the top two channels are social networks (41.8%) and news (40%), both below 50%, while only 15.65% learned about carbon inclusion through corporate carbon accounts. For college student groups, social networks rank first with 63.16%, and school education accounts for 35.53%. The data indicates that social networks are currently the most effective promotion channel. News has also played a positive role in promoting carbon inclusion. Governments, enterprises, and schools still need to strengthen the promotion and popularization of carbon inclusion.



[2] This is a multiple-choice question. The percentage of each option = Number of times the option was selected ÷ Number of valid questionnaires.

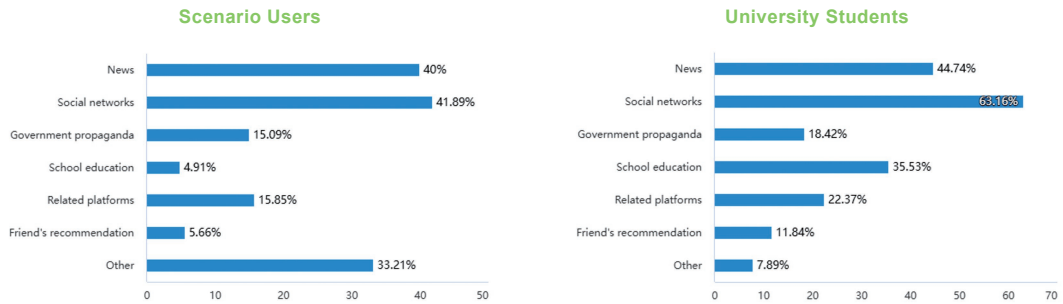


Figure 3.6 Statistical results on channels for learning about carbon inclusion<sup>[3]</sup>

In the survey on the question "How difficult is it to participate in current carbon inclusion platforms/activities?", the average proportion of respondents who considered it easy was 38.65%, those who thought it was moderately difficult accounted for 55.06%, and only 6.29% found it relatively difficult. The proportions of respondents who viewed participation as easy or moderately difficult have increased compared with last year, while the proportion of those who found it relatively difficult has dropped significantly from nearly 20% last year. Overall, the public participation experience of carbon inclusion platforms and activities has been continuously improving, and the participation threshold has been gradually lowered. It is expected that various carbon inclusion platforms and enterprises will further optimize public participation methods and experiences in the future, encouraging more people to practice the concept of carbon inclusion.

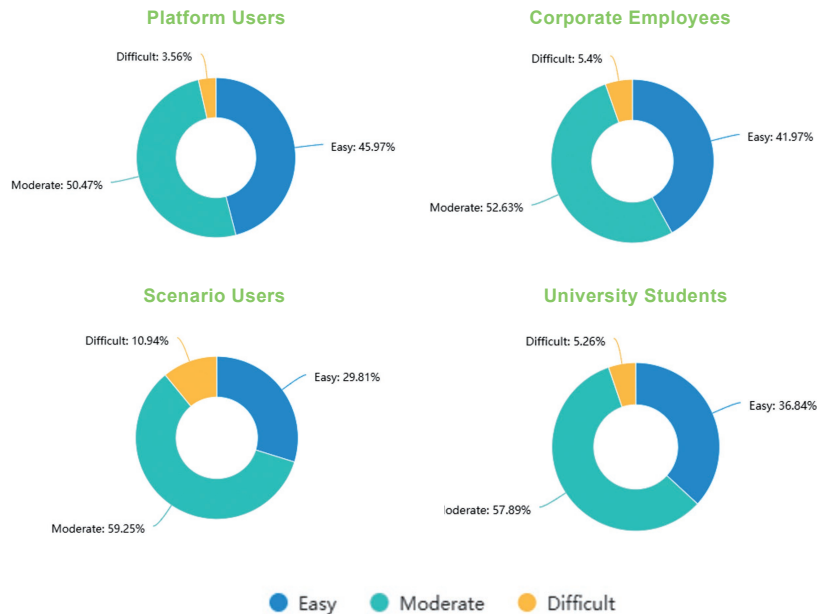


Figure 3.7 Statistical results on the perceived difficulty of participating in current carbon inclusion platforms/activities

[3] This is a multiple-choice question. The percentage of each option = Number of times the option was selected ÷ Number of valid questionnaires.

In the survey on "which carbon inclusion scenarios have you participated in?", the results are basically consistent with those of last year. Among all surveyed user groups, green travel remains the most participated scenario, accounting for approximately 90%. Green travel is still the most convenient and direct way to participate in carbon inclusion. Notably, the proportion of participation in carbon inclusion scenarios under the green life has increased to a certain extent compared with last year's statistics, which also reflects the strengthening of the public's awareness of green lifestyles.

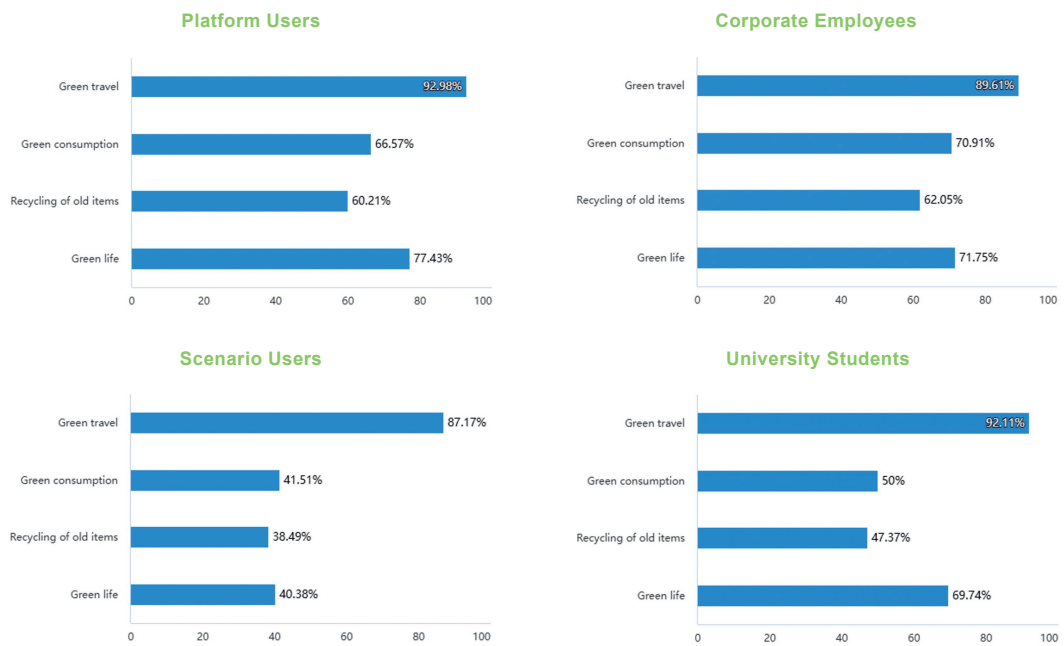
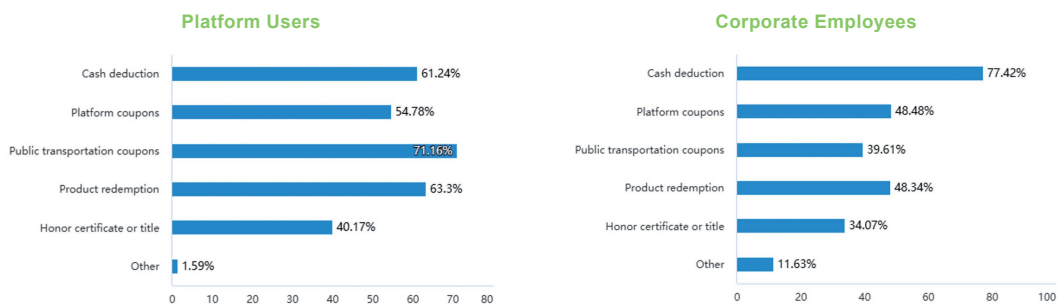


Figure 3.8 Statistical results on participated carbon inclusion scenarios<sup>[4]</sup>

In the question "What rewards do you hope to obtain through carbon inclusion?", 71.6% of platform users chose public transportation coupons, making it the most popular option. For the other three user groups, cash deductions were the top choice, with a proportion exceeding 80%. This indicates that most members of the public prefer more direct and easy-to-use incentive values. It also indirectly reflects that users hope carbon inclusion platforms will offer a wider variety and more diverse incentive measures.



[4] This is a multiple-choice question. The percentage of each option = Number of times the option was selected ÷ Number of valid questionnaires.

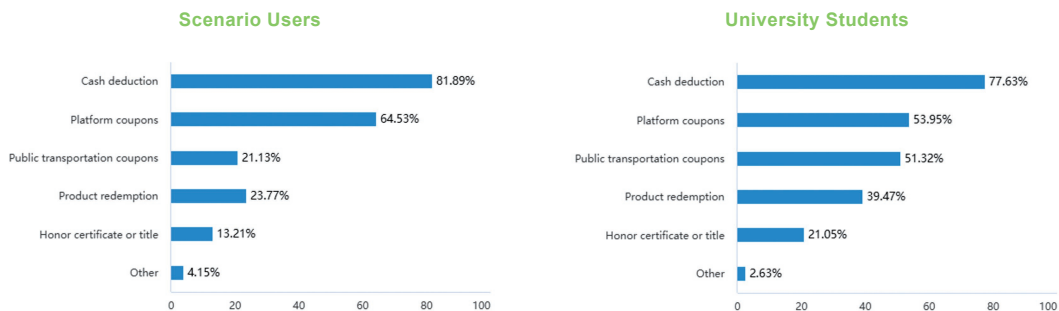


Figure 3.9 Statistical results on desired rewards through carbon inclusion<sup>[5]</sup>

In the question "What value should 1kg of carbon inclusion emission reduction correspond to?", 67% of users believed it should exceed 0.1 RMB last year. However, this proportion has decreased this year: the highest is 52.45% among scenario users, and the lowest is 14.47% among college student groups. Overall, the proportion of users who think the value should be between 0.01 RMB and 0.06 RMB is relatively high. This indicates that the public is becoming more rational about the carbon inclusion pricing mechanism, especially among college student groups. Currently, the price of 1kg of carbon emission reduction in the national carbon market is about 0.05 RMB, a significant drop from 0.09 RMB last year. It is hoped that the price of carbon inclusion emission reduction will align with that of the national carbon market in the future and become an effective supplement to the national carbon market and CCER (China Certified Emission Reduction).

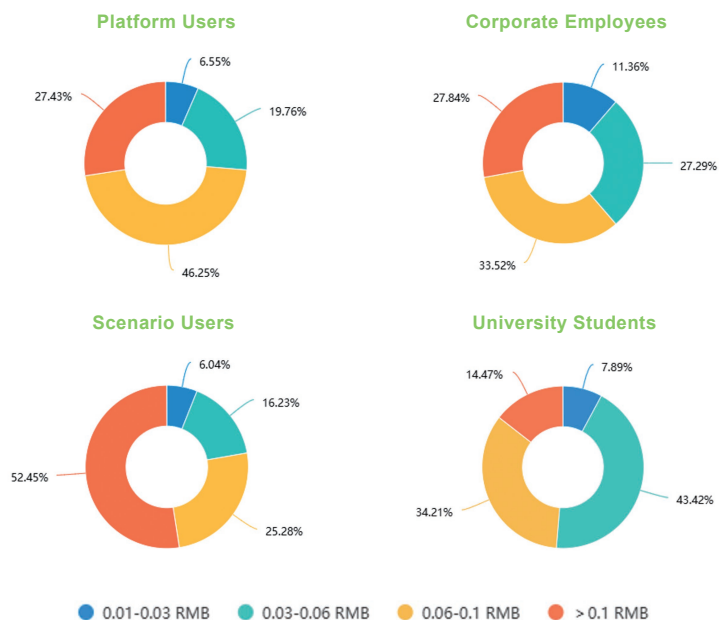
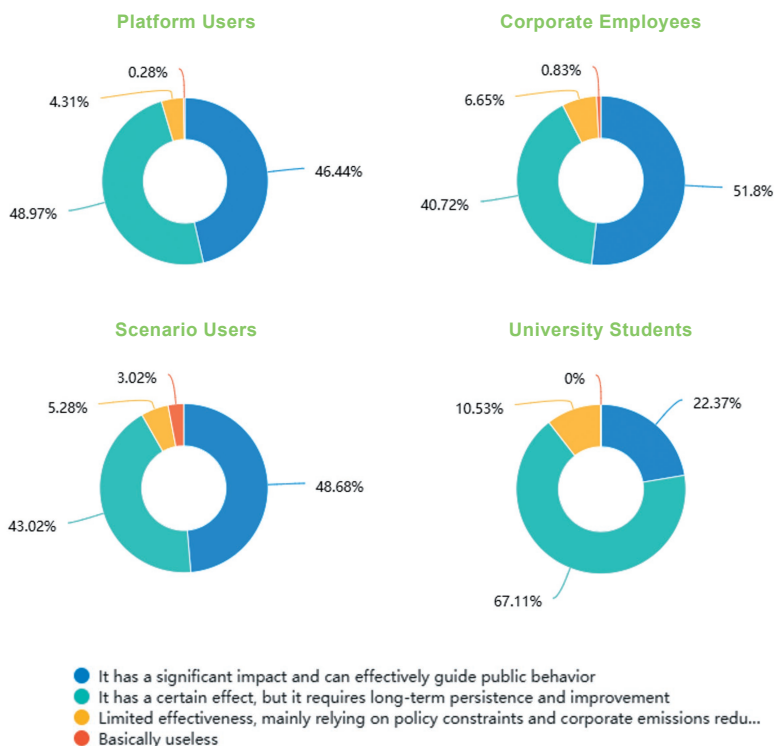


Figure 3.10 Statistical results on the perceived value corresponding to 1kg of carbon inclusion emission reduction

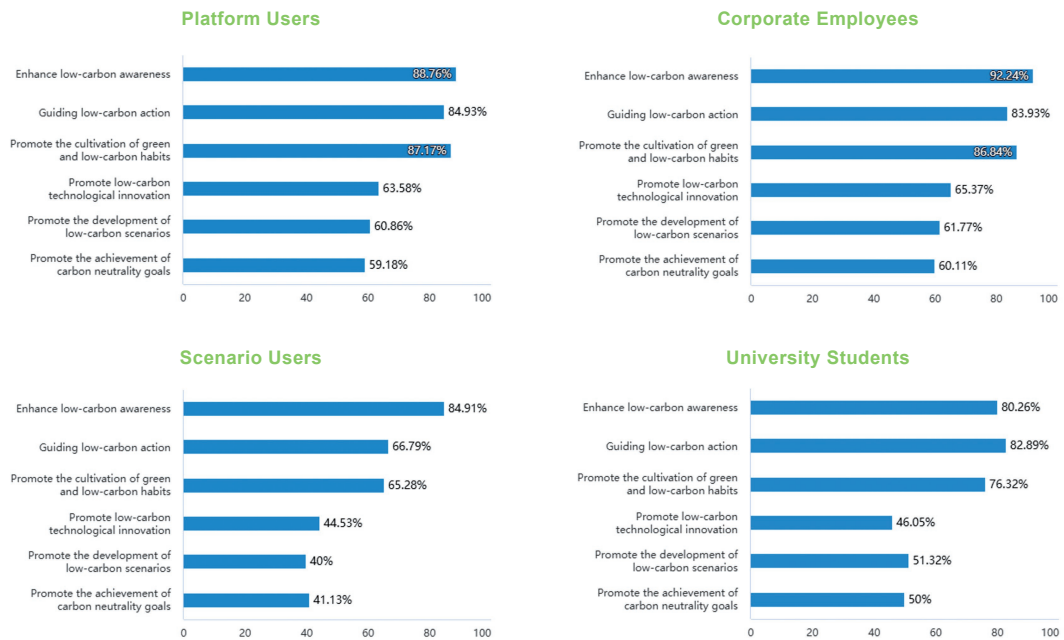
[5] This is a multiple-choice question. The percentage of each option = Number of times the option was selected ÷ Number of valid questionnaires.

In the question "To what extent do you think the implementation of the carbon inclusion mechanism contributes to promoting overall social energy conservation and emission reduction?", nearly 90% or more of respondents across all user groups believe it can promote overall social energy conservation and emission reduction. At the same time, a high proportion of respondents chose the option "It has a certain effect, but it requires long-term persistence and improvement". This indicates that the public believes the development of the carbon inclusion mechanism still has a long way to go, requiring sustained efforts from all participating parties including the government, platforms, enterprises, and the public.



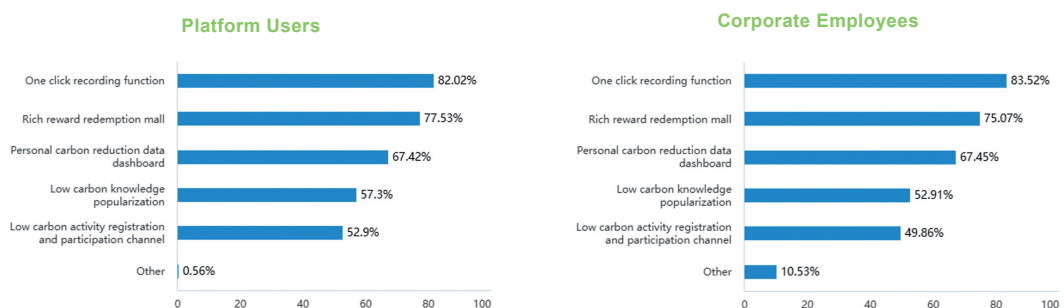
**Figure 3.11 Statistical results on the perceived effectiveness of the carbon inclusion mechanism in promoting overall social energy conservation and emission reduction**

In the question "In which aspects do you think carbon inclusion mainly plays a role in enhancing individual and social low-carbon awareness and actions?", the survey data is basically consistent with last year. The top three options are enhancing low-carbon awareness, guiding low-carbon actions, and promoting the cultivation of green and low-carbon habits. The data for the three options—promoting low-carbon technological innovation, promoting the development of low-carbon scenarios, and promoting the achievement of carbon neutrality goals—have all increased compared with last year. Especially among platform users, thanks to continuous publicity, education and regular carbon inclusion activities, the proportions of these three options have risen by about 10%. This fully indicates that carbon inclusion has made positive progress over the past year, with growing public recognition.

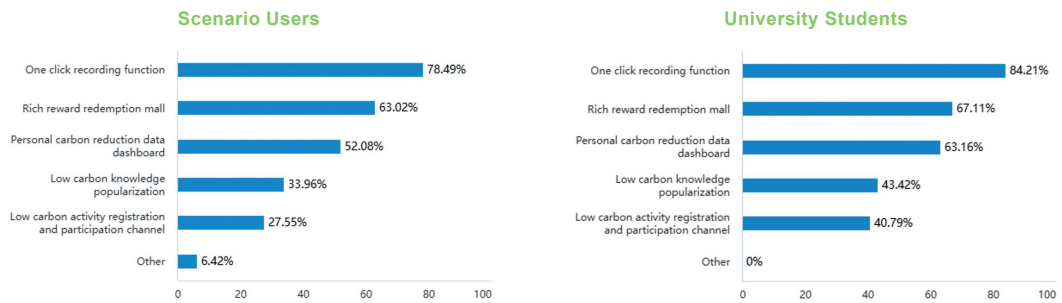


**Figure 3.12** Statistical results on the main roles of carbon inclusion in enhancing individual and social low-carbon awareness and actions<sup>[6]</sup>

In the question "What functions or services do you most hope Carbon Inclusion platforms or corporate carbon accounts can provide?", the expectations of all surveyed user groups tend to be consistent. Ranked from highest to lowest, they are: convenient one-click recording functions (such as connecting step counts and public transport payments); a rich reward redemption mall; a personal carbon emission reduction data dashboard and achievement system; low-carbon knowledge popularization and community interaction functions; and registration channels for low-carbon activities. This indicates that the public prefers more convenient ways to participate in Carbon Inclusion behaviors. While providing sufficiently rich incentive measures, Carbon Inclusion platforms and corporate carbon accounts should also consider continuous optimization and iteration of their product terminals to lower the public participation threshold and form a positive closed-loop incentive mechanism.

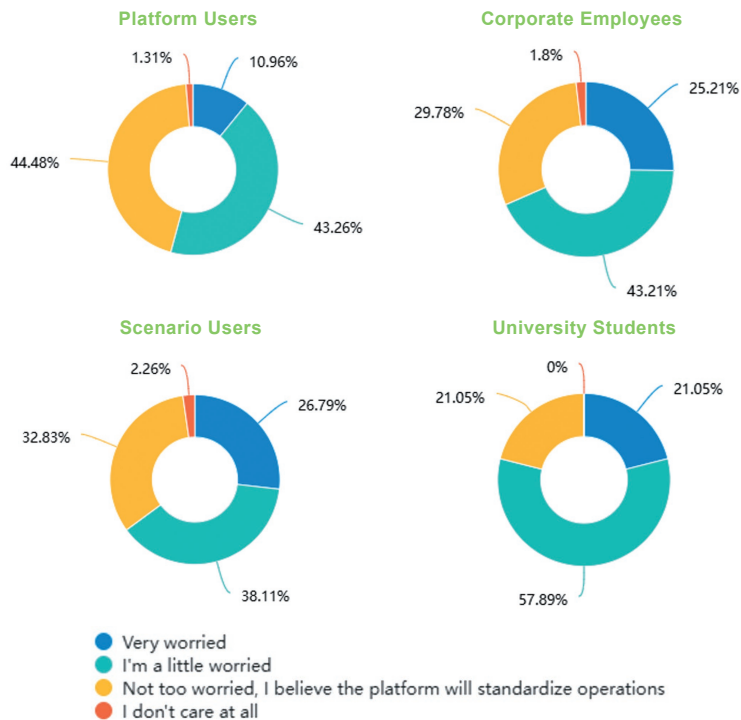


[6] This is a multiple-choice question. The percentage of each option = Number of times the option was selected ÷ Number of valid questionnaires.



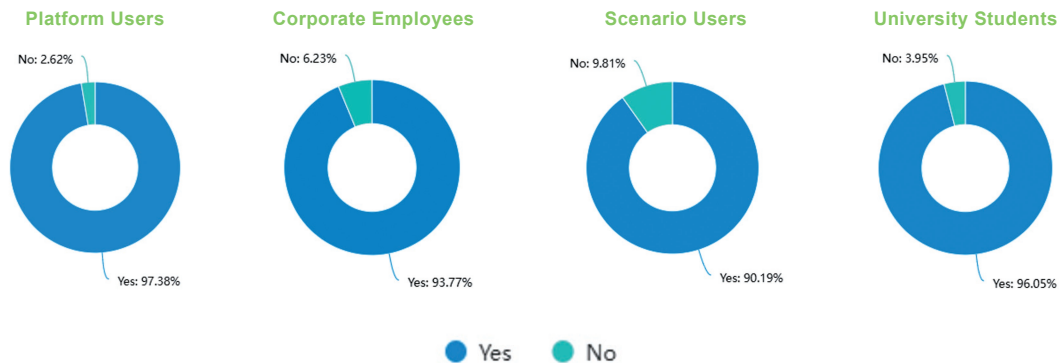
**Figure 3.13 Statistical results on desired functions or services from carbon inclusion platforms or corporate carbon accounts**

In the survey on the question "Are you worried about personal privacy and data security when participating in carbon inclusion?", most users still have concerns. The proportion of users who chose "I don't care at all" is extremely low—this figure is 0% among college student groups in particular. This indicates that the younger generation pays more attention to data privacy protection and security. It is hoped that both carbon inclusion platforms, corporate carbon account systems, and organizers of relevant carbon inclusion activities will strengthen the management of users' privacy and data security, ensure the platforms' compliance with laws and regulations, strictly prevent data leakage, and allow the public to participate in carbon inclusion practices with confidence.



**Figure 3.14 Statistical results on concerns about personal privacy and data security when participating in carbon inclusion**

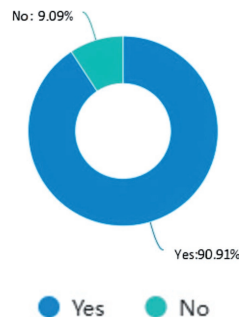
In the question "Would you recommend others to participate in carbon inclusion activities?", 97.38% of platform users chose "Yes", while only 2.62% chose "No". This reflects that the vast majority of platform users have recognized the positive impacts of green and low-carbon behaviors on themselves through participating in carbon inclusion, and are willing to engage in and promote carbon inclusion concepts and activities. Among other user groups, the proportion of those willing to recommend also exceeds 90%. This indicates that the concept of carbon inclusion has gradually become a broad consensus for the whole people to practice a green lifestyle.



**Figure 3.15** Statistical results on willingness to recommend others to participate in carbon inclusion activities

In the survey, a special question "Is it necessary to develop carbon inclusion platforms targeting student groups?" was set for college students. Among them, 90.91% of students believed it was necessary.

This indicates that due to the relatively closed environment where young students currently live, their access to carbon inclusion scenarios is limited. In the future, it is hoped that all carbon inclusion platforms and scenario-related enterprises will conduct sufficient research on young student groups to meet the specific usage needs of this group for carbon inclusion.



**Figure 3.16** Statistical results on the necessity of developing carbon inclusion platforms targeting student groups

In response to the question "What suggestions do you have to better encourage the whole people to participate in carbon inclusion and practice a green lifestyle?", public opinions were collected centrally.



of participants in scenarios such as new energy vehicle charging, online car-hailing, and ride-sharing has doubled compared to 2024, fully demonstrating the significant guiding effect in promoting short-distance travel and new energy transportation among citizens.

#### ● **Diversified Cooperation Expands Coverage, Active Participation in Daily Life Scenarios**

Low-carbon communities are the second most popular category for low-carbon participation, accounting for 25% of the total participation in low-carbon scenarios. Among them, the innovative "Internet + garbage classification" model shows distinct characteristics. "Tianfu Carbon Credits" has collaborated with 6 local garbage classification and recycling enterprises, including LvGangHuanzi, GuoXinZhichuang, TanShiGuang, and YinGuTanHui, realizing real-time point synchronization. There are over 600 offline garbage classification and recycling points, covering all 23 districts (cities) and counties in Chengdu. Meanwhile, various convenient scenarios such as bulky waste recycling, trade-in, and used item recycling have been built, echoing Chengdu's ongoing garbage classification policy. In 2025, the number of participants in offline garbage recycling low-carbon scenarios increased by 130% year-on-year, effectively helping citizens form garbage classification awareness and enhance their willingness to act. In addition, online interactive scenarios such as "Clear Your Plate Campaign" and garbage classification games account for over 90% of participation in low-carbon communities. Highly interactive and easy-to-operate scenarios like "garbage classification games" and "Clear Your Plate Campaign" have attracted active user participation, demonstrating the effectiveness and appeal of combining behavioral guidance with interesting design.

#### ● **Effective Integration of Chengdu's Characteristic Culture and Scenarios, Continuously Expanding the Connotation of Low-Carbon**

"Tianfu Carbon Credits" integrates low-carbon behaviors with Chengdu's culture to create multiple characteristic scenarios. The "Urban Culture Exhibition" scenario combines green concepts with Chengdu's distinctive elements such as ancient Shu civilization, the Three Kingdoms period, giant pandas, Sichuan cuisine, and Sichuan wine. The number of participants in this scenario increased by 15.6% year-on-year, showing that highly interactive cultural and educational scenarios have strong appeal to users. The low-carbon reading and children's book sharing scenario, co-built with Chengdu Library, takes the lead in transforming the concept of "national reading" into "national low-carbon reading". Due to the relatively high participation threshold, "Tianfu Carbon Credits" has carried out offline promotion activities based on the original scenario to accurately guide the reading group to participate. In addition, low-carbon leisure scenarios such as Tianfu Greenway and "watching snow-capped mountains" fully utilize the city's geographical resources, highly aligning with Chengdu's development positioning as a "park city", further enhancing brand influence and strengthening brand positioning.

#### ● **Growth in Low-Carbon Government Services and Consumption Scenarios, Government-Enterprise Collaboration Promotes Prosperity**

"Tianfu Carbon Credits" has gradually formed a low-carbon governance pattern connecting the government, enterprises, social organizations, and citizens. Through in-depth connection and data intercommunication with enterprises and institutions such as Alipay and Chengdu Municipal Bureau of Government Offices Administration, low-carbon government services have achieved a year-on-year growth of 34%, reflecting the increasing demand of citizens for low-carbon government service scenarios. The newly launched "Enterprise Carbon Circle" section in 2025 has first attracted Shui Jing Fang to join. Users of Shui Jing Fang's "Neighbor Program" can synchronize historical points, make exclusive redemptions, and check the low-carbon results of the special zone. This combines low-carbon actions with enterprise guidance and precise incentives, realizing co-construction and mutual benefit among the

platform, enterprises, and users. Offline low-carbon consumption scenarios have shown significant growth, with the number of participants increasing by 127% year-on-year, reflecting the continuous improvement of Chengdu citizens' low-carbon awareness. This achievement is attributed to the sound ecology of multi-party collaboration and promotion: on the one hand, the platform has received strong support from internationally renowned catering groups such as McDonald's and Yum China, whose extensive offline store networks provide a rich physical foundation for the activities; on the other hand, the active promotion and implementation support from all districts (cities) and counties in Chengdu have effectively expanded the coverage and influence of the activities.

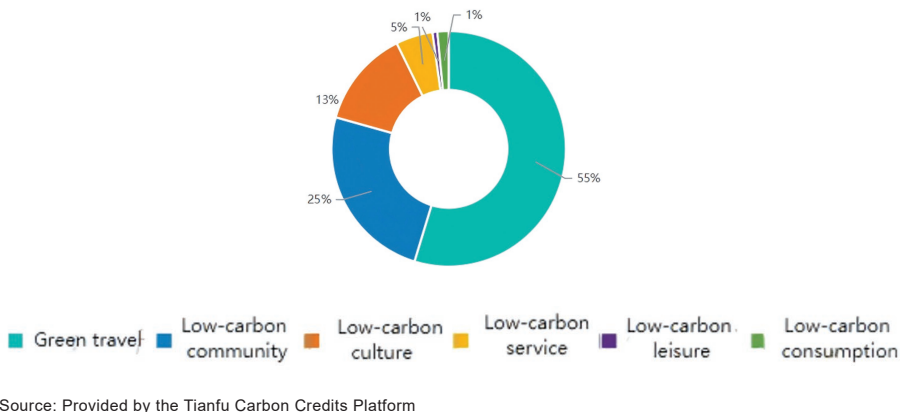


Figure 3.18 Proportion of participation in carbon inclusion scenarios on the Tianfu Carbon Credits Platform

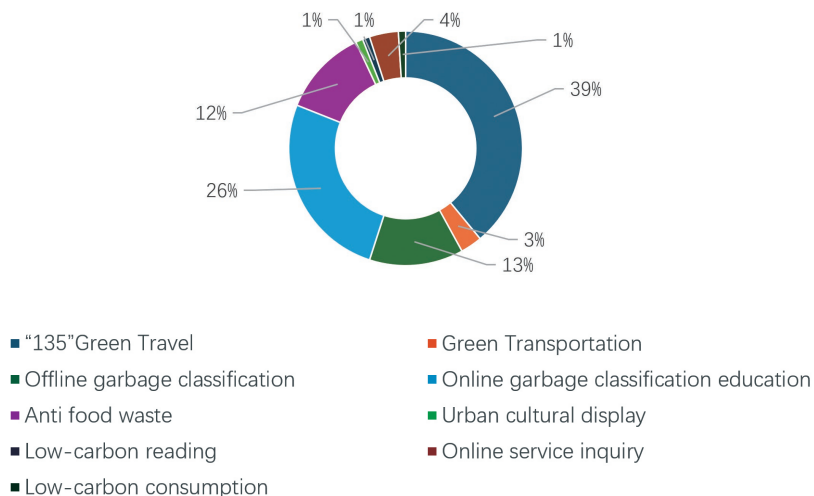


Figure 3.19 Proportion of participation in sub-scenarios of carbon inclusion on the Tianfu Carbon Credits Platform

The data from the Wuhan "Zero Carbon Together" Platform is equally impressive. As of October 2025, by connecting with 22 high-frequency social applications, the platform has achieved remarkable results in guiding public participation and popularizing low-carbon lifestyle concepts, demonstrating distinct structural characteristics.

#### ● **High-Frequency and Necessary Scenarios Lead Public Participation, with Outstanding Share in Transportation**

In terms of the proportion of emission reduction times, high-frequency and necessary scenarios serve as the core entry points for public participation in low-carbon actions, particularly concentrated in transportation. Subway ranks first with a 50.48% share of emission reduction times, becoming the most popular scenario on the platform. As the mainstream daily commute method for Wuhan citizens, the metro is connected to 4 high-frequency payment platforms including Alipay, WeChat Pay, China UnionPay QuickPass, and China Merchants Bank. Users can automatically record emission reductions (78.4g per kilometer) without additional operations, and the extremely low participation threshold drives high-frequency engagement. New energy vehicle (NEV) travel (14.58%), Cycling (9.16%), and Bus travel (7.83%) rank second to fourth in terms of times proportion, with the four transportation scenarios accounting for a total of 82.05%. This data indicates that by connecting with mainstream transportation platforms such as Didi and Meituan Bikes, carbon inclusion accurately targets the public's "travel needs", integrates low-carbon incentives into daily travel decisions, and effectively promotes the popularization of green travel methods.

#### ● **High Emission Reduction Efficiency Scenarios Contribute Core Emission Reductions, with Significant Potential in Energy-Related Scenarios**

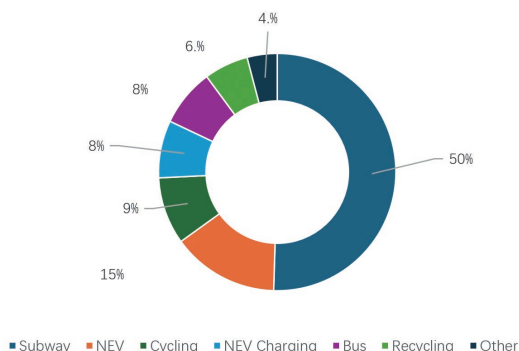
In terms of the proportion of emission reduction volume, scenarios with high unit emission reduction volume, although with lower participation frequency, have become key forces in the platform's emission reduction contributions, especially showing great potential in the field of energy consumption. The NEV charging scenario ranks first with a 25.39% share of emission reduction volume, far exceeding its 7.83% share of times. Launched in 2024, this scenario has a relatively short operation period but extremely high unit emission reduction efficiency (409.4g per kilowatt-hour). Connected to widely covered charging platforms such as Kuai Dian and e-Charging, it has attracted a large number of new energy vehicle owners. The emission reduction from a single charging session per user is equivalent to that of 5-6 kilometers of metro travel, highlighting carbon inclusion's strong incentive for "low-carbonization of energy consumption". Through high emission reduction feedback, it encourages users to more actively choose new energy vehicles and charging behaviors. Subway (24.26%), NEV travel (20.66%), and NEV charging scenarios account for a total of 70.31% of emission reduction volume. Among them, Subway travel, relying on the superimposed effect of "high frequency × stable emission reduction volume", becomes the scenario with the highest emission reduction volume in transportation; although new energy vehicle travel has a low unit emission reduction volume (2.1g per kilometer), it still contributes more than 20% of the emission reduction volume due to the high frequency of online car-hailing use (e.g., multiple trips per day), reflecting the cumulative effect of "small emission reduction × high frequency".

#### ● **Participation in Lifestyle Service Scenarios Needs Improvement, with Gradual Deepening of Low-Carbon Concept Penetration**

In addition to transportation and energy scenarios, although the current participation in lifestyle service scenarios is relatively low, the scenario-based penetration of low-carbon concepts has initially been achieved. The residential electricity consumption scenario (0.48% share of times, 5.76% share of emission reduction volume) shows the characteristics of "low frequency × high value": the unit emission reduction

volume (525g per kilowatt-hour saved) is relatively high, but due to the need for users to authorize data connection with the Huijie Dian platform for "daily electricity consumption data statistics", the participation threshold is slightly higher than that of transportation scenarios, resulting in a low share of times. However, the 5.76% share of emission reduction volume indicates that the "electricity conservation" behaviors of participating users have achieved substantial emission reduction effects. Carbon inclusion's guidance for "low-carbonization of household energy" has initially shown results, and future participation can be further improved by simplifying authorization processes and strengthening rights and interests incentives.

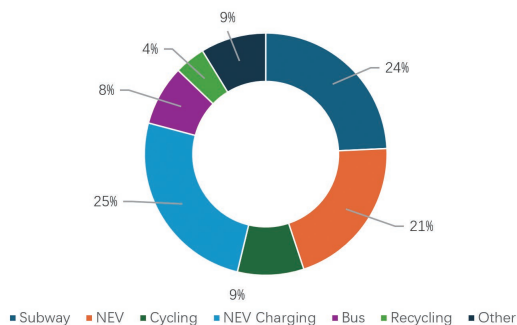
Proportion of participation in emission reduction scenarios



Source: Provided by the Zero Carbon Together Platform

Figure 3.20 Proportion of participation in carbon inclusion scenarios on the Zero Carbon Together Platform

Proportion of emission reductions in each scenario



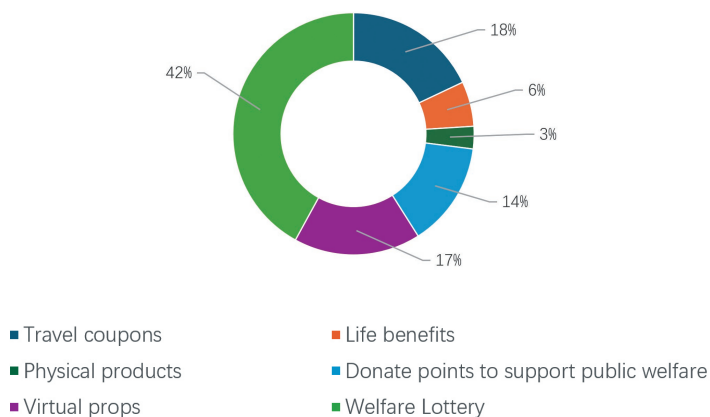
Source: Provided by the Zero Carbon Together Platform

Figure 3.21 Proportion of emission reduction volume by scenario on the Zero Carbon Together Platform

### 3.3 Analysis of Public Redemption of Carbon Inclusion Rights and Interests

The Benefits Mall of Chengdu's "Tianfu Carbon Credits" Platform has launched 7 categories, including

green travel, lifestyle services, cultural and creative products, exclusive lucky bags, other commodities, prop items, and the Shui Jing Fang special zone. It has integrated over 260 types of goods or services, among which there are more than 70 lifestyle services, 60 cultural and creative products, over 20 travel-related items, 8 products in the Shui Jing Fang special zone, and 100 types of lucky bags. A total of 650 products have been put on the shelf, and the cumulative number of point redemptions is expected to reach 6 million person-times by the end of 2025. Among these, travel coupons such as public transport and subway coupons, as well as bike riding cards, are the most popular among platform users, followed by cash discounts, physical products, scenic spot tickets, and platform-specific coupons. Therefore, travel coupons account for the largest proportion of the benefits distributed by Tianfu Carbon Credits, with over 700,000 green travel consumption vouchers issued through various activities. The Benefits Mall offers green travel rights and interests including public transport and subway coupons, bike riding cards, new energy vehicle charging coupons, parking coupons, and new energy ride-hailing coupons. In addition, due to their high prize value, rich variety, low point consumption, and strong entertainment, welfare lottery account for the highest proportion (42%) of redemptions in the Benefits Mall. They have now become one of the regular welfare forms and are deeply loved by active users.

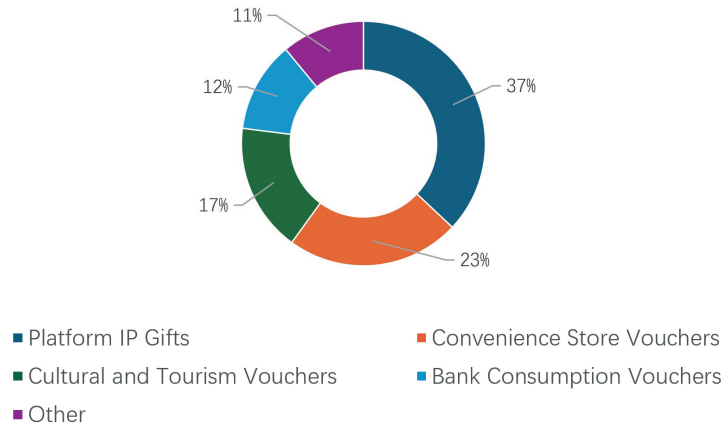


Source: Provided by the Tianfu Carbon Credits Platform

**Figure 3.22 Proportion of redemption categories by users on the Tianfu Carbon Credits Platform**

By building a diversified incentive system of "combination of virtual and real", the "Zero Carbon Together" Platform has effectively transformed individual carbon emission reductions into sustainable low-carbon motivation for the public. Data on rights and interests redemption from the platform's Low-Carbon Mall shows that the top three most popular categories are peripheral gifts of the platform's IP "Dundun Duck" (37%), convenience store vouchers (23%), and cultural and tourism coupons (17%). The former attracts young groups through the emotional value and zero-carbon attributes of the "Dundun Duck" IP, while the latter two lower the threshold for low-carbon participation with their daily essential characteristics. This structure indicates that the carbon inclusion incentive mechanism has successfully achieved the organic integration of spiritual recognition and material rewards. Peripherals of the IP

"Dundun Duck" meet users' needs for emotional belonging and social display, while consumption vouchers and cultural and tourism rights and interests provide high-frequency and practical daily discounts. This rights and interests design that accurately matches users' multi-level needs not only significantly enhances the sense of gain and stickiness of public participation but also successfully explores an innovative path connecting low-carbon behaviors and green consumption through carbon emission reductions as the link, providing key support for continuously guiding the public to practice low-carbon lifestyles.



Source: Provided by the Zero Carbon Together Platform

Figure 3.23 Proportion of redemption categories by users on the Zero Carbon Together Platform



# 4

## Selected Cases of Carbon Inclusion Practices



## 4. Selected Cases of Carbon Inclusion Practices

### 4.1 China Carbon Inclusion Practices Cases

#### 4.1.1 Platform-Oriented Cases

(a) Chengdu's "Tianfu Carbon Credits" Platform Launches Popular Science Book "The Wonderful Journey of Garbage"

In promoting public environmental education, Chengdu has organically integrated carbon inclusion with popular science education. The popular science book *The Wonderful Journey of Garbage*, jointly planned and published by Chengdu's "Tianfu Carbon Credits" Green Public Welfare Platform, Yanbian University Press, and Hainuoer Environmental Science Popularization Base, has innovatively created China's first immersive environmental science popularization pop-up book. With "the life journey of garbage" as its narrative main line, it integrates historical time travel, interactive design, and green technology.

Focusing on the concepts of resource recycling and sustainable development, the book systematically demonstrates China's practical exploration in green transformation and delves into the resource value and development potential behind waste. This attempt to integrate the concept of carbon inclusion into popular science education products not only enriches the forms and contents of environmental education but also provides a new carrier for cultivating public environmental awareness and promoting green lifestyles, reflecting the innovative application of carbon inclusion in enhancing public cognition.



Figure 4.1 Promotional image of the popular science book "The Wonderful Journey of Garbage"

In terms of content design, the book innovatively integrates environmental protection knowledge with interactive narratives. Each chapter corresponds to practical issues such as garbage recycling and garbage incineration. It not only sorts out the inherited relationship between the traditional wisdom of "making the best use of everything" and modern circular economy, but also combines full-color printing

with gamified interactive design to adapt to the cognitive characteristics of teenagers. Moreover, it transforms abstract concepts into operational exploration tasks, realizing the transformation from knowledge to action. Readers will understand environmental protection concepts in the context of climate change through immersive experiences, and intuitively perceive China's institutional advantages and technological innovation in green development. Through core issues such as waste sorting, energy transition, and circular economy, it builds a bridge between knowledge and action, enhancing teenagers' environmental awareness and participation ability. As an original popular science work integrating knowledge dissemination and value guidance, *The Wonderful Journey of Garbage* expands the boundaries of environmental education with innovative forms, providing a new paradigm for popular science publishing and the dissemination of ecological civilization in the new era.

#### (b) National Low-Carbon Day in Guangzhou and "Reducing Carbon for the National Games" Carbon Inclusion Themed Activity

On the morning of June 25, 2025, the National Low-Carbon Day in Guangzhou and the "Reducing Carbon for the National Games" Carbon Inclusion themed activity was held at Yunluo Botanical Garden. Hosted jointly by the Guangzhou Municipal Ecology and Environment Bureau, the Executive Committee of Guangzhou Division for the 15th National Games and National Paralympic & Special Olympic Games, and the Guangzhou Municipal Forestry and Garden Bureau, the event was attended by representatives from units including the Guangdong Provincial Forestry Bureau, the Executive Committees of Guangdong Division, Shenzhen Division, Foshan Division, and Zhuhai Division for the 15th National Games and National Paralympic & Special Olympic Games, as well as relevant enterprises. Responding to the call of the Ministry of Ecology and Environment for "Pioneering Carbon Pathways, Greening the Future," the activity, with the theme of "Reducing Carbon for the National Games," showcased Guangzhou's achievements in green and low-carbon development through case releases, joint declarations, on-site interviews, and interactive games. It advocated for the practice of green and low-carbon lifestyles, rallying efforts from all sectors to support carbon neutrality for the Guangzhou Division of the 15th National Games.

At the event, *Outstanding Cases of Carbon Neutrality in Guangzhou (2024)* was released, presenting Guangzhou's progress in green and low-carbon transformation and innovative practices of the carbon inclusion mechanism to the public. Guangzhou has innovatively developed the carbon inclusion mechanism, making efforts on both the supply and absorption ends. It has creatively quantified and assigned values to individuals' carbon reduction behaviors, integrating carbon inclusion, carbon trading, and carbon neutrality. The emission reductions generated from citizens' low-carbon behaviors are verified, issued, and traded, and finally used to meet the carbon reduction and carbon neutrality needs of market entities, forming a closed-loop ecosystem of low-carbon incentives. Driven by the carbon inclusion mechanism, Guangzhou has nurtured a large number of outstanding carbon neutrality cases, including GAC AION, GAC Honda, the 136th Canton Fair, the Mingzhu Bay International Climate Finance and Investment Conference, green supply chains, zero-carbon hotels, and zero-carbon bank outlets, providing excellent references for carbon neutrality in various fields. The promotional video *Guangzhou's Low-Carbon 24 Hours* premiered at the event. From dawn to dusk, it comprehensively showcased low-carbon life scenarios such as resource conservation, green transportation, and green consumption through a temporal and spatial narrative, vividly presenting how Guangzhou leads the city in achieving "integration of production, living, and ecology" and "coordination of form, function, and vitality" under the concept of green and low-carbon development.

In 2024, the Guangzhou Municipal Ecology and Environment Bureau and the Guangzhou Municipal

Forestry and Garden Bureau jointly developed the *Guangzhou Forestry Carbon Inclusion Methodology*, opening up channels for the development of local forestry carbon sink resources in Guangzhou. The Guangzhou Municipal Forestry and Garden Bureau organized 5 state-owned forest farms in Baiyun, Huadu, Conghua, and Zengcheng, completing the development of 82,600 tons of forestry Carbon Inclusion emission reductions, all of which were donated to the Executive Committee of Guangzhou Division for the carbon neutrality of the 15th National Games. It is reported that this is the first large-sum donation of carbon emission reductions received by the 15th National Games. This donation has realized the support of "Beautiful Green Guangzhou" ecological carbon sinks for the "Beautiful Guangzhou" Zero-Carbon National Games, serving as a vivid practice of Guangzhou's implementation of the concept that "lucid waters and lush mountains are invaluable assets."

To inspire public participation, the activity innovatively created "online + offline" scenarios for public carbon reduction. Offline: Yunluo Botanical Garden set up a low-carbon market, handcraft workshops, and 8 themed check-in spots. Citizens could unlock green gifts through stamp-collecting interactions, immersively experiencing the charm of low-carbon life. Online: Relying on the "Carbon Inclusion Service" platform, citizens could participate in online activities in the zero-carbon "15th National Games" zone through low-carbon behaviors such as green travel, electricity conservation, and garbage recycling to obtain carbon emission reductions or carbon coins. The carbon emission reductions could be donated to the Guangzhou Division of the 15th National Games to support its carbon neutrality. In addition, carbon coins could be exchanged for zero-carbon gifts and exquisite souvenirs of the 15th National Games.

#### (c) "Zero Carbon Together" Platform and Minsheng Bank: Using "Carbon" to Offset Loans

In March 2025, the "Zero Carbon Together" platform, in cooperation with China Minsheng Bank Wuhan Branch, launched an activity of "using carbon emission reductions to deduct loan interest," exploring the cross-border integration of "carbon inclusion + consumer finance." The carbon emission reductions accumulated by citizens on the "Zero Carbon Together" platform can be exchanged for consumer loan interest red envelopes at Minsheng Bank according to the conversion standard of "1,000 grams = 2 yuan." A single user can get a maximum deduction of 2,000 yuan, applicable to various financial products such as mortgage loans and comprehensive consumer loans, covering people's livelihood consumption fields including home decoration, education, and medical care.

This practice has turned individual emission reductions into quantifiable, redeemable, and consumable green assets. By organically integrating carbon inclusion with consumer credit, it not only enhances the public's sense of gain from participating in green lifestyles through "real money benefits" but also releases consumption potential through financial profits concessions. Meanwhile, it provides an innovative path for banking institutions to expand green financial services and support real consumption. It is a beneficial exploration to promote the coordinated development of "low-carbon benefits for the people, finance serving the real economy, and consumption quality improvement," and offers replicable Hubei experience for building an inclusive social emission reduction mechanism where "everyone reduces carbon, everyone benefits."

#### (d) Hefei Carbon Inclusion Enters Campus Activity

In October 2025, staff from the Hefei Municipal Ecology and Environment Bureau, accompanied by Hefei Carbon Inclusion's Mascot "TanXiXi," visited Class 22, Grade 7 of the Olympic Sports Campus of Hefei No.50 Middle School. They brought an extremely interesting "Low-Carbon Journey" class to the students, joining hands to contribute to the goal of "striving to be low-carbon guardians and building a beautiful new Hefei!" After the class, the students not only gained a clear understanding of professional terms like "carbon peaking," "carbon neutrality," and "carbon inclusion" but also kept in mind the principle

that "low-carbon living is all around us." At the end of the activity, everyone gathered around "TanXiXi" to take group photos and made various low-carbon pledges, such as "I will be a little expert in saving electricity from now on," "I will never litter casually again," and "I will practice low-carbon living with my parents." This carbon inclusion campus activity, like a spring breeze, blew the concept of green and low-carbon living into the students' hearts.

As Anhui's first carbon inclusion pilot city, under the guidance of the Anhui Provincial Department of Ecology and Environment, Hefei's carbon inclusion platform "TanHuiLuZhou" — built by the Hefei Municipal Ecology and Environment Bureau and supported by the "Green Inclusive Cloud - Carbon Emission Reduction Digital Account" system — has been making consistent efforts since its launch. It continuously expands green and low-carbon scenarios, establishing four core sectors: green catering, green travel, green office, and green living, which comprehensively cover citizens' daily lives.

#### 4.1.2 Enterprise-oriented Cases

##### (a) Shandong Hi-Speed Group Promotes Carbon Emission Reduction — Painting a New Picture of Green Highways

Transportation is one of the primary sources of global carbon emissions. Promoting the integrated development of "transportation + new energy" is a crucial pathway to energy conservation and consumption reduction, build green transportation infrastructure, and support the "carbon peaking and carbon neutrality" goals. In recent years, Shandong Hi-Speed Group has actively implemented the "dual carbon" strategy, explored carbon emission reduction pathways in the transportation sector, promoted the resource utilization of waste materials in infrastructure construction, maintenance, and operation, and vigorously developed new energy industries such as wind, solar, hydrogen, and geothermal energy, blazing a distinctive path of green transformation and development.

##### ● Zero-Carbon Benchmarks: Zero-Carbon Solutions for Transportation Infrastructure

Leveraging its resource advantages in the investment, construction, and operation of transportation infrastructure, Shandong Hi-Speed Group has continuously explored and innovated in the integration of transportation and energy, successively launching a number of national pioneering projects. These include: China's first large-scale expressway slope solar project (Rongcheng-Wendeng section of Rongwu Expressway), China's first zero-carbon smart toll gate (Penglai Toll Gate of Pengqi Expressway), China's first zero-carbon service area (Jinan East Service Area of Qingyin Expressway), China's first zero-carbon smart expressway (Jiwei Expressway), China's first zero-carbon expressway reconstruction and expansion project (Jinan-Heze Expressway Reconstruction and Expansion Project), China's first "operational carbon-negative + whole-process zero-carbon" service area (Tanyi Service Area of Linteng Expressway), and China's first CCPC-certified zero-carbon expressway yard (Qilin Expressway Prefabrication Yard). These benchmark projects have set a demonstration model with radiating effects nationwide. To date, Shandong Hi-Speed Group has built new energy installed capacity of 5.7 million kilowatts, including 710,000 kilowatts of expressway roadside solar power—accounting for approximately 70% of the national total roadside solar capacity and ranking first in China's transportation industry. This achieves an annual power generation of about 780 million kilowatt-hours and reduces carbon dioxide emissions by approximately 690,000 tons per year.

##### ● Green and Low-Carbon Construction: High-Value Transformation of Solid Waste Resources

Focusing on expressway construction and maintenance, Shandong Hi-Speed Group has prioritized the high-value utilization of bulk solid wastes such as steel slag, reclaimed asphalt pavement (RAP), and waste rubber powder. It has developed key technologies including high-content RAP mixing, guardrail

renovation, comprehensive steel slag utilization, and solid waste-based cementitious materials, realizing 100% recycling of RAP and old guardrails. The promotion of in-situ thermal recycling has covered over 20 million square meters, saving 2.2 million tons of stone and 108,000 tons of asphalt, while reducing emissions by 114,000 tons. New materials such as solid waste-based cementitious materials and modified rubber asphalt have lowered project costs by approximately 20-30% and reduced carbon emissions by about 80%.

- **ETC Efficiency Improvement: Unlocking the Low-Carbon Value of Travel**

The optimization and upgrading of the ETC system is a key component of Shandong Hi-Speed Group's carbon inclusion practices, indirectly reducing carbon emissions by improving travel efficiency. At the Penglai Zero-Carbon Smart Toll Gate, the average passage efficiency of ETC vehicles has increased by 20%, card-issuing efficiency by 10%, and special-case handling efficiency by 30%. These improvements have significantly reduced vehicle waiting time at toll gates and fuel consumption.

- **Online Training: Making Digital Office a New Engine for Emission Reduction**

As an important scenario for carbon inclusion, Shandong Hi-Speed Group has implemented an "OMO blended training" model through its "Gaosu E-Learning" platform. By leveraging big data and artificial intelligence technologies, it has integrated digital office into the carbon emission reduction accounting system. Since the system's launch, it has accumulated 14.95 million hours of online learning, organized 10,500 online exams with 5.67 million participants, and conducted over 1,100 online surveys, reducing carbon emissions by approximately 15,800 tons. While completing training tasks, employees can redeem points for physical goods or services, turning "emission reduction" into tangible benefits and transforming carbon inclusion actions from "passive response" to "active preference."

- (b) **Alipay Carbon Inclusion Platform — Facilitate Green Travel Toward Wherever You Want to Go**

Alipay, as one of the platforms offering the most versatile travel services in China, covers travel services in 8 scenarios, including buses, metro, shared bicycles, carpooling, and NEV charging services. At present, its travel services have reached more than 600 million people annually in more than 1,300 cities in 31 provinces, municipalities and autonomous regions nationwide. The business positioning is to create convenient travel experiences during people's daily life, making travel easier for each user.

- **Build One Carbon Inclusion Platform Suitable for the Government, Enterprises and People to Promote Innovation-driven Green Development**

In 2024, Alipay Transport, Hospitality, and Tourism Team, relying on diversified services in low-carbon travel scenarios and strengths in technological innovation, released the "Alipay Carbon Inclusion Platform", expected to be a joint operation hub between the government and users. Through this platform, Alipay cooperates with the government to build methodologies for green travel scenarios in public transportation, the shared cycling, carpooling, and NEV charging services. In this way, it helps the government realize digital and intelligent upgrade of its platform for the dual carbon targets, but also encourage the public to practice low-carbon travel. Toward users, science popularization activities are designed based on the local conditions of different cities, a more interesting and diverse way of interaction to introduce the carbon inclusion policies to them. As of the end of October 2025, Alipay Carbon Inclusion Platform has served over 300 million people since its launch in Beijing, Shenzhen, Wuhan, Shanghai, Chongqing, and other cities, reducing a total of nearly 40,000 tons of carbon emissions.





Figure 4.2 Promotional picture of Alipay Carbon Inclusion Platform (Alipay page display)

### ● The "Green Travel · Carbon Surprise Quest" Campaign Contributes to Building of a "Beautiful China"

To answer the call for building a "Beautiful China" and contribute to achieving the goals of carbon peaking and carbon neutrality, Alipay Transport, Hospitality, and Tourism Division officially launched the "Green Travel · Carbon Surprise Quest" campaign on May 20, 2025 under the planning guidance of "Cultivating Individual Low-Carbon Habits" by the Publicity and Education Center of the Ministry of Ecology and Environment. By adopting an innovative digital operation mode and with the "Mileage Coin" incentive mechanism at its core, this campaign covers green travel scenarios, such as buses, metro, cycling, ride-sharing, and NEV charging services, and industries with frequent customer services, such as flight tickets, hotels, cultural tourism, and motor vehicle services, to encourage and guide hundreds of millions of Alipay users to practice green and low-carbon life and strive to implement the "Beautiful China, I am an actor" initiative.

As of October 2025, the campaign has achieved remarkable results: more than 152 million users participate in earning mileage coins every month; exposure in total exceeds 500 million times; and the total of mileage coins redeemed driven by the campaign is nearly 400 million.



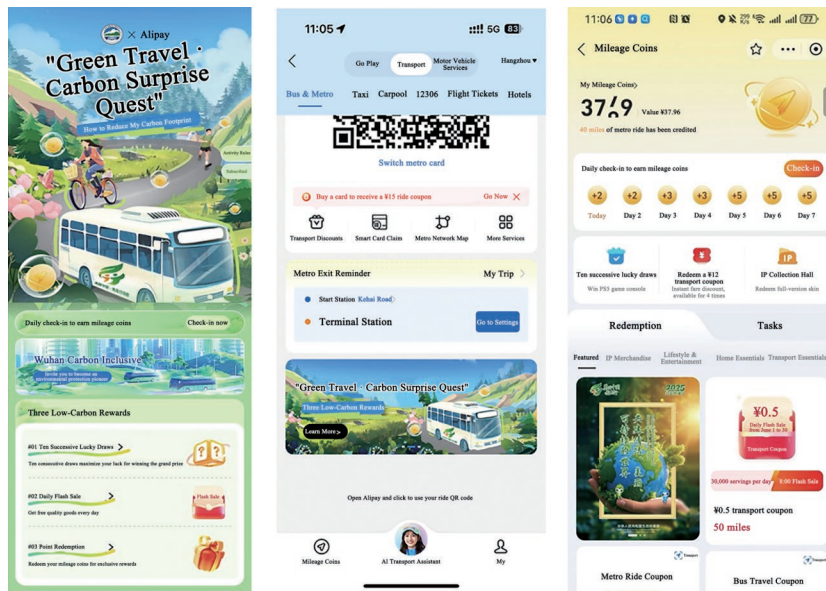


Figure 4.3 Promotional picture of "Cultivating Individual Low-Carbon Habits · Carbon Surprise Quest" campaign

### ● Help Local Governments to Design a City-specific, Innovative Business Card of "Low-carbon + "

In March 2025, the carbon inclusion campaign, that is, "Low-Carbon Cherry Blossom Fun", was officially launched by Wuhan Carbon Inclusion Management Co and Alipay, under the guidance of Department of Ecology and Environment of Hubei Province and Wuhan Municipal Ecology and Environment Bureau. Tourists can earn carbon points using Alipay's low-carbon travel services in exchange for real benefits, such as price discounts and reduction of cultural and tourism tickets and queue exemption. This innovative attempt truly realizes green travel + green cultural tourism and drives urban green consumption. Throughout the campaign, 100,000 new users of carbon inclusion-oriented services were added, and carbon emissions reduced by nearly 2,000 tons. In addition, Alipay, based on the local conditions of the city, has launched many "green travel + culture and sports, + colleges and universities" joint campaigns, together with the government and enterprises, to introduce the carbon inclusion policies and extend benefits to a wider range of people. In June 2025, Alipay and Wuhan Carbon Inclusion Management Co jointly launched another campaign, "Find the Campus Low-Carbon Champions in Beautiful Universities of Wuhan". After opening a personal account with the Alipay's Carbon Inclusion Platform, universities students across Wuhan can contribute to carbon emission reductions using low-carbon travel methods, including taking a bus or metro by scanning Alipay's ride QR code and will be ranked according to the total of their reduced carbon emissions. Together with "Wutan Jianghu", the emission reductions are calculated fairly. The top 50 students will be awarded the "Low-Carbon Pioneer" certificate, Alipay Transport voucher packages worth RMB 100, and other rewards. Apart from the rewards said above, the top 3 students will also receive a youth privilege package worth RMB 1,000 provided by Alipay, enjoying benefits in food, accommodation, transportation, tourism, entertainment and shopping.



Figure 4.4 Promotional pictures of Alipay's campaigns

On September 12, at the launch ceremony of the 2025 Beijing Green Lifestyle Season, Beijing Carbon Inclusion · Alipay was officially launched. Beijing users can earn officially certified carbon points for using green and low-carbon services provided in Alipay, such as NEV charging, and taking buses and metro. Such points can be used to redeem abundant gifts in the green life service platform. Based on the calculation according to Beijing's green transportation methodology, all emission reductions will be used for carbon neutrality and green upgrading in Beijing. At the same time, under the guidance of the Beijing Energy Conservation and Environmental Protection Center, Alipay launched the joint campaign themed on "Travel Green Together, Accompanied by Yuan Xiaoyuan". From September 12 to November 30, 2025, all registered users in Beijing can participate in a lucky draw free of charge every day. The prizes include RMB 2 off RMB 20 spent on new energy vehicle charging and 50 other rewards, covering benefits for utility payment, travel benefits, and vouchers for daily necessities. During this year's Green Lifestyle Season, Alipay will also co-hold a series of forum activities, such as Technology + Life Circle, under the guidance of the Energy Conservation and Emission Reduction Center to share with users about green travel, low-carbon and energy saving, green power and fast charging, AI technology, Alipay Tap!, and other hot topics. Everyone and every family can jointly contribute to a greener and more inclusion Beijing.

#### (c) Sungrow iCarbon Platform: Digital Enablement for End-to-End Corporate Low-Carbon Transformation

Leveraging its integrated expertise in R&D and manufacturing across solar, wind, energy storage, power electronics, and hydrogen, Sungrow strategically entered the carbon management sector by establishing its subsidiary, Sungrow iCarbon Co., Ltd. . The iCarbon Platform, independently developed by Sungrow iCarbon, leverages AI algorithms and big data to establish an end-to-end system for carbon accounting, analysis, reduction, and management. Built on a unified cloud-edge-device architecture, the platform offers the advantages of light-footprint deployment, rapid implementation, and cost-effectiveness, reducing barriers to green transformation and helping companies seize opportunities in compliance and markets.

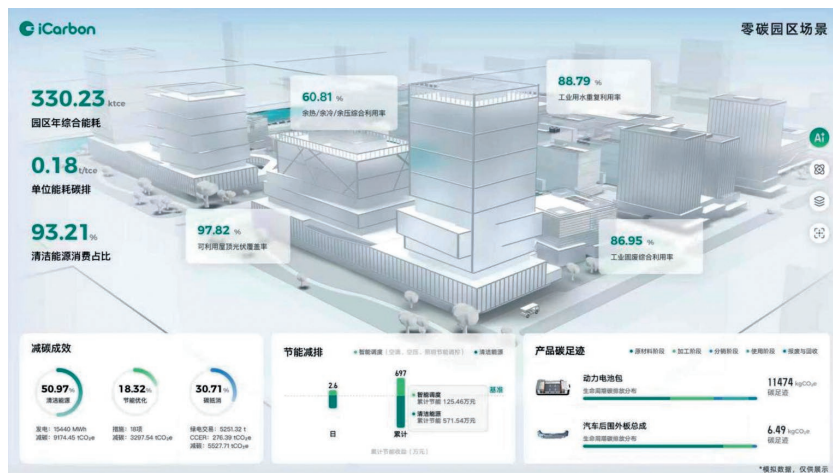


Figure 4.5 Display image of Sungrow iCarbon Platform

### ● Digital & Intelligent Carbon Accounting: Mapping Your Carbon Baseline to Solidify Reduction Foundations.

The iCarbon Platform reengineers carbon accounting with a fully digital process. It leverages real-time data and AI to quickly produce accurate carbon inventories, reports, and footprints for organizations and products. By enabling direct links to certified third-party bodies, it facilitates online certification and generates internationally-aligned reports. This delivers the solid data foundation needed for effective carbon reduction planning, compliance with cross-border carbon tariffs, and enhanced green brand competitiveness.

#### ● Granular Energy Management: Driving Cost and Carbon Reduction Together.

The iCarbon Platform uses digital and AI technologies to deploy an analytics system for all energy scenarios (water, power, gas, cooling, heating), optimizing efficiency from production and distribution to storage and end-use. It provides customized solutions like detailed energy diagnostics, smart equipment control, and lighting optimization. This helps businesses pinpoint conservation opportunities without disrupting operations, achieving both lower costs and lower emissions.

#### ● End-to-End Supply Chain Carbon Management: Driving Collaborative Decarbonization Across the Value Chain.

The iCarbon Platform tackles supply chain carbon challenges—like management difficulty and data gaps—by using core algorithms and AIoT to seamlessly integrate data across an organization and its entire supply chain for real-time, comprehensive emissions calculation. It introduces an innovative "Supply Chain Carbon Account" to dynamically track emissions and uses a proprietary model to rate supplier carbon performance. This creates a closed-loop system from data collection and calculation to assessment and green procurement, fostering a green ecosystem across the industry value chain.

The technical capabilities and ecosystem architecture of the Sungrow iCarbon Platform serve as a cornerstone for the scalable rollout of carbon inclusion mechanisms. Moving forward, we plan to further integrate personal carbon account scenarios and deepen interoperability with local carbon inclusion platforms, evolving into a central hub that bridges producers and consumers.

#### (d) China Unicom's "Through to Countryside" Carbon Inclusion Platform

China Unicom Payment Co., Ltd. contributes communication wisdom to "national action for green and low-carbon development" and "activating the momentum of rural industrial revitalization." Guided by China Unicom's *Carbon Exploration Green Action Plan and Digital Rural Development Strategic Outline*, it fulfills the social responsibility of central enterprises in advocating green and low-carbon lifestyles and building beautiful villages. Leveraging China Unicom's resource endowments — including a massive user base, communication data, and its role as the chain leader of the modern industrial chain for cybersecurity — the company assists China Unicom in innovatively launching "Through to Countryside," the first public welfare carbon inclusion platform integrating green low-carbon development and rural revitalization. Its core technology, the "carbon emission reduction calculation model," has taken the lead in obtaining authoritative certification from national-level green trading institutions, filling the gap in personal carbon accounts in the communications industry and creating a new public welfare path of "rewards for green carbon reduction and warm consumption support for farmers." It provides a digital solution for the whole people to participate in green and low-carbon lifestyles and support rural revitalization.

The "Through to Countryside" Public Welfare Carbon Inclusion Platform adopts cutting-edge technologies of "big data + blockchain + privacy computing," featuring the function of intelligently recording and quantifying users' personal carbon emission reduction contributions. Users can earn carbon energy (points) rewards by practicing low-carbon behaviors such as online card application, online recharge and payment, online handling of services, and online queuing. Through the incentive mechanism of "low-carbon points × rural public welfare," the platform guides users to consume carbon energy to participate in beautiful village development games and collect ecological coins. Finally, the ecological coins can be converted into agricultural support benefits such as consumption support and construction of smart water stations, providing users with one-stop low-carbon lifestyle services.



Figure 4.6 Product application interface of "Through to Countryside " Carbon Inclusion Platform

To date, the achievements of this Carbon Inclusion Platform have been fully disclosed in China Unicom's Sustainable Development Report for two consecutive years and showcased at multiple national-level exhibitions (including the PT Show, MWC Shanghai, and China International Fair for Trade in Services). It has won 18 domestic and international honors from institutions such as the State-owned Assets Supervision and Administration Commission of the State Council (SASAC), the Ministry of Industry and Information Technology (MIIT), the International Finance Forum, the Beijing Municipal Administration of Government Services and Data Management, and the Financial Program Center of China Media Group, as well as 1 software copyright. Its theoretical research projects have been selected into the Communication Soft Science Projects of the Science and Technology Committee of the Ministry of Industry and Information Technology for two consecutive years and successfully concluded. By uniting multiple stakeholders to build a personal carbon account system and explore innovative models of carbon inclusion platforms, it empowers the general public and enterprises across the entire supply chain to carry out carbon inclusion application demonstrations. It also provides data support on public green behaviors for social sustainable development, realizing a sustainable cycle where carbon reduction behaviors empower rural development and rural values feed back into the green inclusive ecosystem, ultimately rallying the strength of the whole people to build a green inclusive ecosystem.

#### (e) China Automotive Data: Standard Construction and Innovative Practices in the Field of New Energy Vehicle Carbon Emission Reduction

To support the construction of carbon emission reduction scenarios in the new energy vehicle sector, China Automotive Data started with standard research and initiated the project approval for the industry standard "Method for Evaluating Carbon Emission Reductions from Electric Vehicle Operation" in 2022. This standard systematically studies the accounting method for carbon emission reductions of new energy vehicles during the travel phase, filling the gap in China's relevant standard system. After multiple rounds of expert demonstration and review, the public consultation was completed in July 2024, making it China's first industry standard for carbon emission reduction accounting covering the travel phase of new energy vehicles. Based on standard research, China Automotive Data has simultaneously actively promoted the research on local carbon inclusion methodologies, cooperating with Dongfeng Motor R&D Institute to participate in Wuhan's carbon inclusion mechanism and providing suggestions for the formulation of methodologies in the transportation sector.

In addition to standard research, China Automotive Data has actively promoted project-based innovative practices. In June 2024, it supported New Automobile Co., Ltd. in building a carbon asset management system for new energy last-mile logistics delivery vehicles, realizing real-time collection of vehicle operation data and automatic accounting of carbon emission reductions, which effectively improved the accuracy of carbon asset quantification and management efficiency. Through integrated design, the system helps enterprises complete carbon emission reduction verification and transaction preparation, providing technical support for new energy logistics fleets to participate in the carbon market and further promoting the low-carbon transformation of the transportation industry.

To accelerate the promotion and application of the new energy vehicle carbon inclusion mechanism, in August 2025, China Automotive Data launched a new energy vehicle carbon asset development product for new energy vehicle enterprises, building a dual-system architecture of "carbon account + carbon asset management platform" and forming a digital operation system linking the user end and the management end. Among them, the carbon account mini-program is oriented to new energy vehicle owners, who can register through the App portals of cooperating car companies or insurance companies. The system automatically obtains the vehicle's driving mileage data from government supervision platforms every

day, scientifically calculates carbon emission reductions and converts them into carbon points. Users can redeem physical products or service discounts in the rights and interests mall with the points, forming a complete closed-loop experience of "green travel — point incentives — rights and interests redemption." This product can help new energy vehicle enterprises quickly build the foundation of a carbon account operation platform and carbon asset development capabilities. Currently, China Automotive Data has carried out project docking with well-known domestic car companies such as Dongfeng Motor, Great Wall Motor, and Seres Automobile, promoting the implementation and large-scale operation of the new energy vehicle carbon asset management system.

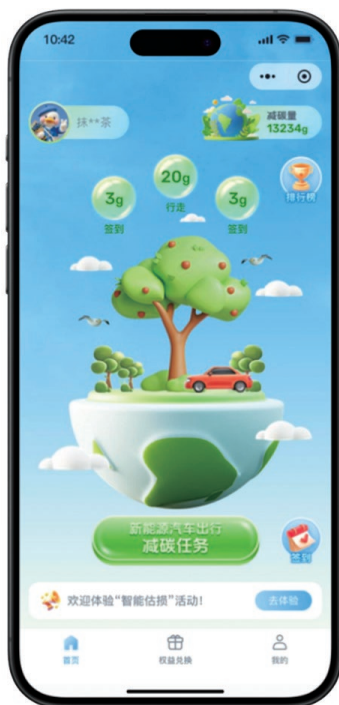


Figure 4.7 Page screenshot of China Automotive Data's carbon account mini program

(f) Zhejiang Jiaxing: Launch of the Province's First "Transportation Sector" Carbon Inclusion Emission Reduction Credit Pledged Loan

In January 2025, under the strong promotion of the Jiaxing Branch of the People's Bank of China, Bank of Jiaxing Co., Ltd. successfully signed an agreement with Haining Transportation Investment Holding Group to use 1,000 tons of carbon inclusion emission reduction credits as collateral for loan guarantees, marking the province's first "transportation sector" carbon inclusion emission reduction credit pledged loan in Jiaxing. The enterprise received nearly 100,000 yuan in initial loans that month. The remaining 7,000 tons of emission reductions will continue to be explored in application scenarios such as urban green spaces, arboreal carbon sequestration, and solar-powered parking garages, achieving a win-win outcome for economic and environmental benefits and providing a new financing path for public service projects.

In 2024, after technical and approval processes, Haining Transportation Investment Holding Group's *Jiaxing Carbon Inclusion Emission Reduction Project Methodology for Public Bicycles* successfully passed the carbon inclusion verified emission reduction filing. Upon learning of this, Bank of Jiaxing immediately engaged, leveraging relevant green finance policies and the advantages of its "Low-Carbon Jiaxing" green financial product system to develop a tailored financial service plan for the enterprise, effectively addressing its funding shortages and high operating costs.

## 4.2 International Carbon Inclusion Practice Cases

(a) Carbon Inclusion for Sustainable Cities in the Global South: Jospong Group's IRECOP Model Empowering Ghanaians in Climate Action Under Article 6

- Background

Ghana has one of the fastest-growing urban populations in West Africa, putting pressure on municipal waste systems that mainly rely on open dumping and unmanaged landfills. With over 60% of Ghana's solid waste being organic, methane emissions from decomposition pose both a climate threat and a missed opportunity for sustainable development. To address this, the Government of Ghana partnered with the Jospong Group of Companies, acting as the private-sector project developer and operator under a public-private partnership (PPP), to establish the Integrated Recycling and Composting Plant (IRECOP) programme. While IRECOP facilities are being developed across all regions of Ghana as part of a national circular economy strategy, four facilities with a combined installed processing capacity of 1,800 tonnes per day have been officially authorised under Article 6.2 of the Paris Agreement through Ghana's bilateral cooperation agreement with the Swiss Government.

A key feature of the IRECOP model is its role in carbon inclusion, where the climate benefits from improved waste sorting and treatment are linked to the communities participating in the service, representing an estimated population of 1,407,589. This establishes the foundation for recognising and valuing everyday climate actions by citizens within Ghana's developing carbon market ecosystem—a crucial step towards equitable climate finance in the Global South. This public-private partnership approach enables private-sector innovation to support national climate and sustainability objectives, contributing to SDG 11 (Sustainable Cities), SDG 12 (Responsible Consumption & Production), and SDG 13 (Climate Action).



Figure 4.8 Manual sorting of municipal solid waste and compost materials on the conveyor belt

- **Social and Economic Co-benefits Supporting Adoption**

The IRECOP initiative offers many social and health benefits that go well beyond waste diversion and climate change mitigation. By moving from open dumping to organised waste management, the programme directly addresses long-standing sanitation issues that have historically affected the quality of life in nearby communities. Before the implementation of IRECOP facilities, many municipalities faced ongoing problems related to improper waste disposal, including persistent odours, smoke from waste burning, rodent infestations, and stagnant wastewater, all of which caused environmental damage and increased disease risk. The intervention has significantly reduced public health hazards associated with unmanaged waste, such as cholera, typhoid, malaria, and respiratory infections, which tend to increase in areas with poor waste management, thereby strengthening public health resilience in line with SDG 3 (Good Health and Well-Being).

The operational facilities developed and managed by the Jospong Group now ensure that household waste is safely transported and processed in controlled environments. This has improved community hygiene and air quality, enhancing dignity and livability across small towns and rapidly expanding urban areas, directly contributing to SDG 11. Economically, the programme encourages the creation of green jobs and formalises the livelihoods of workers who previously operated in informal or unsafe waste environments. Approximately 200 direct, formal green jobs have been established across the four plants, with women comprising 34% of the workforce. Employees gain access to social protection systems, including SSNIT, health insurance enrolment, and structured career development pathways, supporting SDG 8 (Decent Work & Economic Growth). Women, in particular, benefit from safer working environments, professional recognition, and new opportunities in supervisory and quality-control roles, thereby reinforcing SDG 5 (Gender Equality). Moreover, by converting organic waste into compost that enhances agricultural productivity, the project links urban waste management to rural food security and soil regeneration, advancing SDG 2 (Zero Hunger) alongside SDG 13.

- **Expected Climate Outcomes and Environmental Integrity**

The IRECOP facilities are designed to prevent significant methane emissions by diverting organics from uncontrolled decomposition. The quantification methodology is based on AMS-III.F (avoidance of methane emissions through composting), with continuous monitoring of waste input, composting operations, and facility energy use. Under the bilateral partnership with Switzerland, Ghana is making progress towards issuing internationally transferred mitigation outcomes (ITMOs). These results, once verified and authorised, are expected to help Ghana achieve its NDC climate target and contribute to global mitigation efforts through voluntary cooperation under the Paris Agreement. Carbon integrity measures, including data transparency, clear project boundaries, prevention of double counting, and conservative estimation methodologies, have been put in place to ensure alignment with UNFCCC principles.

- **Partnerships and Future Outlook**

Successful implementation depends on stronger collaboration among national ministries, district assemblies, the Jospong Group of Companies, and international partners including UNDP and the Swiss BAFU. This PPP governance framework ensures high accountability and encourages replication. With proof of concept demonstrated in four regions, Ghana aims to expand IRECOP services to more municipalities, incorporate carbon incentives into community waste programmes, extend digital carbon accounts to millions of citizens, and share technical insights with peer African nations. By enabling communities to contribute directly to national climate targets, the IRECOP model strengthens carbon inclusion and establishes the foundation for future benefit-sharing mechanisms linked to internationally transferred mitigation outcomes. The project demonstrates how local climate solutions can generate

internationally recognised climate finance value, promoting both development and mitigation while advancing SDGs 11, 12, and 13.

As verification advances and mitigation outcomes approach issuance, the IRECOP case, led by a robust domestic PPP, stands as a flagship example of African leadership in people-centred climate finance, demonstrating how Article 6 can equitably channel climate resources to the communities and households driving measurable change.



Figure 4.9 Training session of IRECOP staff by Jospong Chief Corporate Communications Officer on Climate Change

(b) Thailand’s Digital Carbon Offset Initiatives – A Pathway to a Low-Carbon Future

As the world moves toward a low-carbon economy, empowering individuals to take measurable climate action has become a cornerstone of sustainable progress. Thailand has emerged as a leader in this transformation, showing how digital technology can connect personal awareness with tangible action. Two key innovations — the “Net Zero Man” application from the Thailand Greenhouse Gas Management Organization (TGO) and the carbon-credit feature within the TrueMoney digital wallet — are reshaping how individuals can participate in Thailand’s decarbonization journey.

These platforms combine mobile technology, blockchain, and user-centric design to make carbon inclusion simple, transparent, and effective. Together, they have already enabled the offset of more than 7,000 tons of carbon, reflecting Thailand’s growing success in embedding climate action into daily life.

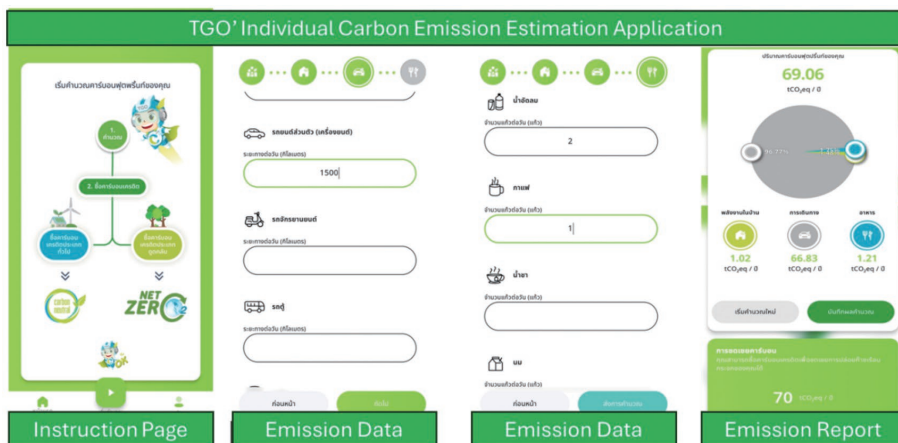


Figure 4.10 TGO’s Carbon Footprint Calculator: empowering individuals to measure their impact

The TGO “Net Zero Man” app enables users to estimate their personal carbon footprint by aggregating data from their daily activities — such as transportation, energy use, and waste generation — and converting these into CO<sub>2</sub>-equivalent emissions.

By providing clear, data-driven insights, the app allows individuals to visualize their climate impact and make informed lifestyle adjustments. This digital tool transforms climate awareness into measurable behavioral change and forms the foundation for citizen-led decarbonization.



Figure 4.11 TrueMoney’s Carbon-Credit feature: digital finance for climate action

As Thailand’s leading digital wallet, TrueMoney has taken a pioneering step in integrating carbon credits into mainstream financial services. Through its app, users can directly purchase and retire carbon credits certified under international standards such as VERRA, supporting projects across Thailand and worldwide — from reforestation and clean energy to sustainable agriculture initiatives.

What makes this innovation transformative is the fusion of digital finance and blockchain technology. Each purchase is represented by a tokenized carbon-credit NFT, issued via Ascend Bit’s blockchain platform, ensuring transparency, traceability, and prevention of double counting. Users can select one-time purchases or set up ongoing subscriptions, aligning personal spending with climate responsibility.

Behind the scenes, TrueMoney’s API integration connects its consumer wallet to verified carbon marketplaces, enabling real-time settlement and retirement of credits. By embedding carbon offsetting into a familiar, trusted payment ecosystem, TrueMoney has effectively mainstreamed climate participation, turning every mobile wallet into a potential climate-action tool.

This model of “climate-inclusive finance” demonstrates how fintech can democratize sustainability — transforming millions of small digital transactions into measurable contributions to global emissions reduction. TrueMoney’s platform also opens opportunities to link carbon offsets with loyalty programs, e-commerce, and corporate ESG initiatives, extending the impact beyond individuals to the wider digital economy.

The synergy between TGO’s calculator and TrueMoney’s offsetting feature creates a powerful behavioral loop: users first measure their footprint, then act on it through seamless digital finance tools. This transition — from passive awareness to active engagement — anchors climate participation in daily habits. By lowering barriers to entry, Thailand ensures that carbon participation is inclusive, engaging not only eco-conscious citizens but also everyday consumers across all income levels.

The use of blockchain fosters public trust in the offsetting process, addressing long-standing skepticism about the authenticity of carbon credits. With transparent records of each transaction and retirement,

users can see their climate impact in real time, reinforcing motivation and credibility.

These initiatives demonstrate how digital finance can scale climate action and link individual efforts to Thailand's Nationally Determined Contributions (NDCs). By enabling citizens to measure and offset their carbon footprints through platforms like TGO and TrueMoney, Thailand bridges personal responsibility with systemic change. While challenges such as data accuracy, credit integrity, and equitable access remain, these digital solutions show how fintech can be a powerful tool in the fight against climate change.

As Thailand heads toward COP30, these platforms offer a replicable model for other countries, especially in the Global South, showcasing how inclusive, transparent, and accessible digital finance can mobilize millions for measurable climate action. With blockchain ensuring trust and transparency, TrueMoney's integration of carbon credits into everyday transactions is a groundbreaking step toward a low-carbon society, offering a path for nations to leverage digital tools for decarbonization and demonstrating how small, everyday actions can lead to significant global impact.

### (c) Finland's "CitiCAP" Project

Lahti, Finland, a green pioneer in Europe, implemented the world's first pilot of personal carbon trading for citizens (CitiCAP Project) between 2019 and 2020. Local authorities developed a mobile app that allocates a travel carbon budget to each citizen. The app can automatically monitor and identify travel methods, then calculate personal transportation emissions. If a citizen's actual weekly transportation emissions are lower than the budget, the difference is converted into virtual carbon points. Accumulated points can be redeemed for rewards such as monthly public transport passes, shared bike discounts, and swimming pool tickets within the app. Approximately 3,000 residents downloaded the app, with the peak number of active users reaching 350 per week. Pilot results show that more than one-third of users reported reducing their travel carbon emissions due to the app's incentives. Surveys found that information feedback and self-challenge are the main drivers of behavioral change, while the amount of rewards or carbon pricing mechanisms are secondary motivations. This pilot fully demonstrates a potential path for the government-led carbon inclusion mechanism: empowering personal "carbon accounts" through digital means and encouraging citizens to voluntarily reduce emissions with market-oriented incentives. Lahti won the title of "European Green Capital" in 2021 for this project, with the goal of achieving city-wide carbon neutrality by 2028 — seven years ahead of Finland's national target.

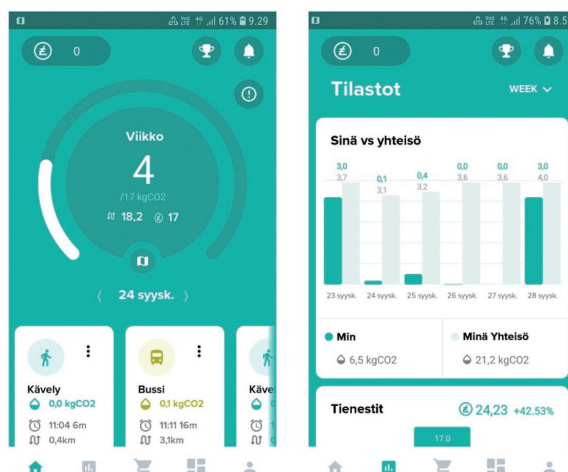


Figure 4.12 Product display image of Finland's "CitiCAP" project

5

# Innovative Integration of Carbon Inclusion



## 5. Innovative Integration of Carbon Inclusion

The "Innovative Integration of Carbon Inclusion" chapter in the *White Paper on Carbon Inclusion Development 2024* already covers the core integration directions of carbon inclusion with financial innovation, data governance, and AI. Building on this, over the past year, carbon inclusion has further expanded its application boundaries, achieving new breakthroughs in integration with fields such as technological innovation, biodiversity, ESG, characteristic cultural tourism, and RWA.

### 5.1 Carbon Inclusion and Technological Innovation

The in-depth integration of carbon inclusion and technological innovation is shifting from "technical support" to "value reconstruction" — leveraging technologies such as the Internet of Things (IoT), blockchain, artificial intelligence (AI), and big data to address the core pain points of carbon inclusion: difficulties in data collection, inaccurate accounting, poor asset circulation, and low participation. These technologies transform scattered low-carbon behaviors into "quantifiable, verifiable, tradable, and traceable" green assets. Meanwhile, technological innovation optimizes user experience and expands application scenarios, enabling carbon inclusion to evolve from "niche pilots" to "participation by all" and become a key technical link connecting micro-level emission reductions with the "dual-carbon" goals.

In the future, with continuous technological iteration, carbon inclusion will no longer be a single "emission reduction tool" but a green ecosystem integrating "trusted data, asset circulation, and user resonance," serving as a digital portal for everyone to participate in achieving the "dual-carbon" goals.

#### • Innovation Integration Case: Nanchang's "Carbon Inclusion+" Comprehensive Service Platform

The "Carbon Inclusion+" Comprehensive Service Platform highlights four major features in its functional design, leveraging technological strength to promote green and low-carbon transformation. In terms of functional innovation, the platform has built a multi-level emission reduction system linking the government, enterprises, and individuals. Through digital means, it not only provides carbon emission supervision tools for government departments but also opens up new paths for enterprises to optimize carbon asset management, while encouraging citizens to practice low-carbon lifestyles through incentives such as carbon points. Industrial innovation is another key feature of the platform. Focusing on urban basic industries such as municipal utilities and agriculture, as well as Nanchang's advantageous industries like electronic information and automobile manufacturing, the platform tailors emission reduction methodologies and strives to cultivate a number of national-level emission reduction benchmark enterprises with demonstration effects. In terms of technological innovation, the platform fully utilizes the technical advantages of blockchain's immutability and AI analysis to build a reliable carbon data management system, ensuring the quality of carbon credits. The platform also innovatively integrates carbon emission reduction with enterprise brand building. By customizing carbon emission reduction solutions for enterprises, it not only helps them implement the concept of sustainable development but also effectively enhances their brand reputation and social influence.

### 5.2 Carbon Inclusion and Biodiversity

Carbon inclusion and biodiversity conservation are not independent ecological issues, but important

partners in synergistically advancing the "dual carbon" goals and ecosystem integrity. Carbon inclusion activates ecological protection behaviors of the public and enterprises through market-oriented incentive mechanisms, while ecosystems with rich biodiversity (such as forests, wetlands, and grasslands) are themselves efficient "carbon sinks". The two form a positive cycle of "protection promotes carbon sequestration, and carbon sequestration feeds back protection". Currently, carbon inclusion is gradually extending from traditional consumer-side scenarios such as "low-carbon travel and garbage classification" to "carbon sink scenarios related to biodiversity conservation", becoming an innovative tool to promote the implementation of biodiversity conservation.

### 5.2.1 Core Synergistic Relationship Between Carbon Inclusion and Biodiversity

The essence of carbon inclusion is "converting intangible ecological contributions (such as emission reduction and carbon sequestration) into tangible economic or social incentives", while the core of biodiversity conservation is safeguarding ecosystem functions. Specifically, their synergy is mainly reflected in three aspects:

- **Biodiversity Conservation Scenarios are Important "Carbon Sink Sources" for Carbon Inclusion**

Ecosystems with rich biodiversity (such as tropical rainforests, mangroves, and peatlands) have extremely high carbon sequestration capacity, accounting for more than 70% of the carbon sink in global terrestrial ecosystems. The protection and restoration of such ecosystems (such as afforestation, wetland restoration, and maintenance of endangered species habitats) are themselves high-quality carbon inclusion projects, which can be accounted for as "quantifiable and tradable" carbon sink volumes through carbon inclusion mechanisms.

- **Carbon Inclusion Provides "Market-Oriented Incentives" for Biodiversity Conservation**

Traditional biodiversity conservation relies mostly on government financial investment or charitable donations, with weak sustainability. Carbon inclusion, through the model of "carbon points exchanging for rights and interests and carbon sink trading for cash", endows protective behaviors with economic value and stimulates the participation motivation of multiple subjects.

- **Both Jointly Serve "Ecosystem Resilience Enhancement"**

Low-carbon behaviors promoted by carbon inclusion (such as green consumption, energy conservation, and emission reduction) can reduce the threats of industrial pollution and climate change to biodiversity (such as damage to species habitats caused by extreme weather). Ecosystems with rich biodiversity have more stable carbon sink capacity and stronger anti-interference ability (for example, diverse plant species can improve forests' ability to cope with diseases and pests, ensuring long-term carbon sequestration effects).



### 5.2.2 Innovative Application Scenarios of Carbon Inclusion Empowering Biodiversity Conservation

Currently, various regions have begun to explore incorporating biodiversity conservation behaviors into the carbon inclusion system in a "tangible and quantifiable" manner, forming a number of replicable scenario models:

**Table 5 Carbon inclusion integration models for different biodiversity scenarios**

Application Scenario	Core Conservation Actions	Carbon Inclusion Incentive Methods	Biodiversity Benefits
Conservation of Rare Species' Habitats	Community patrol, habitat vegetation restoration, garbage cleaning	Calculate carbon points based on patrol frequency / restoration area, redeem for materials or cash subsidies	Protect habitats of endangered species (e.g., Asian elephants, Crested Ibises), reduce human disturbance
Restoration of Native Vegetation	Afforestation on barren hills, grazing prohibition on grasslands, protection of famous ancient trees	Include carbon sink in regional carbon market transactions, with benefits going to conservation entities	Restore the original structure of ecosystems, enhance plant and insect diversity
Sustainable Agriculture/ Fisheries	Organic farming, rice-fish symbiosis, offshore proliferation and release	Enterprises purchase carbon sinks to offset emissions, providing premium acquisition for producers	Reduce agricultural non-point source pollution, protect soil organisms and aquatic biodiversity
Ecological Corridor Construction	Construction of wildlife passages, maintenance of ecological isolation belts	Government purchases carbon points for public service redemption (e.g., public transport cards, medical subsidies)	Promote species gene flow, alleviate the "ecological island" problem

With the advancement of the "dual carbon" goals and the Kunming-Montreal Global Biodiversity Framework under the Convention on Biological Diversity, carbon inclusion will become a key link connecting "climate action" and "biodiversity conservation". Meanwhile, carbon inclusion is not only a "carbon reduction tool" but also a "market-oriented catalyst for biodiversity conservation" — by converting every ecological protection action into perceptible value, it ultimately achieves the harmonious coexistence of "humans, carbon, and nature".

#### • Integration and Innovation Case: "Tianfu Carbon Credits" Black Bear Conservation Program

Faced with the increasingly severe global challenges such as environmental pollution, species extinction, and ecological imbalance, Chengdu's "Tianfu Carbon Credits" Green Public Welfare Platform has actively explored an innovative model of "low-carbon behavior + public welfare incentives". As the only black bear rescue institution in China, the Sichuan Longqiao Black Bear Rescue Center holds a special position in wildlife protection. "Tianfu Carbon Credits" has joined hands with the center to launch the Black Bear Conservation Program.

Users are encouraged to participate through the innovative form of low-carbon behavior challenges. By practicing low-carbon behaviors, users earn carbon points, which can not only be redeemed for benefits but also donated voluntarily. The platform aggregates the donated carbon points to purchase public welfare materials and provides daily supplies needed for black bear rescue to the center in the name of all public participants. Additionally, invited participants have the opportunity to act as "experience officers" to participate in animal protection practices, experience the work of the rescue center firsthand, and gain in-depth knowledge about black bear conservation. This model effectively connects the public's low-carbon behaviors, public welfare institutions, and corporate resources through the carbon inclusion mechanism, successfully transforming individual low-carbon actions into tangible public welfare outcomes. It broadens the channels for public participation in biodiversity conservation and provides an innovative example for building an ecological governance system with universal participation.



Figure 5.1 Public welfare certificates issued to users by “Tianfu Carbon Credits”

### 5.3 Carbon Inclusion and ESG

The integration of the carbon inclusion mechanism and ESG (Environmental, Social, Governance) essentially transforms ESG's "macro responsibility goals" into "micro-participatory actions." By activating scattered emission reduction behaviors of the public and micro-enterprises, the carbon inclusion mechanism provides quantitative support for the "environmental dimension" of corporate ESG, injects inclusion attributes into the "social dimension," and forces enterprises to improve data transparency in the "governance dimension" of ESG. Ultimately, it forms a two-way collaborative pattern where "corporate ESG needs drive the implementation of carbon inclusion mechanisms, and carbon inclusion practices feed back the upgrading of ESG value." This integration not only shifts ESG from internal corporate compliance to universal public participation but also enables the carbon inclusion mechanism to gain market-driven demand support beyond policy incentives, making it a key bridge connecting the "dual carbon" goals and sustainable development. From a specific dimensional perspective, the innovative integration of the two is reflected in three core aspects:

1. **Environmental Dimension:** Providing quantifiable emission reduction increment for corporate ESG indicators such as carbon emission reduction and carbon neutrality in corporate ESG reports often face challenges of single data sources and limited emission reduction scenarios. In contrast, the carbon inclusion mechanism can cover scattered scenarios including personal green travel, community waste classification, and low-carbon technological transformation of micro-enterprises. Enterprises can supplement their own emission reduction gaps (e.g., offsetting part of operational carbon emissions) and incorporate universal carbon reduction into ESG achievements by purchasing personal/community carbon inclusion emission

reductions or launching employee carbon accounts. This approach significantly expands the breadth and persuasiveness of corporate environmental responsibility.

**2. Social Dimension:** Enhancing ESG's inclusionness and participation the core of ESG's social dimension lies in win-win outcomes for stakeholders. The carbon inclusion mechanism effectively breaks the top-down single promotion model of corporate ESG, transitioning to a diversified pattern of "enterprise guidance, public participation, and benefit for vulnerable groups." This not only aligns with ESG's social equity requirements but also extends corporate ESG from mere corporate responsibility to people's livelihood empowerment, enabling all sectors of society to participate in and benefit from sustainable development.

**3. Governance Dimension:** The core of ESG governance is data authenticity and traceable processes. Relying on blockchain and big data technologies, the carbon inclusion mechanism achieves "real-time quantification and tamper-proofing" of emission reduction behaviors, precisely addressing the pain points of corporate ESG environmental data—difficulty in self-verification and susceptibility to greenwashing. When enterprises include carbon inclusion emission reductions in their ESG reports, they must simultaneously disclose the accounting methods, data sources, and benefit distribution processes of carbon inclusion projects. This forces enterprises to establish more standardized ESG data governance systems. Additionally, the third-party verification mechanism of carbon inclusion platforms (e.g., certification by local ecological departments and professional institutions) enhances the credibility of corporate ESG environmental data. Enterprises can directly connect certified data to ESG reporting systems, avoiding the risk of data fraud and improving the stability of ESG ratings.

Looking ahead, we can promote the transition from superficial integration to in-depth symbiosis between the two by establishing "carbon inclusion-ESG data docking standards," incorporating carbon inclusion emission reductions into ESG rating reference indicators, and standardizing the benefit distribution mechanism of corporate carbon inclusion projects. Ultimately, this will achieve a win-win situation for improving corporate ESG value, realizing public green rights and interests, and advancing social sustainable development.

- **Integration and Innovation Case: NaaS Carbon Account**

NaaS's carbon account serves as the core carrier and innovative starting point for the implementation of its ESG strategy. Through a three-pronged approach of "quantifying personal emission reduction value, linking industrial green transformation, and building a transparent governance system," it deeply integrates the environmental, social, and governance dimensions of ESG into the entire industrial chain of new energy charging. This not only promotes the advancement of the enterprise's own sustainable development but also provides a replicable "NaaS Solution" for ESG practices in the transportation energy sector. The core value of the carbon account lies in converting charging-related emission reduction behaviors into quantifiable and tradable carbon assets, which serve as the cornerstone for the environmental dimension of NaaS's ESG. Relying on independently developed charging carbon emission reduction methodologies, NaaS has established a closed loop of "charging behavior → emission reduction accounting → carbon credit confirmation." For each kilowatt-hour of electricity charged by new energy vehicles, 0.5-0.8kg of CO<sub>2</sub> emission reduction can be verified, and this data is converted into carbon credits at a 1:1 ratio and recorded in users' accounts. By the end of 2024, the number of carbon account users exceeded 1 million, and the total charging-related carbon emission reduction in 2024 reached 3.2249 million tons—equivalent to the carbon sequestration capacity of planting 180 million trees .

Driven by the carbon account, NaaS has extended charging services from end-use emission reduction to full-chain carbon reduction—sourcing 81.14% of its electricity from clean energy and deploying

integrated PV-storage-charging projects at charging stations . This dual-drive model combining user-side emission reduction and industrial carbon reduction has earned NaaS international authoritative recognition, including a Grade A rating in CDP Climate Change Questionnaire and ranking among the top 1% globally in the S&P Global Corporate Sustainability Assessment 2024. NaaS's carbon account is not merely a single emission reduction tool but a value link connecting the three ESG dimensions: carbon emission reduction in the environmental dimension provides the value foundation for social participation; public engagement in the social dimension offers practical scenarios for governance standardization; and compliance and transparency in the governance dimension guarantee the realization of environmental value. This synergistic effect has not only led NaaS to be included in Bloomberg Green's "China ESG 50" list and awarded the "ESG Pioneer 60" enterprise title but also established it as a global benchmark in the new energy charging sector through its outstanding ESG rating performance over the past year—achieving the highest score in the Asia-Pacific region in Sustainable Fitch ESG Entity Rating and ranking first among Chinese peers and seventh globally in the S&P Global Corporate Sustainability Assessment (S&P Global CSA).



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**NaaS Technology Inc.**  
Retail Industry



**China Corporate S&P Global CSA 2024 Score**

72/100 | March 31, 2025

Figure 5.2 NaaS ranked "Top 1%" in S&P Global Corporate Sustainability Assessment (CSA) 2024

**●Integration and Innovation Case: Hubei Hongtai Group's "Zero-Carbon State-Owned Enterprise" Employee Participation Case**

As a representative of provincial-level state-owned enterprises, Hubei Hongtai Group has actively explored an innovative path for the in-depth integration of the carbon inclusion mechanism and ESG

governance system, forming a closed-loop model for carbon neutrality within state-owned enterprises. In 2024, with its headquarters building as a pilot, Hongtai Group launched its self-developed "Zhongtan Cloud" energy and carbon dual-control platform, systematically conducting online carbon emission accounting, energy-saving renovation of existing buildings, and refined energy management to reduce office and operational carbon emissions at the source. For unavoidable carbon emissions, Hongtai Group innovatively designed a "carbon neutrality crowdfunding" mechanism. Relying on the "Low-Carbon Enterprise" module of the "Zero Carbon Together" platform, it established corporate carbon accounts and a low-carbon ranking list, guiding cadres and employees to accumulate personal emission reductions through low-carbon behaviors such as commuting by public transport, new energy vehicle charging, and garbage classification and recycling, which are then donated to the group to offset the operational carbon emissions of the headquarters building. This mechanism has effectively driven the participation of 19 subsidiaries and nearly 2,000 employees of Hongtai Group, achieving an annual emission reduction of 324 tons. It not only enhances employees' low-carbon awareness but also provides an inclusion internal solution for the enterprise to achieve operational carbon neutrality. Building on this, in 2025, Hongtai Group jointly initiated the "Zero-Carbon State-Owned Enterprise" campaign with 14 other provincial-level state-owned enterprises, promoting the pilot experience to a wider scope and providing a Hubei sample for state-owned enterprises to build an ESG practice system of "full-staff participation and internal-external synergy." Hongtai Group's practice not only innovates the path to corporate carbon neutrality but also extends the carbon inclusion mechanism from the "public end" to the "enterprise end," proving that the carbon inclusion mechanism can be an important starting point for corporate ESG construction. It reduces the cost of corporate carbon neutrality through employee participation, strengthens employees' low-carbon consensus, and improves the quality of corporate ESG disclosure, providing a highly valuable practical sample for the carbon inclusion mechanism to serve the real economy and support the construction of "zero-carbon enterprises."

## 5.4 Carbon Inclusion and Characteristic Culture

The integration of carbon inclusion and characteristic culture essentially uses "cultural warmth to activate carbon reduction motivation." It embeds cultural elements such as local folk customs, intangible cultural heritage techniques, historical IPs, and rural customs into the scenario design, incentive mechanisms, and communication links of carbon inclusion, upgrading scattered low-carbon behaviors from task-based participation to emotional identification. This not only infuses carbon inclusion with unique regional cultural symbols but also enables characteristic culture to find new inheritance carriers and communication paths in the "dual carbon" era, ultimately forming a two-way win-win pattern where "carbon reduction empowers cultural inheritance and culture feeds back carbon reduction popularization."

### ● Low-Carbon Scenic Spots on Chengdu's "Tianfu Carbon Credits" Platform

In building its carbon inclusion mechanism, Chengdu has deeply explored the cultural value of ancient Shu civilization, the Three Kingdoms period, giant pandas, Sichuan cuisine, Sichuan wine, and other local elements, closely integrating local characteristic cultural resources with the promotion of low-carbon behaviors to create low-carbon cultural and educational scenarios with Chengdu characteristics. At the same time, it has incorporated public cultural and sports facilities such as museums, libraries, and stadiums into the carbon inclusion system, covering content including historical backgrounds, cultural characteristics, check-in routes, and interesting quizzes. This not only expands the channels for the public to obtain carbon points but also constructs low-carbon scenarios with cultural connotations.



Figure 5.3 Screenshot of the low-carbon scenic spot product on “Tianfu Carbon Credits” Platform

Giant panda culture is Chengdu's most prominent urban calling card. Therefore, in 2022, the Chengdu Research Base of Giant Panda Breeding became one of the offline low-carbon consumption scenarios in the scenic spot category of Chengdu's "Tianfu Carbon Credits" platform. Subsequently, the "Tianfu Carbon Credits" Green Public Welfare Platform has continued to carry out in-depth cooperation with the base.

In terms of low-carbon scenarios, it has meticulously built an online giant panda museum, innovatively achieving the in-depth integration of the carbon inclusion mechanism and panda culture. Empowered by digital technology, users can start the "cloud tour of the museum" experience with just a touch on their mobile devices. While appreciating the morphological characteristics of giant pandas at various growth stages and systematically learning about their living habits and the development history of species protection, users can also accumulate carbon points by participating in interactive tasks such as low-carbon knowledge quizzes and sharing green life practice experiences set in the museum. As of July 2025, the redemption of tickets and popular science magazines provided by the Chengdu Research Base of Giant Panda Breeding has cumulatively consumed nearly 400 million carbon points from citizens. According to preliminary statistics, this incentive model has directly driven citizens to practice low-carbon behaviors about 5 million person-times. Every learning of panda culture knowledge and every sharing of green concepts are closely linked to the practice of low-carbon behaviors.

In terms of publicity and promotion, it has jointly carried out various forms of popular science publicity activities for four consecutive years on relevant occasions such as World Earth Day, World Environment Day, and International Giant Panda Conservation Day. Combining biodiversity conservation, giant panda

popular science with the theme of green and low-carbon environmental protection, supplemented by incentive mechanisms such as scenic spot tickets, it guides the public to practice the concept of green and low-carbon life, significantly enhancing the enthusiasm and sustainability of public participation.

This innovative model not only endows the profound panda culture with a new carrier for digital communication, helping it reach the public extensively, but also leverages the high social attention and influence of giant pandas to promote the deep integration of low-carbon concepts into public life, continuously injecting new momentum into the city's green development.



Figure 5.4 Screenshot of the low-carbon scenic spot product page on “Tianfu Carbon Credits” Platform

#### ● Integration and Innovation Case: “Sanjin Green Life” Supports Shanxi's First Low-Carbon Themed Tourist Trail

On June 20, 2025, the Shanxi Provincial Department of Ecology and Environment, the Department of Culture and Tourism, and the Provincial Administration of Cultural Heritage jointly launched Shanxi's first low-carbon themed tourist trail — “Seeking Climate Imprints: A Journey of Time and Temperature in Shanxi” — at the Shanxi Museum. This trail is an exploration based on the Declaration on the Protection of Cultural Heritage Under Climate Change issued by Shanxi Province in 2024. It aims to promote the in-depth integration of cultural heritage protection and low-carbon development, further enhance the public's understanding of the relationship between climate change and cultural heritage protection, explore new forms of climate change popular science, tell Shanxi's green and low-carbon stories well, and encourage all sectors of society to actively practice low-carbon concepts and participate in cultural heritage protection. Linked by climate change, the trail connects 12 representative cultural heritage sites in the province, starting from the Yungang Grottoes in the north and ending at the Yongle Palace in the south. Along the route are included the Yingxian Wooden Pagoda, Chongfu Temple, Wutai Mountain, Foguang

Temple, Jinci Temple, Pingyao Ancient City, Xiaoxitian Temple, Taosi Site, Qinglian Temple, and Yuhuang Temple. Through the "cultural heritage + low-carbon guardianship" model, it constructs an innovative path for cultural heritage protection and green development under the background of climate change.

Relying on Shanxi's carbon inclusion platform — the "Sanjin Green Life" mini-program — the trail innovatively builds a closed-loop mechanism of "cultural tourism experience → low-carbon actions → rights and interests redemption". The public can accumulate carbon points by checking in via location to redeem themed cultural and creative products. Meanwhile, during the tour, the public can learn about the climate challenges faced by cultural heritage sites through the "Sanjin Green Life" mini-program and the trail's "Pass Document", engaging in a dialogue across time and space.



Figure 5.5 Display map of Shanxi's low-carbon themed tourist trail

## 5.5 Carbon Inclusion and RWA

First, from the perspective of carbon credits, geographic, standard, and methodological fragmentation has severely restricted carbon market liquidity. There are more than 200 different methodologies across the world's five major standard-setting bodies, and each carbon credit represents a unique combination of attributes, thereby resisting substitutability. In 2024, the global voluntary carbon credit trading price fluctuated between \$0.25 and \$100 per ton, with "retired credits" commanding a premium of approximately 381% compared to tradable credits, and carbon credits from recent years carrying a premium of about 217% over older credits. Tokenization significantly enhances liquidity through fragmentation and standardization mechanisms. Traditional carbon credits are typically traded as indivisible units, while tokenized credits can be split to 18 decimal places, enabling consumers to precisely purchase offsets

that match their own emissions. Through the "carbon pooling" mechanism, heterogeneous credits can be aggregated into standardized tokens. For example, Toucan Protocol's Base Carbon Tonne (BCT) pool accepts post-2008 Verra credits from nature-based projects, thereby creating substitutable tokens. At the same time, mainstream financial institutions are actively deploying tokenized carbon credit infrastructure. In 2022, the International Finance Corporation (IFC) provided \$10 million in seed funding to the Carbon Opportunities Fund, focusing on tokenized carbon credit projects integrated with the Climate Action Data Trust (CADT) on the CHIA blockchain—a green, low-energy distributed ledger network. CADT is a data-sharing platform led by the World Bank, designed to aggregate carbon credit metadata from major carbon registries (such as Verra, Gold Standard, American Carbon Registry, etc.) and support transparent cross-registry tracking and duplicate detection. In June 2023, the fund completed its first transaction with Sumitomo Corporation of Americas (SCOA), minting and trading 10,000 tons of tokenized carbon credits. IFC officials emphasized that these initial projects in Latin America help validate the CAD Trust framework proposed by the International Emissions Trading Association (IETA) and advance the standardization and investability of carbon credits in global financial markets.

On the banking front, Carbonplace, a banking alliance including BNP Paribas, Standard Chartered, and UBS, launched a shared settlement layer pilot in 2022 to provide institutional-grade infrastructure support for tokenized carbon trading. PwC analysis points out that banks actively participating in the development of tokenized carbon credit mechanisms can not only demonstrate their strategic commitment to addressing climate change but also gain network effects through alliance cooperation, enhancing market influence and business innovation capabilities. These initiatives indicate that major financial institutions are shifting from mere market participants to providers and promoters of digital carbon market infrastructure.

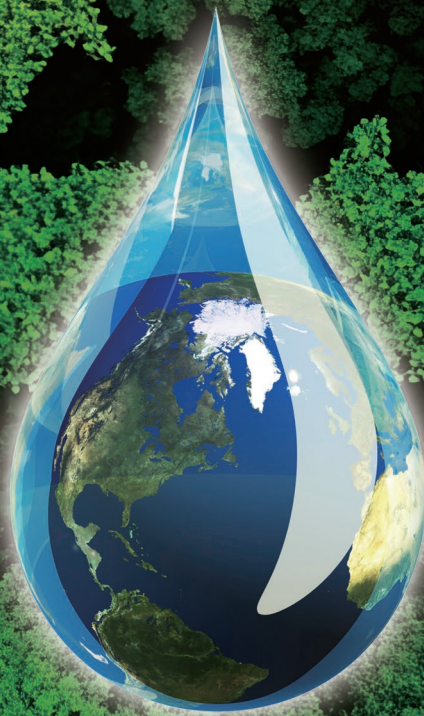
On the carbon exchange side, AirCarbon Exchange (ACX) obtained regulatory approval from the Abu Dhabi Global Market (ADGM) Financial Services Regulatory Authority in November 2022, becoming the world's first fully regulated tokenized carbon exchange. ACX's blockchain infrastructure provides transparent, tamper-proof ownership and transaction records for carbon credits while complying with traditional financial regulatory frameworks, verifying the compatibility of tokenized carbon credits with compliant supervision. The exchange also offers key institutional-grade functions such as settlement, custody services, and real-time asset valuation, providing a complete infrastructure for financial institutions to participate in the digital carbon market.

In summary, the feasibility of carbon credit tokenization in terms of regulatory compliance and financial infrastructure adaptation has laid a technical foundation and market consensus for the integration of real-world assets (RWA) and carbon-related assets. In this context, carbon inclusion—focused on incentivizing low-carbon behaviors among individuals and small-to-medium entities—faces challenges in scaling the monetization and value circulation of its decentralized, small-ticket carbon reductions. The core logic of RWA, which converts real assets into standardized digital tokens, aligns closely with the scenario attributes and incentive needs of carbon inclusion, thereby spawning an innovative integration mechanism between carbon inclusion and RWA.

In the future, the in-depth integration of carbon inclusion and RWA can break the dual predicament of "no value in individual carbon reduction" and "difficulty in corporate transformation financing." By using financial tools to convert scattered low-carbon behaviors into quantifiable, tradable, and monetizable "green assets," it will build a new closed loop of "micro-emission reduction → asset confirmation → financial empowerment → ecological value addition." This innovation not only injects market vitality into carbon inclusion but also positions finance as a core link connecting public participation, corporate transformation, and the "dual carbon" goals.

6

# Development Suggestions and Future Outlook



## 6. Development Suggestions and Future Outlook

Over the past year, China's carbon inclusion mechanism has developed vigorously, with a number of innovative practices in mechanism design, technology integration, and scenario expansion formed in various regions, accumulating valuable experience for system deepening and large-scale promotion. However, the operation of the mechanism still faces many unresolved challenges: inconsistent accounting methods and carbon credit value standards across provinces and cities hinder the cross-regional circulation and mutual recognition of carbon emission reductions; insufficient participation coverage among specific groups, with prominent digital divides and scenario mismatches; limited depth and breadth of financial support, and the value conversion path of carbon assets has not been fully opened; international exchanges and cooperation as well as standard alignment are also relatively lagging. Looking forward, to promote the high-quality development of the national carbon inclusion system and transition from "local pilots" to "national coordination", efforts can be focused on the following key directions:

- **Policy Level:** Issue the National Guidelines for Carbon Inclusion System Construction to clarify the emission reduction scenarios and projects included in the construction of the carbon inclusion mechanism, and provide reference methodologies or standards for carbon emission reduction accounting. At the same time, encourage provinces and cities to develop characteristic methodologies and scenarios based on local industrial characteristics, resource endowments, and digital foundations. Support the formation of a multi-stakeholder collaborative carbon inclusion ecological network involving "government, enterprises, and the public" with cross-industry data interconnection, and cultivate a number of industry-level aggregation platforms to realize the diversified development of the carbon inclusion system under unified norms. Encourage exploration to promote the cross-regional recognition and circulation of carbon inclusion emission reductions, and use them as quota surrender offsets in the national carbon market or regional pilot carbon markets. Meanwhile, enrich their application scenarios in fields such as ESG disclosure, ecological compensation, and financial credit to comprehensively enhance the value and liquidity of carbon inclusion assets.

- **Technology Level:** Encourage carbon inclusion platforms to widely apply technologies such as the Internet of Things (IoT), blockchain, and artificial intelligence (AI) to improve the accuracy of data collection and verification efficiency, achieve "traceability and tamper-proofing", and ensure data security. Through "unconscious" recording and other methods, enhance user participation while ensuring convenience. Improve the intelligence level of platforms and optimize user experience by connecting to AI platforms such as DeepSeek and Doubao. At the same time, it is recommended that each platform adopt the "five-star evaluation system" mentioned in the first chapter of this book to conduct a comprehensive evaluation of its own platform, and continuously optimize and iterate platform mechanisms and products.

- **Market Level:** Ensuring stable and diversified absorption channels for carbon inclusion emission reductions is the key to maintaining the vitality of the mechanism. First, we can consider "taking the opportunity of dual control of carbon emissions" in some regions to guide specific enterprises to purchase a certain proportion of carbon inclusion emission reductions. At the same time, fully implement the carbon neutrality policies for large-scale activities and zero-carbon park construction to create stable demand. Promote the value closed-loop model of "public emission reduction → platform aggregation → product neutralization" nationwide. The successful application of personal carbon assets in the carbon neutrality of physical products, scenic spots, and enterprises has provided a new path for the green transformation of the consumer goods industry. Encourage more enterprises to integrate the carbon inclusion mechanism

into products and organizational carbon footprint management, so that the public's low-carbon behaviors can directly empower supply chain emission reduction and green brand building, thereby stimulating new trends in green consumption and forming a virtuous cycle of coordinated carbon reduction in production and consumption. At the financial level, explore including the carbon inclusion records of residents and micro-enterprises into the green credit reference system, and encourage banks to provide credit preferential policies based on carbon credits. Meanwhile, explore the development of carbon asset securitization products based on carbon inclusion projects to activate financial vitality.

- **Social Level:** Eliminate participation barriers and enhance the sense of gain for all people. Launch the Carbon Inclusion Entering Communities, Rural Areas, and Schools Initiative, develop carbon inclusion platform products for students and aging-friendly groups, and open offline registration channels to strive for full population coverage. Incorporate carbon inclusion into the grassroots governance system and link it with the selection of civilized families and green communities, forming a co-governance pattern of "government guidance, enterprise leadership, public participation, and public welfare support".

- **International Level:** Strengthen regional and international cooperation and connect with the global market. Encourage enterprises to initiate the formulation of global carbon inclusion governance rules, share Chinese experience, and attract international capital to participate in domestic carbon inclusion projects. Establish a cross-border compliant data circulation mechanism for carbon inclusion to ensure data security.








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