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# 01

## Background of China's Carbon Inclusion Development

### 1. Background of China's Carbon Inclusion Development

#### 1.1. The Concept of Carbon Inclusion

Carbon inclusion is an incentive mechanism that uses daily consumption as a scenario to assign value to the green carbon reduction behaviors of the public, communities and small enterprises. It uses digital technologies such as the Internet, big data, and blockchain to specifically quantify and assign a certain value to the carbon reduction behaviors of small and micro enterprises, community families, and individuals through low-carbon methodology. It uses business incentives, policy encouragement, and certified emission reduction transactions help realize its value, thereby building a "recordable, measurable, profitable and recognized" mechanism for public carbon emission reduction. The goal of this mechanism is to encourage more people to participate in carbon emission reduction activities and convert the public's carbon emission reduction behavior into economic value through market-based means. Under this mechanism, the emission reductions caused by the low-carbon behavior of the public and small and micro enterprises can offset their own carbon emissions, participate in carbon trading, or be converted into other more diversified incentives, which is an important way to reduce carbon emissions in daily life.



Figure 1.1 The operation mechanism of carbon inclusion

Carbon Inclusion is an innovative mechanism for green and low-carbon development. By establishing a positive guidance mechanism for public low-carbon behavior such as business incentives, policy encouragement, and certified emission reduction transactions. It links consumption-side emission reductions and production-side emission reductions, and integrates personal green actions into a torrent of low-carbon development, opening a new window for individuals to participate in emission reduction. It is an important way to



guide the public to participate in green life, a digital tool to encourage the public to practice green lifestyle, an important part of green finance and an critical path for implementing China's "Carbon Peaking and Carbon Neutrality" goals.

## 1.2.The History and Policies of China's Carbon Inclusion

The development process of carbon inclusion can be traced back to before 2008. At that time, as the global climate change problem became increasingly serious, carbon emission reduction became the focus of attention of the international community. In this context, the concept of carbon inclusion began to be proposed. However, at the initial stage, carbon inclusion was only a theoretical concept and no specific practical model was formed. The development of carbon inclusion in China can be traced back to 2011, when the Chinese government proposed a trial of carbon emissions permit trading and launched related research in cities such as Shenzhen.

In 2013, Guangdong Province proposed for the first time the idea of trading the public's emission reductions in the carbon market at the Shenzhen Carbon Market Launch Conference, which laid an early foundation for the development of carbon inclusion in China.

In 2014, Wuhan issued the "Wuhan Low-Carbon Pilot Work Implementation Plan", proposing to strive to achieve the peak of carbon dioxide emissions from energy use by 2020, and basically form a low-carbon production and living model with a demonstration effect.

In 2015, Guangdong Province issued the "Guangdong Province Carbon Inclusion Mechanism Pilot Work Implementation Plan" to carry out the pilot work on carbon inclusion mechanism, selecting communities, public transportation, tourist attractions, and energy-saving and low-carbon products as pilot areas, and released relevant implementation plans and construction guide.

In 2016, Wuhan's "Tanbaobao" was officially launched. Citizens can exchange carbon coins through green travel methods and use them to redeem movie tickets and group buying coupons. This is one of the earliest urban carbon inclusion projects in China. In the same year, Guangdong Province also confirmed six cities including Guangzhou, Dongguan, Zhongshan, Huizhou, Shaoguan and Heyuan as the first batch of pilot cities for the carbon inclusion.

In 2017, the Guangdong Provincial Development and Reform Commission issued the "Interim Measures for the Management of Certified Emission Reductions under Carbon

Inclusion Mechanism". This means that relevant enterprises or individuals in the pilot areas can voluntarily participate in the Puhui Certified Emission Reductions (PHCER) generated by low-carbon behaviors such as reducing greenhouse gas emissions and increasing green carbon sinks, and can access the provincial carbon market.

After 2018, the Chinese government proposed a series of initiatives such as the "Green and Low-Carbon National Action", which further promoted the development of carbon inclusion. Subsequently, Hebei, Henan and other provinces also began the planning and pilot construction of carbon inclusion mechanism.

After China proposed dual carbon targets in 2020, it took the "Green and Low-carbon National Action" as one of the important measures to achieve the goal of carbon peaking and carbon neutrality, striving to maximize the potential of all forces in society. The carbon inclusion mechanism once again entered the fast lane with the promotion of related policies.

In January 2021, six departments including the Ministry of Ecology and Environment jointly released the "' Beautiful China, I Am an Actor' Action Plan to Raise Citizens' Ecological Civilization Awareness (2021-2025)", which clearly proposed to establish and improve a green life incentive and feedback mechanism to promote Green lifestyle has become an active and conscious choice of the public. In October of the same year, the State Council's top-level design document "Action Plan for Carbon Dioxide Peaking Before 2030" planned the "Ten Major Actions for Carbon Peaking", including the need to carry out green and low-carbon national actions. In the same month, in the report "China's Achievements, New Goals and New Measures for Nationally Determined Contributions" submitted to the United Nations, it was clearly stated that a long-term mechanism for "carbon inclusion" would be established.

In January 2022, the National Development and Reform Commission and other departments issued the "Implementation Plan on Promoting Green Consumption". Under the plan, green consumption patterns will become a conscious choice, and green and low-carbon products will become mainstream by 2030. A sound green consumption system, policies, and institutional mechanisms will also be established.

Two major reports released by the Chinese government in October and November 2022 - "China's Policies and Actions for Addressing Climate Change (2022)" and "Progress on the Implementation of China's Nationally Determined Contributions (2022) " both proposed to explore and carry out the innovative voluntary emission reduction mechanism - carbon inclusion, encourages the whole society to participate in carbon emission reduction.

On November 6, 2023, the National Development and Reform Commission issued the "National Carbon Peaking Pilot Construction Plan", which proposed that pilot cities and parks should focus on strengthening ecological civilization science education for the public and popularizing basic knowledge of "carbon peaking and carbon neutrality". It is necessary to vigorously promote the concept of green and low-carbon life, promote green consumption, and explore systems and mechanisms for green travel, curbing waste, and garbage classification. It is necessary to guide enterprises and institutions to strengthen energy resource conservation, improve the level of green development, and effectively enhance the theoretical level and professional capabilities of cadres at all levels to promote green and low-carbon development.

After the dual carbon goals were proposed, all provinces and cities also actively participated in the construction of the carbon inclusion mechanism. Since 2021, many provinces and cities have proposed the development of a carbon inclusion mechanism at the policy promotion level. At present, Shaanxi, Chongqing, Hebei, Tianjin, Hubei, Zhejiang, Hainan, Shanghai, Jiangsu, Guangdong, Jiangxi, Beijing, Ningxia, Shandong and Guangzhou, Luzhou, Shenzhen, Suzhou, Wuhan, Qingdao and other provinces and cities have introduced policy documents on carbon inclusion. Among them, Hainan, Shanghai, Tianjin, Shenzhen, Wuhan, Qingdao and other places have introduced detailed construction plans and online platforms for carbon inclusion.

Region	Policy
Shandong	"Shandong Province Carbon Inclusion System Construction Work Plan"
Qingdao	"Qingdao Carbon Inclusion System Construction Work Plan"
Tianjin	"Tianjin Carbon Inclusion System Construction Plan", "Tianjin Carbon Inclusion Management Measures (Trial)"
Guangdong	"Guangdong Province Carbon Inclusion Mechanism Pilot Work Implementation Plan", "Guangdong Province Carbon Inclusion Trading Management Measures"
Guangzhou	"Guangzhou Carbon Inclusion Voluntary Emission Reduction Implementation Measures"
Shenzhen	"Shenzhen Carbon Inclusion System Construction Work Plan", "Shenzhen Carbon Inclusion Management Measures"
Shanghai	"Shanghai Carbon Inclusion System Construction Work Plan", "Shanghai Carbon Inclusion Management Measures (Trial)"
Chengdu	"Implementation Opinions of the Chengdu Municipal People's Government on Building a 'Tianfu Carbon Credits' Mechanism", "Chengdu's Action Plan to Deepen the Construction of the 'Tianfu Carbon Credits' Mechanism"
Hebei	"Hebei Province Carbon Inclusion Mechanism Pilot Work Implementation Plan"
Hainan	"Hainan Province Carbon Inclusion Management Measures (Trial)"
Wuhan	"Wuhan Carbon Inclusion Management Measures (Trial) (Draft for Public Comments)", "Wuhan Carbon Inclusion System Construction Implementation Plan (2023-2025)"

Table 1. Carbon inclusion policies of some provinces and cities

Data Sources: Publicly available data on the Internet

### 1.3. The Significance of Developing Carbon Inclusion

As an important supplement to China's multi-level carbon market system, carbon inclusion are of great significance to promoting green and low-carbon development of the whole society. The development of carbon inclusion is of far-reaching and important significance, which is reflected in the following aspects:

#### a) Raise public environmental awareness and drive public participation in carbon emission reduction

The carbon inclusion mechanism allows everyone to participate in carbon emission reduction activities by quantifying individual carbon emission reduction behaviors. At the same time, the carbon inclusion mechanism can stimulate the public's environmental awareness by giving certain economic rewards to the public for their carbon emission reduction behaviors, enable the public to participate more actively in environmental protection activities, thereby promoting a green and low-carbon society.

#### b) Promote the innovative application of carbon management and carbon trading in non-production fields

In the past, the concepts of carbon management and carbon emission reduction were mainly concentrated in the industrial field and production field, and rarely touched on the low-carbon behavior of ordinary people. The carbon inclusion mechanism adopts strict rules and develops a carbon emission reduction credit system to quantify and motivate the general public's low-carbon behavior. The public has a better understanding of carbon trading and has actually benefited from it, and the mass foundation for green transformation in society has become stronger.

#### c) Promote green transformation and upgrading on the consumer side in an orderly manner across society

Low-carbon development has become an important development trend currently. Under the pressure of two constraint indicators, energy consumption and carbon emissions, the carbon inclusion mechanism can not only improve the public's awareness of low-carbon environmental protection and guide the public to develop more low-carbon and healthy living and consumption habits, but also indirectly promote the research, development and application of energy-saving and environmental protection technologies by enterprises from the bottom up at the consumer terminal. Promote low-carbon transformation and upgrading and the formation of green consumption behaviors.

#### d) Explore and promote the innovative development of carbon finance in the field of carbon inclusion

The implementation of the carbon inclusion mechanism will affect the public's consumption patterns to a certain extent, and will also promote financial innovation in the



consumption process of banks and other financial institutions, lay the foundation for the realization of a resource-saving and environment-friendly society, and promote the innovative development of carbon finance and contribute to the construction of ecological civilization in the "the Five-sphere Integrated Plan" of socialism with Chinese characteristics.

**e) Promote scientific and technological innovation in low-carbon industries**

The implementation of the carbon inclusion mechanism needs to rely on advanced scientific and technological means, such as blockchain, Internet of Things, big data, artificial intelligence, etc., which can not only promote the development of related technologies, but also promote the innovation of environmental protection technologies.

**f) Help to achieve the goal of carbon peaking and carbon neutrality**

The implementation of the carbon inclusion mechanism can effectively reduce carbon emissions and play an important role in achieving China's carbon peaking and carbon neutrality goals.

Generally speaking, carbon inclusion can mobilize and inspire the public to actively participate in carbon neutrality actions, visualize the contribution of a wide range of groups and individuals to the dual carbon goals, and is a typical application of digital carbon neutrality. And it is an important manifestation of Xi Jinping's Thought on Ecological Civilization, It is an effective measure to promote the formation of a green lifestyle. It is of great significance to accelerating the process of ecological civilization, promoting high-quality economic and social development, and realizing the sustainable development goals.

# 02

## Carbon Inclusion Methodology



## 2. Carbon Inclusion Methodology

The carbon Inclusion methodology refers to a technical guidance document used to standardize the baseline identification, additionality demonstration, emission reduction accounting and monitoring plan formulation of carbon emission reduction projects or carbon emission reduction behaviors in specific areas. Methodologies are generally divided into carbon emission reduction project methodology and carbon emission reduction scenario methodology.

The carbon inclusion methodology is an important technical means to achieve carbon inclusion. It is of great significance for promoting carbon emission reduction and achieving sustainable development. The development of carbon inclusion methodology should be in areas that are in line with national and regional ecological civilization policy orientations, have synergistic benefits such as carbon reduction, pollution reduction, green expansion, and growth, and are conducive to guiding the green and low-carbon development of society. Different categories of methodologies should be formulated based on principles such as scientificity, reliability, and inclusiveness to promote different consumption channels for different types of emission reductions.

Whether it is a carbon emission reduction project or a scenario, it should be carried out according to the published methodology. First, the carbon emission reduction can be quantified through the methodology. According to the data model of the methodology, the project or public low-carbon scenario behavior can be analyzed.

Through monitoring and data analysis, we can obtain the specific value of the emission reduction amount of the project or scenario behavior. Then the data quality and accuracy can be improved through methodology, and the public can clearly understand how their emission reduction behavior is recorded and quantified, thereby enhancing the public's trust and participation in the mechanism, and further increasing the transparency and credibility of carbon inclusion platform, which providing reliable data support for the subsequent carbon trading market. Finally, through methodology, the establishment of cross-industry cooperation can be promoted. The carbon inclusion methodology encourages cooperation between different fields and industries to jointly promote green and low-carbon development. This cross-industry cooperation helps break down industry barriers and promote exchanges and cooperation among various industries.

At present, many provinces and cities have developed and formulated relevant carbon inclusion methodologies.

Region	Methodology
Guangdong	"Carbon Inclusion Methodology for Forestry Carbon Sink", "Carbon Inclusion Methodology for Installing Distributed Photovoltaic Power Generation Systems", "Carbon Inclusion Methodology for Using High-efficiency Energy-saving Air Conditioners", "Carbon Inclusion Methodology for Using Household Air Source Heat Pump Water Heaters", "Carbon Inclusion Methodology of Waste Clothing Reuse", "Guangdong Province Mangrove Forests Carbon Inclusion Methodology (2023 Edition)"
Guangzhou	"Guangzhou Internet Rental Bike Cycling Carbon Inclusion Methodology (Trial)"
Shenzhen	"Shenzhen Low-Carbon Public Travel Carbon Inclusion Methodology (Trial)", "Shenzhen Residents' Low-Carbon Electricity Carbon Inclusion Methodology (Trial)", "Shenzhen Forest Management Carbon Inclusion Methodology (Trial)"
Shanghai	"Shanghai 'Hutanxing' Low-carbon Travel Carbon Emission Reduction Methodology (Trial)"
Hainan	"Hainan Province Mangrove Afforestation/Reforestation Carbon Sequestration Project Methodology"
Sichuan	"Carbon Inclusion Project Methodology for Conservation and Restoration of Giant Panda Habitat"
Chengdu	"Chengdu 'Tianfu Carbon Credits' Mechanism Carbon Emission Reduction Project Methodology (First Batch)"
Chongqing	"Chongqing 'Tanhuitong' Methodology"
Beijing	"Beijing Carbon Emission Reduction Methodology for Low-Carbon Travel (Trial)", "Beijing Carbon Emission Reduction Methodology for Passenger Car (Oil to Electric) Travel (Trial)"
Shandong	"Shandong Province Seagrass Bed Carbon Sink Carbon Inclusion Methodology"
Qingdao	"Qingdao Low-Carbon Travel Carbon Inclusion Methodology (Trial)"
Wuhan	"Carbon Inclusion Methodology for Operation of Distributed Photovoltaic Power Generation Projects in Wuhan (Trial)", "Carbon Inclusion Methodology for Large-Scale Poultry Manure Resource Utilization in Wuhan (Trial)", "Carbon Inclusion Methodology for Low-carbon Electricity Consumption for Residents Based on Electricity Demand Response in Wuhan (Trial)"
Yueqing	"Yueqing Distributed Photovoltaic Power Generation System Carbon Inclusion Methodology"

Table 2. Carbon inclusion methodologies of some provinces and cities

Data Sources: Publicly available data on the Internet





# 03

## Carbon Inclusion Emission Reduction Projects and Scenarios

### 3. Carbon Inclusion Emission Reduction Projects and Scenarios

#### 3.1. Carbon Inclusion Emission Reduction Projects

Carbon inclusion emission reduction projects refer to local government agencies, enterprises and institutions, social groups, other social organizations and other project owners. They refer to projects that can produce carbon inclusion emission reductions and are developed based on the carbon inclusion methodology established by local governments. Emission reduction project development entities can participate as project owners in the review and approval of carbon inclusion emission reduction projects and the verification, filing, trading and other activities of their emission reduction. The unit in charge of project review will organize relevant professional technical service agencies to review the implementation of emission reduction projects. After passing the review, the emission reduction amount of the project will be issued through the carbon inclusion management and operation platform. Certified emission reductions can be traded through local carbon exchanges. At present, Guangdong, Chongqing, Chengdu and other places have actively carried out the construction of carbon inclusion emission reduction projects, and formed a closed loop of project methodology, application, review, issuance and transaction in the fields of forestry, marine carbon sinks, distributed renewable energy and other fields.

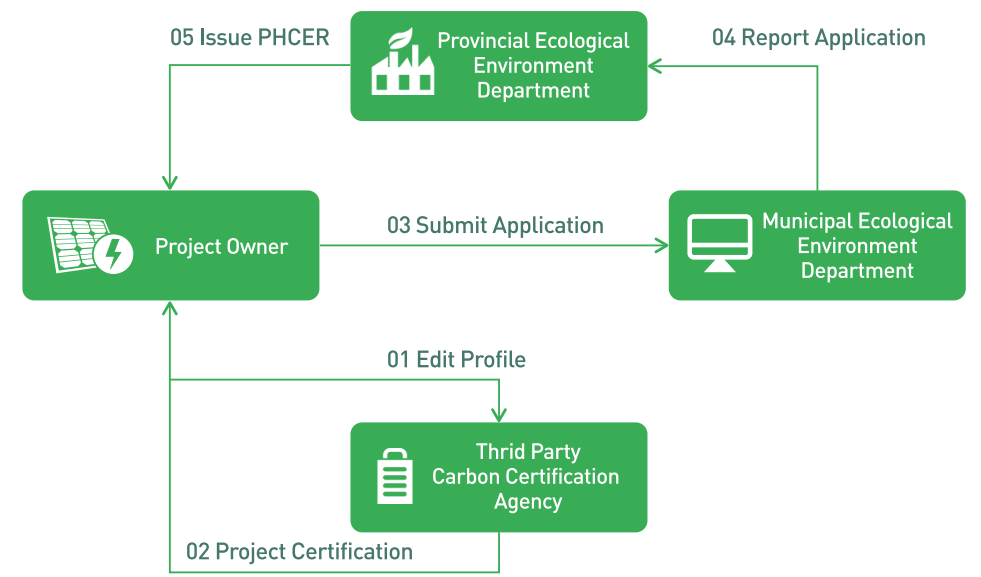


Figure 3.1 The review process of PHCER project in Guangdong province



### 3.2. Carbon Inclusion Emission Reduction Scenarios

Emission reduction scenarios are an important part of the carbon inclusion system. establish public carbon inclusion emission reduction scenarios and gradually formulate and establish carbon emission reduction evaluation specifications and scenarios covering personal life areas such as clothing, food, housing, transportation and use, actively promoting green and low-carbon lifestyles and providing diversified path choices for the public to participate in carbon emission reduction activities. These are effective ways and important starting points to realize and improve the carbon inclusion system. Currently, based on the accuracy of scenario accounting, it can be divided into quantitative emission reduction scenarios and qualitative emission reduction scenarios. The quantitative category has relatively clear accounting boundaries, while the qualitative category means that the accounting boundaries are relatively indistinct and cannot be accurately calculated. For example, in scenarios such as garbage classification and cleaning plate campaign, a common reference value may be used for accounting.

#### a) Green Travel

Green travel is an important scenario of carbon inclusion. In this scenario, the public can reduce carbon emissions by choosing to participate in public transportation, riding bicycles/electric bicycles, walking, charging/driving new energy vehicles, stopping fuel vehicles, and digital refueling. Different green travel scenarios also have different amount of carbon emission reductions. For example, in the relevant carbon inclusion methodology, walking is the most convenient green travel choice, and each kilometer of walking can reduce carbon dioxide emissions by about 0.04 kg. Due to the great differences in basic information such as transportation infrastructure and population in different cities, the carbon emission baselines of high-carbon travel in each city are different, and the methodologies for carbon reduction related to travel in each city are also different. Taking Qingdao and Shanghai as examples, the carbon emission factors of high-carbon travel are 0.202kgCO<sub>2</sub>/PKM and 0.140kgCO<sub>2</sub>/PKM respectively. Therefore, compared with the baseline carbon emissions, the carbon emission reductions of each green travel scenarios are also different. The carbon emission reduction factors of subway travel in Qingdao and Shanghai are 0.089kgCO<sub>2</sub>/PKM and 0.092kgCO<sub>2</sub>/PKM respectively, that of bus travel are 0.741kgCO<sub>2</sub>/P and 0.371kgCO<sub>2</sub>/P respectively, and that of bicycles are 0.202kgCO<sub>2</sub>/PKM and 0.140kgCO<sub>2</sub>/PKM respectively. Specific data can be found in Table 3 and Table 4. (“/PKM” means “per person per kilometer”)

Travel Mode	Carbon Emission Reduction Factor
Baseline	0.202kgCO <sub>2</sub> /PKM
Subway	0.089kgCO <sub>2</sub> /PKM
Bus	0.741kgCO <sub>2</sub> /P
Bicycle	0.202kgCO <sub>2</sub> /PKM
Electric Powered Bicycle	0.193kgCO <sub>2</sub> /PKM
New Energy Vehicles	0.153kgCO <sub>2</sub> /PKM

Table3. The Carbon Emission Reduction Factors of Green Travel in Qingdao (2021)

Data Sources: “Qingtanxing” platform

Travel Mode	Carbon Emission Reduction Factor
Baseline	0.140kgCO <sub>2</sub> /PKM
Bicycle	0.092kgCO <sub>2</sub> /PKM
Bus	0.371kgCO <sub>2</sub> /P
Bicycle	0.140kgCO <sub>2</sub> /PKM
New Energy Vehicles	0.100kgCO <sub>2</sub> /PKM

Table4. The Carbon Emission Reduction Factors of Green Travel in Shanghai (2021)

Data Sources: “Hutanxing” platform

New energy vehicles use electric energy, which can significantly reduce carbon emissions compared to traditional fuel vehicles. According to the methodology provided by NaaS Technology Inc., new energy vehicles can effectively reduce carbon emissions by 0.5 kg-0.8 kg per kilowatt hour of electricity charged based on different power grid areas. In terms of carbon emission reduction when fuel vehicles are stopped, the Beijing Environment Exchange conducted an in-depth analysis of the carbon emission reduction scenario of “voluntarily stopping cars” and adopted a common carbon emission reduction calculation method at home and abroad to calculate different emissions. Then the average daily emission reductions of different displacement models are obtained. Among fuel vehicles, the average daily emission reduction of 1.2 liters and below is 2.58kg of carbon dioxide emissions, the average daily emission reduction of 1.3-1.5 liters is 3.27kg, 1.6-1.9 liters is 3.54kg, and the average daily emission reduction of 2.0 liters and above is 4.55kg when stopped. In the field of digital refueling, according to the “Technical Specification for Carbon Emission Reduction Assessment of Digital Fueling Methods - Fuel Vehicle” group standards, it is found that refueling through the online App can effectively reduce the waiting time for vehicles behind by an average of 2 minutes. Each fuel vehicle can reduce carbon emissions by about 0.0076kg in a refueling through the online App.



Green travel is currently the most widely developed carbon inclusion scenario and is also the scenario with the highest participation. The public obtains corresponding carbon emission reductions and carbon credits through green travel. The government can also collect the public's opinions through this mechanism and green travel data helps them to understand the public's travel habits, thereby formulating more effective transportation policies and measures, promoting the development of public transportation, reducing the use of private cars, and further reducing carbon emissions.

### b) Green Consumption

Green consumption, also known as sustainable consumption, is a new consumption behavior and process characterized by purchasing green and low-carbon products, moderate consumption, avoiding or reducing damage to the environment, advocating nature and protecting ecology. Green consumption is an important part of the carbon inclusion mechanism. Green consumption should include purchasing green and low-carbon products, App payment, ETC payment, credit card payment, e-CNY payment, plastic free shopping, using electronic contracts and invoices, etc.

Taking electronic contracts and invoices as an example, the emission reduction calculation method is similar, mainly by reducing the use of paper and thereby reducing carbon emissions. In 2022, the third-party electronic contract cloud platform Fadada and the Beijing Green Exchange released China's first "Contracted Carbon Reduction" calculation model, which can calculate the carbon emission reduction amount of each online contract. According to official data, as of the third quarter of 2022, the Fadada platform has signed more than 7 billion contracts and documents. According to the "Contracted Carbon Reduction" calculation model, it has reduced a total of 1.23 million tons of carbon dioxide emissions for users, equivalent to the carbon sequestration of 2,128 square kilometers of forest. In terms of electronic invoices, according to JD Group's ESG report, JD issued over 3.3 billion electronic invoices in 2022, saving approximately 18,500 tons of paper, equivalent to avoiding the felling of 370,000 adult trees and reducing carbon emissions by 17,000 tons.

Green consumption emphasizes that consumers should choose environmental-friendly, and pollution-free products in consumption, adopt reasonable consumption patterns, and use green payment methods for consumption. At the same time, green consumption also advocates consumers to pay attention to the entire life cycle of products, including the acquisition, production, use and recycling of raw materials. Promoting enterprises to adopt environmental-friendly production methods and promote the development of green economy, thereby accelerate the construction of an environment-friendly society.

### c) Green Community

Green communities with carbon inclusion refer to innovative models that promote green

and low-carbon development of communities by adopting carbon inclusion mechanisms and integrating low-carbon concepts into community construction and management. In a carbon inclusion green community, residents can achieve carbon emission reductions by adopting green behaviors such as low-carbon electricity consumption, energy conservation and emission reduction, online payment of water, electricity and gas bills, and garbage classification. At the same time, communities should also actively encourage green and low-carbon lifestyles, such as using solar energy and other clean energy, building green buildings and green public spaces, etc. The construction of a carbon inclusion green community will not only help improve the quality of life of residents, but also help reduce the community's carbon emissions and environmental burden, and help the formation of green and low-carbon lifestyle.

At present, Shenzhen has issued the "Shenzhen Residential Low-Carbon Electricity Carbon Inclusion Methodology (Trial)", which stipulates the accounting process and method for the emission reductions generated by residents through low-carbon use of electricity. It is clarified that residents can participate in the low-carbon electricity of carbon inclusion activities by registering with their real names on the daily electricity bill payment platform, record the emission reductions generated by their low-carbon electricity consumption through the entrusted electricity bill payment platform, and participate in the transaction of certified emission reductions obtained from carbon inclusion activities, thereby receiving a monetary or material reward. According to data disclosed by the Shenzhen Power Supply Bureau, 805,000 households have opened carbon accounts in nearly a year from June 2022 to July 2023, accounting for more than 1/4 of the city's users, and the cumulative carbon reduction amount is about 12,000 tons, equivalent to saving about 4,516 tons of standard coal.

In 2023, Chengdu's "Tianfu Carbon Credits" platform launched the "smart community waste delivery" scenario, taking Wugensong Community in Chengdu High-tech Zone as a pilot. After community residents deliver garbage for recycling in specific location or smart boxes, they can receive additional carbon credits as rewards based on the type and weight of the garbage delivered. As of the end of October 2023, more than 200,000 residents of Wugensong Community have participated in this activity, and a total of 666,100 tons of recyclable garbage, 3,836,300 tons of hazardous waste, 33,500 tons of kitchen waste, and 3,865,500 tons of other garbage have been recycled. The accumulated carbon reduction (reduced carbon dioxide emissions) is approximately 1,300 tons.

In addition to introducing low-carbon concepts into community construction and management, carbon inclusion green communities can also use digital means, such as establishing a digital carbon management platform, promoting smart homes, etc., to achieve real-time monitoring and management of community carbon emissions, providing residents with more convenient, efficient green and low-carbon services.

#### d) Green Catering

The construction of green catering scenarios under the carbon inclusion mechanism can be carried out jointly by catering companies and consumers. Catering companies can achieve carbon reduction by optimizing the procurement process, using local ingredients, choosing green supply chain and clean energy, and using environmental-friendly tableware. The public can achieve carbon emission reductions when consuming food and beverages through behaviors such as cleaning plate campaign, bringing their own cutlery, ordering small portions, takeaway with "no-cutlery" option, and going vegetarian.

Take takeaway with "no-cutlery" option as an example. In 2017, Meituan and Ele.me launched environmental protection programs such as the "Qingshan Plan" and "Blue Planet Plan" respectively. When ordering food, consumers must select "need cutlery" or "no-cutlery" option. Meituan Takeaway told that as of August this year, more than 360 million users have selected the "no-cutlery" option, and the number of "no-cutlery" orders has exceeded 4.7 billion, with a cumulative carbon reduction of approximately 178,000 tons. Ele.me data shows that as of August this year, "no-cutlery" orders have exceeded 1.4 billion, with a cumulative carbon reduction of approximately 53,000 tons.

Take cleaning plate campaign as an example. During the 31st Summer Universiade, more than 210,000 people participated in this campaign through the carbon inclusion platform of Chengdu called "Tianfu Carbon Credits", providing strong support for the Green Universiade.

The significance of green catering for carbon inclusion is to promote public participation in carbon emission reduction, encourage enterprises to adopt environmental protection measures, and jointly promote the green development of the entire catering industry.

#### e) Green Recycling

The green recycling scenario is an important link in the carbon inclusion mechanism, mainly involving the recovery and reuse of recyclables. In the green recycling scenario, recyclables include electronic products, glass, metal, plastics, paper, textiles, furniture, home appliances and other items.

According to the "China Idle Second-hand Trading Carbon Emission Reduction Report" released by Tsinghua University's Institute of Energy and Environmental Economics and other institutions, the carbon emission reduction of a second-hand mobile phone transaction can reach 25kg, and the carbon emission reduction of a refrigerator can be as high as 130kg. Taking the carbon reduction achievements of Zhuanzhuan Group, a

well-known domestic second-hand goods trading platform, in 2022 as an example, the Zhuanzhuan platform, together with its users, has achieved a cumulative carbon emission reduction of 668,000 tons, a cumulative energy consumption reduction of 936.8GWh, and a cumulative transaction volume of over 3.486 million by promoting the circulation of idle items. It is equivalent to protecting 30,000 forest resources.

Product Category	Secondary Category	Minimum Unit Emission Reduction (kg/piece)	Baseline Carbon Emissions Example (kg/piece)
3C Electronic Products	Mobile Phone	~25	iPhone (74.0)
	Other (Tablet PC)	~70	Surface (87.1) DELL notebook (170.2)
Large Items	Household Appliances	~170	LG air conditioner (666.1) Samsung refrigerator (389.4)
	Two-wheeled Vehicles (taking bicycles as an example)	~57	bicycle (66.1)
Clothes		~5	Nike hoodie (7.3)
Books		~0.3	300-page book (1.2)

Table.5 Unit Carbon Emission Reduction of Major Categories

Data sources: China Idle Second-hand Trading Carbon Emission Reduction Report





# 04

## Mechanism Analysis of Carbon Inclusion Platform



### 4. Mechanism Analysis of Carbon Inclusion Platform

Under the guidance of the national strategy of “carbon peaking and carbon neutrality” and the “1+N” top-level document, more local governments and enterprises have encouraged and guided users to develop the values and lifestyle of green consumption and green life by creating carbon inclusion platforms and applications, or releasing diversified incentives, for instance joint launch of green marketing activities with various online platforms.

At present, China's carbon inclusion platforms can be roughly divided into carbon inclusion platforms for the public, carbon inclusion platforms for employees in enterprises, and carbon account applications provided by enterprises for the public. There is little difference in the overall operation of various carbon inclusion platforms. Basically, they rely on carbon inclusion scenarios, calculate the emission reduction of public low-carbon behaviors in low-carbon scenarios according to the corresponding methodologies, and give corresponding carbon credits according to relevant rules. The public users can exchange carbon credits for commercial benefits and public services on carbon inclusion platforms. On some platforms, the carbon emission reduction of the public is available for carbon offset, and users can enter the carbon trading market to offset carbon emission quotas of emission control enterprises.

#### 4.1. Carbon Inclusion Platforms for the Public

Most of the carbon inclusion platforms for the public are established in developed urban areas or areas with perfect local environmental protection. They are basically initiated and established by the local governments and ecological environment bureaus, with a wide range of carbon inclusion scenarios, strict calculation of carbon emission reduction and distribution of carbon credits. They also feature remarkable public understanding and wide application coverage due to the strong publicity and promotion by the government. However, since those platforms exist in the form of independent products with great public involvement, there will be difficulty in operation and the overall activity of such platform is low.

##### a) Chengdu “Tianfu Carbon Credits” Platform

Aiming at promoting the Green and Low-Carbon National Action, “Tianfu Carbon Credits”, as the first platform in China featured by the dual-path carbon inclusion mechanism of “credits for public carbon emission reduction and development and operation of carbon emission reduction for projects”, is another important system innovation based on ecological environmental protection and public welfare and initiated by the government.



Figure 4.1 Political Document and Mini Program Interface of "Tianfu Carbon Credits"

"Tianfu Carbon Credits" is a major innovative and exemplary project and has effectively filled the gap in the platform for the public to practice green and low-carbon behaviors, incorporated a lot of "Chengdu elements", and reflected the characteristics of "benefiting public life, stimulating enterprise potential, transforming ecological value and shaping urban characteristics".

The system relevant to the platform has been basically established. Based on the "Tianfu Carbon Credits" platform, relevant supporting management measures have been taken and evaluation standards for low-carbon consumption scenarios such as stores, supermarkets, restaurants, scenic spots and hotels have been released, with a focus on energy alternatives, resource conservation and ecological protection. 9 carbon emission reduction project methodologies have also been released to standardize the development and accounting of carbon emission reduction projects.

The public path closely follows the brand building of "Three Cities and Three Capitals". While building low-carbon scenarios such as green travel and participating in environmental activities, we also establish low-carbon evaluation standards to guide restaurants, supermarkets, scenic spots, hotels, etc. to implement low-carbon management, thereby

endowing consumption behavior within the scene with low-carbon attributes and enriching the ways for the public to obtain carbon credits. At present, 19 low-carbon and environmental protection behavior scenarios have been launched, including voluntary suspension of fuel vehicles, use of new energy vehicles, shared bicycles, intelligent garbage disposal, large waste recycling, anti food waste, charging/driving of new energy vehicles, and Ecosnapp; Jointly Alipay launched five high-frequency service scenarios, including green medical, real estate query, real estate assessment, and life payment; In combination with the brand building of "three cities and three capitals", 74 low-carbon consumption scenarios were launched offline, including Dujiangyan-Qingcheng Mountain Scenic Area, Chengdu Research Base of Giant Panda, KFC, Pizza Hut, etc.

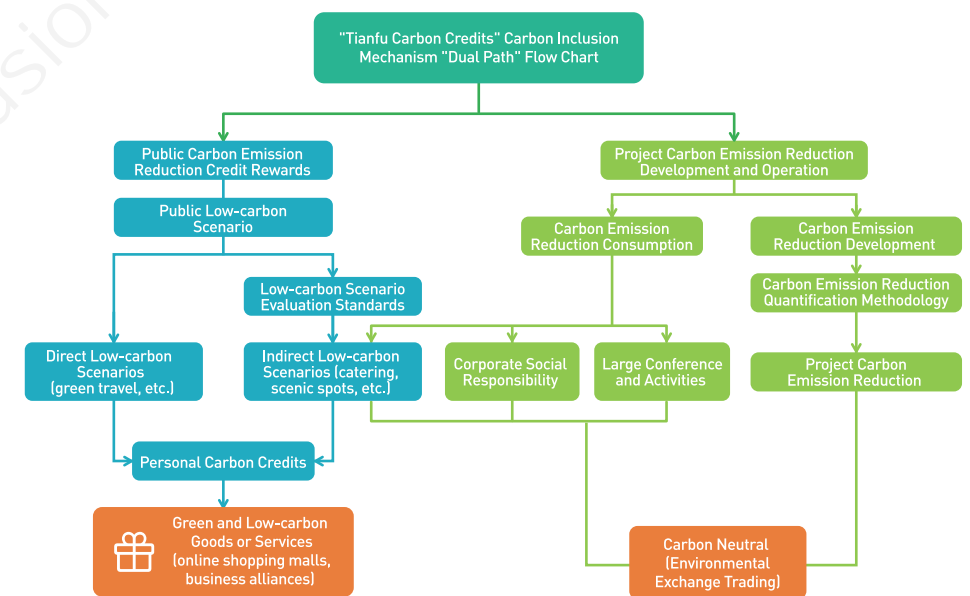


Figure 4.2 "Dual-path" Diagram of "Tianfu Carbon Credits" Carbon Inclusion Mechanism

For the project path, the platform highlights the value conversion in park city. The systematic project methodologies featuring large carbon emission reduction and great environmental benefits are developed to guide enterprises and institutions that implement energy-saving transformation, low-carbon management and ecological protection to develop and trade the carbon emission reduction. So that the environmental benefits generated by ecological construction, energy conservation and carbon reductions projects can present economic value. 82 carbon emission reduction projects have been developed, and more than 590,000 tons of carbon emission reduction have been recorded. 472 organizations including FAW Toyota and SICHUANXWBANK and 4,219 conferences including the 1st China Digital Carbon Neutrality Summit Forum have achieved a cumulated carbon emission reduction



of about 90,000 tons and a purchase amount of about RMB 1.5 million by purchasing the carbon emission reduction from "Tianfu Carbon Credits" and participating in public benefit activities. All those actions have enabled the value conversion of environmental benefits generated by ecological construction, energy conservation and carbon emission reduction of enterprises and institutions.

Low-carbon characteristic brands have taken shape. New media matrices have been built and 120 online and offline publicity activities are held. More than 900 green and low-carbon articles have been published, reflecting over 2.3 million users. Relevant efforts have drawn the attention and been recognized by authoritative organizations such as the State Council and the Ministry of Ecology and Environment of the People's Republic of China and provinces and cities such as Shanghai, Chongqing and Shenzhen. The platform and mechanism have been selected as one of the 28 global cases of natural solutions to climate change.

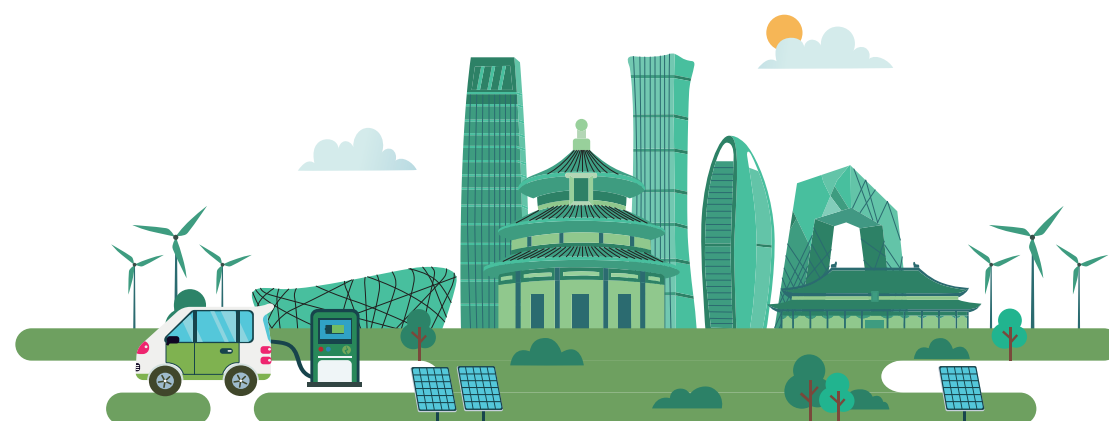
#### b) Beijing "Green Life Season" Platform

In August 2022, the "Green Life Season" mini program was officially launched. "Green Life Season" is the official platform organized by the Beijing Energy Conservation and Environmental Protection Center. It is also Beijing's first "personal carbon ledger" platform and the first green living carbon inclusion platform. The Beijing Green Life Carbon Inclusion Platform is divided into eight sections: green life, green carbon credits, green travel, cleaning plate campaign, green Beijing, green finance, green future, and green landscape. Citizens' green behaviors will be digitally recorded in the carbon ledger and rewarded with corresponding green credits. Green credits can be redeemed for a variety of rewards, such as subway cards, cycling cards, parking coupons and other green consumption coupons. The personal carbon ledger provides a variety of emission reduction scenarios and incentive mechanisms, uses digital means to achieve multi-party links and extensive access, drives citizens to reduce pollution and carbon emissions in a market-oriented manner, and comprehensively supports green consumption and low-carbon life.



Figure 4.3 Promotion of Beijing "Green Life Season" Platform

As of July 27, 2022, the platform has recorded more than 7 million people who have reduced emission 150 million times, and achieved more than 60,000 tons of emissions reductions.



### c) Shanxi “Sanjin Green Life” Platform

“Sanjin Green Life” is a carbon inclusion platform initiated by the Shanxi Provincial Department of Ecology and Environment and the Shanxi Provincial Department of Finance, and organized by the Shanxi Provincial Green Trading Center based on the two departments' approval of the pilot project for the construction of carbon inclusion mechanism. This year, “Sanjin Green Life” was selected as the 2022 green and low-carbon typical case of the Ministry of Ecology and Environment.

The platform provides a variety of emission reduction scenarios and incentive mechanisms around various areas closely related to daily life such as clothing, food, housing, transportation, travel, and use, aiming to mobilize the whole society to participate in ecological environment governance in Shanxi and promote comprehensive emission reduction on the consumer side. Forcing the supply side to reduce emissions from the demand side, assisting the green transformation of production and lifestyle, and injecting new momentum into Shanxi’s “pollution reduction and carbon reduction”.



Figure 4.4 Promotion of Shanxi “Sanjin Green Life” Platform

On the platform, users can practice a variety of green behaviors, such as traveling by subway and bus, riding shared bicycles, driving new energy vehicles, not using disposable tableware, cleaning plate campaign, recycling old items, etc., all of which will be quantified and recorded in the personal carbon ledger and obtain corresponding green credits. These green credits can be redeemed for green consumption vouchers, coupons and other rewards.

“Sanjin Green Life” is the country’s first provincial carbon inclusion platform. As of September 2023, the platform has led more than 3.7 million people to reduce carbon emissions by 86,000 tons.

### d) Luzhou “Green Bud Point” Platform

Luzhou “Green Bud Point” Platform is the first individual green life credit system in West China led by the Bureau of Ecology and Environment of Luzhou. Taking WeChat Mini Program as the carrier, the platform relies on “Green Inclusive Cloud - Digital Carbon Emission Reduction Account” to promote green actions in multiple dimensions such as green travel, green living, green cycling and green finance.

On the Luzhou “Green Bud Point” Platform, users can get credits by multiple means. On the one hand, users can get credits after carbon emission reduction calculation based on data quantification standards and calculation methods through daily environment protection actions such as walking, cycling and online payment. Those credits can be redeemed for prizes or used for public donation. On the other hand, the platform also supports multiple ways to redeem credits. Users can redeem the credits for bus tickets, phone top-up, shopping vouchers at supermarkets, tickets for scenic spots, etc. In addition, users can use the credit for donation to support environmental protection.



Figure 4.5 Promotion of V3.0 of Luzhou “Green Bud Point” Platform





By November 2023, the number of registered users of “Green Bud Point” platform exceeded 300,000, with 20,000 - 40,000 daily active users. The platform resulted in a personal carbon emission reduction of 260 tons, generated over 42 million credits, led the planting of over 20,000 trees, released over 600,000 fry and conducted over 100 river garbage cleanings. The platform has been selected as one of the 2021 “Beautiful China, I Am an Actor” Top Ten National Public Participation Cases and the 2022 Top Ten National Innovative Cases of Smart Environmental Protection, and included in the Forbes 2022 Blockchain Top 50.

#### e) Chongqing Carbon Credit Platform

The “Carbon Credit Platform” for eco-product value realization is the only official platform in Chongqing to fully serve eco-product value realization, green industrial development and citizens' green life. The platform is an eco-product value realization platform established by Chongqing Credit Co., Ltd. under the guidance of Bureau of Ecology and Environment of Chongqing and integrates carbon compliance, carbon neutrality and carbon inclusion.

The platform is an innovative mechanism to transform the achievements of ecological environment protection, clean energy development, energy conservation and carbon emission reduction in Chongqing's ecology, energy and industry into “carbon assets”. The platform makes full use of the “monetization” and price discovery mechanism of local carbon market in Chongqing, and plays an important role in balancing regional ecology and industrial empowerment, promoting the flow of superior resources in urban and rural areas, stimulating the green and low-carbon development of industries, compensating the transformation costs of enterprises, introducing green advanced technologies and applications, and promoting the development of green finance and ecological economy. The platform actively involves in public transportation, shared mobility, green consumption and other application scenarios to attract more citizens, and they can get benefits by practicing low-carbon behaviors through the platform. It guides the general public to build a “Beautiful Chongqing” by promoting the carbon inclusion mechanism.



Figure 4.6 Mini Program of Chongqing Carbon Credit Platform

By the end of October 2023, the platform recorded 1.55 million tons of ecological products featuring carbon emission reduction, with a cumulative transaction volume of about 3.59 million tons, and the cumulative transaction amount exceeded RMB 91.95 million. The number of registered users on the platform has exceeded 1.5 million. The Chongqing Carbon Credit Platform has been successfully included in the “Action Plan to Raise Citizens' Awareness of Ecological Civilization - 2022 National Top Ten Public Participation Cases” by the Civilization Office of the CPC Central Committee and the Ministry of Ecology and Environment of the People's Republic of China, “Innovative Cases of Chongqing's Economic Reform in 2021”, and “Typical Cases of Chongqing Social Responsibility in 2022” and twice selected as one of “Top Ten Excellent Practice Cases of Low-carbon Development in Chongqing” by the Chongqing Leading Group for Climate Change.

#### f) Wuhan “Zero Carbon Together” Platform

In April 2023, the Wuhan Municipal Government issued the “Implementation Plan for the Construction of Carbon Inclusion System in Wuhan (2023 -2025) (WZB [2023] No.26)”. The plan proposes to build a personal low-carbon life platform for carbon inclusion in Wuhan. It also proposes to establish a personal low-carbon life platform based on multi-level carbon emission reduction scenarios, create personal carbon accounts, actively explore incentive mechanisms, and research on incentive measures including convenience services and cultural innovative products such as commercial vouchers,

exchange vouchers for scenic spot ticket, free parking, so as to effectively enhance the enthusiasm and sense of gain of enterprises, institutions and the public to participate in carbon inclusion activities.

On June 2, 2023, the "Zero Carbon Together" App was officially released in the activity for the World Environment Day. Created by Wuhan Carbon Inclusion Management Co., Ltd. under the guidance of Wuhan Municipal Ecology and Environment Bureau, the App is a personal low-carbon life platform for carbon inclusion in Wuhan. The App features functions of low-carbon behavior recording, carbon emission reduction calculation, redeeming for prizes, public donation of carbon emission reduction, carbon neutrality in activities and personal carbon account. "Zero Carbon Together" App relies on digital technical means and scientific methodological algorithms to comprehensively record the low-carbon behavior trajectory of users in their daily lives. Users can scan the QR code or search the name of the App via WeChat or Alipay, open the App and create a personal carbon account. After users practice low-carbon behaviors such as taking a bus, metro line or an EV, using sharing bicycles, and avoiding using disposable items (plastic bags, paper cups, etc.), the carbon emission reduction can be used to redeem for prizes including coupons or for carbon neutrality public donations.



Figure 4.7 Promotion of Wuhan "Zero Carbon Together" Platform

Wuhan Carbon Inclusion Management Co., Ltd. puts forward the model of "carbon inclusion" as donation to promote the ecological protection of the Yangtze River, and actively promotes the coordinated management of responding to climate change and protecting

biodiversity in the Yangtze River. On August 15, 2023, the first "National Ecological Day", Wuhan's personal low-carbon life platform "Zero Carbon Together" launched the low-carbon activity of carbon inclusion as donation to guide citizens to participate in the Yangtze River protection by donating carbon emission reduction to ecological protection themed public welfare projects. The donated project is the "Fish in the Yangtze River" project jointly sponsored by Hubei Charity Federation, Hubei Provincial Yangtze River Conservation Foundation and Yangtze River Fisheries Research Institute. For every 1g carbon emission reduction donated by citizens, the caring enterprises will donate RMB 1 for the project to support the protection of rare fishes in the Yangtze River. This donation is not only an innovative channel for carbon emission reduction consumption, but also an innovative fundraising mode for public welfare projects. In this way, public welfare foundations get donations from enterprises and carbon emission reduction in carbon inclusion from citizens at the same time. Carbon emission reduction can be used for carbon neutrality in public welfare activities, or be accumulated to a certain amount and then exchanged at Hubei Carbon Emission Exchange. Citizens who donate carbon emission reduction can get the opportunity to participate in the public welfare activity of scientific release of fry and have a deep understanding of the importance of ecological protection in the Yangtze River.

#### g) Guangzhou Carbon Inclusion Platform

Guangzhou Carbon Inclusion Platform was launched in 2019. The platform aims to enable functions such as data acquisition regarding citizens' low-carbon behavior, real-time accounting of carbon emission reduction and discount redemption.

A number of low-carbon life scenarios are available on the platform, including recycling of old clothes, cycling, travel by public transportation means, walking, etc., and personal carbon neutrality experience is also provided. Users can calculate their own carbon emissions from food, clothing, housing and transportation, voluntarily purchase for carbon emission reduction and achieve carbon neutrality. In addition, the platform also provides a personal carbon ledger to record the carbon emission reduction from users' low-carbon behaviors and generates an official carbon emission reduction certificate.

By mid-July 2023, the platform featured 226,300 registered users. In 2023, more than 35 million carbon coins were issued and 4 million carbon coins were redeemed.

#### h) Mio

Mio is a carbon inclusion platform of Miotech. It advocates a low-carbon and sustainable life. Through the positive incentives of carbon inclusion, users are encouraged to practice a green, low-carbon and sustainable lifestyle. Based on the material and spiritual incentives from carbon inclusion mechanism, Mio encourages users nationwide to practice a green and low-carbon life in a variety of scenarios such as food, clothing, housing and trans-



portation. It strengthens spiritual incentives in the product mechanism, and highlight social benefits by supporting carbon emission reduction and public welfare projects. The platform also features an online low-carbon community, gathers opinion leaders of sustainable lifestyles and enterprises to build a low-carbon ecological alliance, and encourages users to share their daily low-carbon “Lohas” ideas. Mio considers the important topic of “how to motivate the public to actively respond to the challenges brought about by climate change” in three aspects: product design, operation strategy and public advocacy.

In the first year of its launch, Mio featured accumulated 50.5 billion user steps - about 34.31 million kilometers and equivalent to 856 circles around the Earth. More than 1.29 million people have completed low-carbon behaviors such as charging EVs, cycling and bringing their own coffee cups via Mio. A carbon emission reduction of over 1,661 tons in one year was achieved, equivalent to the annual carbon emission reduction by 92,310 trees.

In July, 2023, Mio became the first enterprise platform to involve the demonstration scenario of green travel for carbon inclusion in Shanghai. The demonstration scenario of green travel was released by the Shanghai Municipal Bureau of Ecology and Environment and the Shanghai Municipal Transportation Commission and marked a key step for the local government to practice the carbon inclusion. It also marked the start of carbon inclusion connection between platforms under political guidance.

## 4.2. Carbon Inclusion Platforms for Employees in Enterprises

The second type is carbon inclusion platforms for employees in enterprises. The model of such platforms is to record the green actions of enterprise employees and quantify their carbon emission reduction by creating enterprise carbon accounts. According to the published data of the European Commission, in 2020, employees in the EU produced an average of 13.6 tons of greenhouse gases, while the per capita carbon emission in the EU in 2020 was only 6.4 tons. Compared with the general public, employees in enterprises will produce more carbon emissions in commuting, travel, and use of energy and paper.

In China, in recent years, many companies have announced their plans for carbon neutrality. In the process of achieving carbon neutrality, their employees' action for carbon emission reduction are very important as they are the owners of enterprises, and their actions directly affect the carbon emissions of their enterprises. In scope III carbon emissions, the carbon emissions generated by supply chains and enterprise employees can promise greater carbon emission reduction with less cost and by virtue of low-carbon

operation. More and more enterprises have realized that carbon emission reduction from employees is the key to practice carbon neutrality in enterprises.

### a) Employee Carbon Account at Ping An Group

On May 27, 2023, in the celebration of the 35th anniversary of Ping An, the group announced that it had officially launched a carbon account platform covering 300,000 employees, upgraded the group's “1+N” carbon account system, and continued to deepen green operation and promote the green development of the society. It is reported that the platform is the first carbon account system covering all employees in the finance and insurance industry. The data of low-carbon office action, daily low-carbon behaviors and carbon emission in each employee's carbon account will be included in the operational carbon emission reduction of Ping An Group, thus facilitating the overall collection and management of carbon emissions. At the same time, Ping An Group will empower green and low-carbon elements for more than 50 public welfare projects, promote the development of carbon assets online and offline, and achieve the growth of public welfare projects and the continuous upgrading of brands.

The employee's carbon account of Ping An Group is the identity of every Ping An employee in the dimension of “carbon emission reduction”. From saving power, water and paper in the workplace, to practicing carbon reduction in group meals in the cloud canteen system, then to participating in green public welfare activities such as low-carbon homes, mangrove protection and time banks, the carbon emission reduction action of every employee in Ping An Group in work, travel, life and other scenarios will be included in their carbon accounts and accumulated for green rights.

### b) Carbonstop Carbon Account

“Carbon Account” is a carbon inclusion application platform developed by Carbonstop and mainly targets at enterprise customers. It combines carbon emission reduction scenarios with employees' clothing, food, housing, transportation and use in the form of carbon credits, encourages employees to participate in carbon reduction actions, motivates employees to participate in low-carbon actions in a game-like manner, and helps enterprises achieve a sustainable “decarbonization journey”.

The platform supports a variety of carbon emission reduction scenarios, and enables automatic data collection of low-carbon scenarios such as green travel, office and recycling by linking external platform technologies (Amap, Baidu AI, Kuaidian, Mayi, etc.), so that users' carbon credit evaluation will be more scientific and accurate. The platform provides multiple prizes and game-like operation modules, bringing incentives for employees to practice carbon emission reduction and enhance the fun of participation.

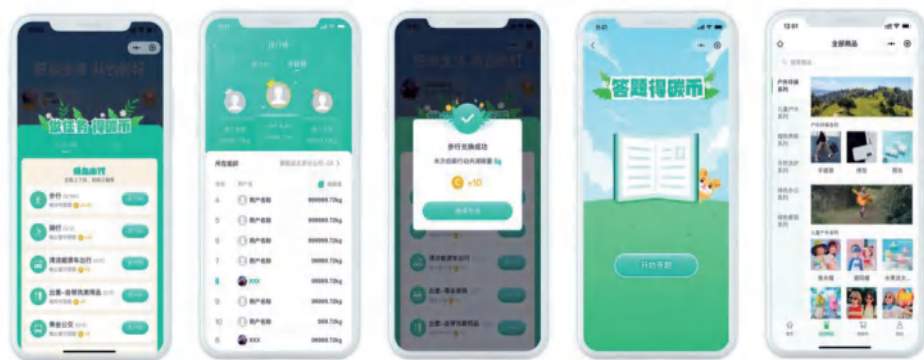


Figure 4.8 Functions of "Carbon Account"

At present, "Carbon Account" has served the top customers in over 10 industries, such as Longji Green Energy, Airbus, BAIC Group, PSA, China Southern Airlines, China Telecom, Xiaomi and China UnionPay, helping them achieve their business goals in response to national policies, brand image promotion and low-carbon education for employees.

#### c) "Geely Carbon Inclusion"

"Geely Carbon Inclusion" is the first employee carbon inclusion App and carbon account system independently developed by Geely Digital Technology. Focusing on eight daily low-carbon office and life scenarios including commuting, stair climbing, catering and meetings, the App encourages employees to practice low-carbon behaviors through carbon emission reduction accounting and the incentive mechanism of carbon credit, so that employees can make personal contributions to carbon neutrality. Currently, over 7,000 employees in Geely headquarters use the App.

#### d) MioTech Employee Carbon Account

The Employee Carbon Account is a management platform for carbon emission reduction of employees in enterprise developed by MioTech. It allows employees to fully implement carbon emission reduction and help achieve carbon neutrality. It provides a feasible solution to respond to the difficulty in collecting scope III carbon emission data and managing carbon emission reduction. Relying on MioTech's long-term professional practice in carbon emission factor library, carbon reduction coefficient and methodology, the platform can quantify employees' low-carbon behaviors and calculate carbon emission reduction data with one click to help the enterprise manage carbon emission reduction.

The Employee Carbon Account can be used for employees, consumers and cover other upstream and downstream enterprises in the supply chain. MioTech Employee Carbon Account has served a number of leading commercial real estate, such as Shui On

Xintiandi, The Ring in Chongqing by Hong Kong Land, and Shanghai Super Brand Mall, and also served multinational enterprises of electronic and household appliances. It has been adopted by national commercial banks, insurance companies and foreign retail banks.

### 4.3. Carbon Account Applications Provided by Enterprises for the Public

The third type is the typical carbon account applications provided by enterprises for the public, which is the carbon inclusion platform with the greatest public participation and activity at present. Such applications rely on the business side, providing users with convenient accesses, especially when carbon credits are used for redeeming. Those applications can use such credits as cash or redeem them for coupons through business support. Therefore, they can quickly complete the closed loop of production-consumption of carbon credits for users.

#### a) Alibaba Cloud Energy Expert "Low Carbon Account for the Asian Games Village on the Cloud"

In order to thoroughly implement the State Council's strategic decision of "carbon peaking by 2030 and carbon neutrality by 2060", the 19th Asian Games Hangzhou 2022 adhered to the concept of "green" and actively promoted the construction of green Asian Games in participation, operation and watching. As the largest non-competition venue of the 19th Asian Games Hangzhou 2022, the Asian Games Village for Hangzhou 2022 has adopted the operation mode of "three villages (athlete village, media village and technical officer village) in one" in the history of large-scale events for the first time. It is an important activity venue for players from 45 participating countries and regions, and also an important scenario for the green operation of Asian Games Hangzhou. Under the guidance of the Asian Games Hangzhou Organizing Committee, the operation team of Asian Games Village, together with Alibaba, the official partner of the Asian Games Hangzhou, created an interactive product named "Low Carbon Account for the Asian Games Village on the Cloud" (hereinafter referred to as "low carbon account") for the villagers of the Asian Games Village with Alibaba Cloud Energy Expert's product capabilities and cutting-edge technologies in low carbon community construction and product carbon footprint certification. As one of the application modules of the intelligent service platform of "Asian Games Village on the Cloud", the low carbon account focuses on the themes of "green technology", "green humanity" and "green achievement", and launches various green and low-carbon activities to encourage players to practice low-carbon lifestyle in Asian Games Village and reduce carbon emissions and energy consumption during their life there. During the operation of the Asian Games Village, the low carbon account provided services for more than 20,000 "villagers".



Villagers can access to low carbon accounts through the following channels. The first is the "Yunshangtong". They can use services such as gym reservation, birthday meal reservation and bus schedule on that page, and the access to low carbon account is also there. The second is to access through offline QR code scanning. The QR code of low carbon account is arranged in crowded areas of those three villages (such as canteens, supermarkets, commercial centers, etc.). Villagers (including overseas people) can access through QR code scanning with mobile phone and participate in low-carbon activities to get credits. The third is to access through scanning the QR code on the Asian Games commemorative cards (carbon-neutral) made from recycling plastic bottles in the Asian Games Village. In addition, the "Zero-waste" Living Center set up in the athlete village can introduce the access to the low carbon account.



Figure 4.9 Promotion and Function of Alibaba Cloud Energy Expert "Low Carbon Account for the Asian Games Village on the Cloud"

Based on the service scenarios of the Asian Games Village, the low carbon account, by cooperation with suppliers in the village, has included 19 types of low-carbon activities, covering food, housing, transportation, travel, shopping, entertainment and other aspects. Since the low carbon account was available to the villagers, guests from more than 40 countries and regions have become account users. Many athletes have got credits by using in low-carbon maps and taking snap shots, and went to the "Zero-waste" Living Center in the Asian Games Village to experience low-carbon lifestyle and redeem their credits for prizes actively. From the pre-launch on September 12, 2023 to the end of the Asian Games, over 16,000 new users have registered the low carbon account, with a cumulative number of users exceeding 700,000. The cumulative carbon emission reduction

exceeds 16,000kg, the total number of users in the redemption of their credits for prizes exceeded 35,000, and the average number of new users registered was nearly 600 on a daily basis, with an average of 25,000 people participating in low-carbon activities every day. Among all activities, low-carbon activities including cleaning plate campaign, shopping without plastic bags, walking and waste classification reflected a participation frequency of over 1,000 times on a daily basis. More than 500 athletes are attracted to visit the "Zero-waste" Living Center and experience the waste-free green lifestyle every day through the pioneering offline visiting and online guiding by the low carbon map by accessing to the low carbon account.

### b) Kuaidian Carbon Account

In 2021, Kuaidian cooperated with its strategic partner NaaS (NASDAQ: NAAS) and launched a "Carbon Account" for car owners as the first carbon inclusion platform for EV charging in the industry. Car owners can obtain carbon credits through charging and users are encouraged to participate in carbon emission reduction. At present, more than 463,000 participants have been the carbon account users.

In 2022, Kuaidian participated in large carbon inclusion events including "Beijing Green Life Season" and connected governments, enterprises and platforms to encourage more users to participate in carbon emission reduction activities. With its innovative practice in carbon inclusion, Kuaidian was successfully included in the "Research Report on Development and Practices of China's Carbon Inclusion" to lead the coverage of carbon emission reduction from industries to consumers. March 12, 2023 marks the 45th Arbor Day in China. Under the guidance of the Center for Environmental Education and Communications of Ministry of Ecology and Environment, Kuaidian App and mini program launched the "Tree Planting Month" activity. After charging, users can accumulate carbon emission reduction in the form of carbon credits and deposit them in the car owner's carbon account. Then, they will have the chance to win the one-year free charging service, iPhone14 or other prizes through the carbon credit ranking. In addition, all participants can get the "Medal of Carbon Reduction Hero".





Figure 4.10 Kuaidian Carbon Account "Arbor Day" Activities

July 12, 2023 is the National Low Carbon Day and also the 33rd National Energy Conservation Publicity Week in China. Kuaidian joined hands with Shanxi "Sanjin Green Life" carbon inclusion platform, Chengdu "Tianfu Carbon Credits" platform, Luzhou "Green Bud Point" platform and CITIC Bank Credit Card to launch the distinctive green and low-carbon activities, advocate green travel and enjoy new benefits of low-carbon life.

### c) Zeekr "Z-Green"

In June, 2022, Zeekr launched the Z-Green in Zeekr App. Undertaking the mission of creating a low-carbon life with users, the community leads consumers to participate in the carbon neutrality process and help the whole society reduce carbon emissions with a focus on promoting low-carbon concepts, participating in carbon inclusion actions and practicing low-carbon public welfare activities.

Z-Green features the carbon emission reduction action module. Through game element design, the community attracts users to open personal carbon account, accumulate carbon emission reduction by practicing low-carbon travel, and continue to advocate and promote low-carbon concepts in the community, so as to obtain credits that can be used for vehicle charging, vehicle rights and interests, and life commodity exchange, etc., thus achieving the closed loop of carbon inclusion in Zeekr's ecology. In that module, digital technology can be used to calculate the carbon emission reduction generated by car owners driving EVs, based on IEC vehicles with the same capacity. Users who have completed the binding of vehicles can collect the carbon emission reduction automatically accumulated by the system in Z-Green, and intuitively check their contribution to carbon neutrality. In order to encourage users to participate in carbon emission reduction actions, a carbon reduction weekly ranking activity has been launched. In addition,

the carbon emission reduction action module has included the scenario of user walking for carbon emission reduction. During the Asian Games, Zeekr launched a step collection environmental protection activity. All users of Zeekr App may have the opportunity to get tickets to the Asian Games, limited collections, medals and other prizes through daily step collection.

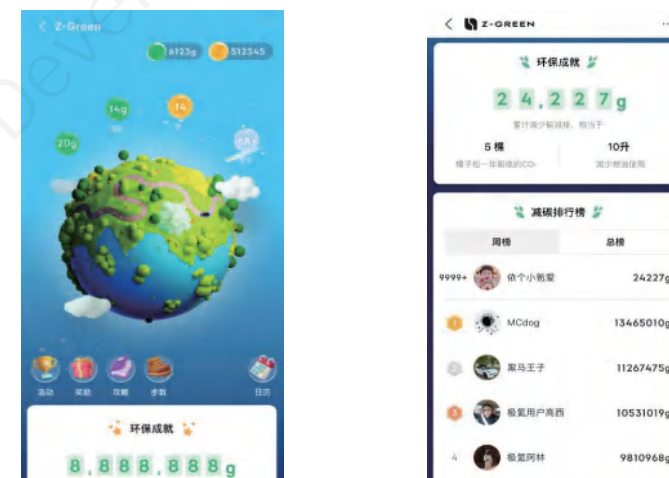


Figure 4.11 Product Page of Zeekr "Z-Green"

Z-Green will announce the top 3 users of the week for low-carbon life in the weekly "Carbon Reduction News" to promote users to actively participate in carbon emission reduction actions. Emission reduction data will also be collected and released from three aspects: the number of people participating in emission reductions, the cumulative emission reductions, and the annual absorption of carbon dioxide by plants. By November 14, 2023, 296,301 users had participated in the "carbon emission reduction action", and the cumulative carbon dioxide emission reduction was 94,039 tons, equivalent to the carbon sink in one year by 20.9 million scots pines. The launch of the "carbon emission reduction action" module reflects that Zeekr, as a new energy vehicle brand, actively responds to the national policies on low carbon and carbon emission reduction, encourages users to travel in a green manner, develops users' low-carbon life concept, promotes the carbon emission reduction actions for the whole society, and is committed to providing users with a more economical and environmentally-friendly travel experience.



# 05

## Analysis on User Behavior of Carbon Inclusion Platform

### 5. Analysis on User Behavior of Carbon Inclusion Platform

#### 5.1. Market Research and Analysis of Public Awareness of Carbon Inclusion

In order to fully investigate and analyze the willingness and form of public participation in carbon inclusion activities, a wide range of market research on the public awareness of carbon inclusion is carried out. In this research, a total of 2,680 valid questionnaires are collected, mainly involving questions on whether the participants have heard of the concept of carbon inclusion or participated in carbon inclusion activities, ways to participate in carbon inclusion activities, scenarios of carbon inclusion activities the participants have been in, items that participants have redeemed for with carbon credits, the main role of carbon inclusion in improving personal and social low-carbon awareness and actions, and ways of the government and enterprises to strengthen the promotion and application of carbon inclusion.<sup>1</sup>

In terms of “whether the participants have heard of the concept of carbon inclusion or participated in carbon inclusion activities”, 53.36% participants presented positive answers, indicating that the promotion of carbon inclusion has achieved phased results. 46.64% of participants presented negative answers, indicating that carbon inclusion mechanism, as a relatively new concept, still needs to be promoted, and the influence of carbon inclusion should be expanded through extensive user popularization.



Figure 5.1 Result of “Whether the Participants have Heard of the Concept of Carbon Inclusion or Participated in Carbon Inclusion Activities”

In terms of “ways to participate in carbon inclusion activities”, 39% participants use mini program, and 51% of participants use App, indicating that the App, as a more popular access to carbon inclusion activities and the online carrier of business, still features a wider user base, and carbon inclusion will reflect more convenience in its combination with business scenarios. Only 10% participants participate in those activities through offline channels mainly because the current carbon inclusion platforms are all online platforms, and there are only few offline relevant activities.

<sup>1</sup>Considering that the research is mainly conducted in the form online research, there may be deviations between the research results and the actual results.



Figure 5.2 Result of "Ways to Participate in Carbon Inclusion Activities for the public"

In terms of the difficulties in using/participating in carbon inclusion platforms/activities, 27.5% participants select "easy", 51.6% "normal" and 20.9% "hard". Such result shows that the overall reach of carbon inclusion platforms and activities to the public is not so satisfactory. Improvement in platform construction, activity planning, user interaction and user experience design is required.

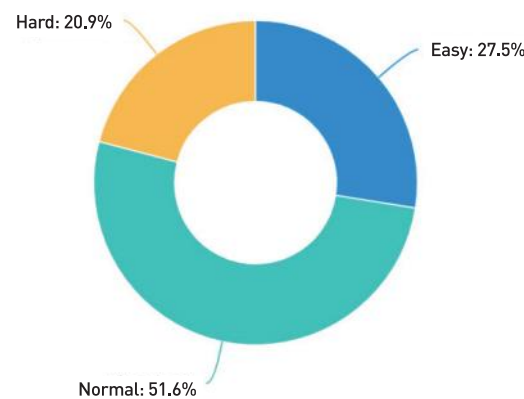
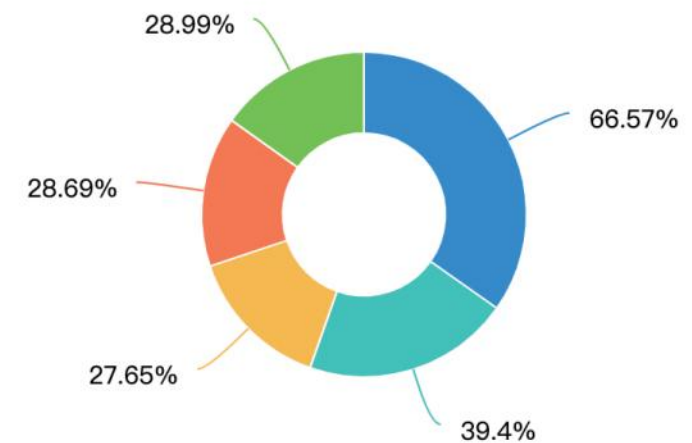


Figure 5.3 Results on the difficulty of participating in carbon inclusion platforms/activities for the public

In terms of "scenarios of carbon inclusion activities the participants have been in", 66.57% participants have been involved in green travel, 39.4% green consumption, 27.65% recycling of old things and 28.69% green life. It can be seen from the data that most people who have reached carbon inclusion participate in green travel due to its popularity. The green consumption however, relies more on digital construction. With the popularization of digital products and payment in China, the overall participation in such scenario is higher as well. The numbers of participants involving in recycling of old things and green life are basically the same, but less than that of green travel and green consumption. Therefore, it is suggested to strengthen the promotion of carbon inclusion in communities, restaurants and other places, and hold more offline activities to encourage the public to participate in green life.



- Green travel (walking, cycling, buses, new energy vehicles)
- Recycling of old things (old clothes, electronic products, waste paper, furniture)
- Green consumption (electronic invoices, low-carbon products, electronic tickets, digital RMB)
- Green life (garbage sorting, clean plate campaign, saving electricity)
- Have not participated

Figure 5.4 Result of "Scenarios of Carbon Inclusion Activities the Participants have been in"<sup>2</sup>

In terms of items that participants have redeemed for with carbon credits, 57.5% and 62.8% participants selected vouchers and coupons at the platform. Such result indicates that users are more willing to redeem products that can be directly monetized or redeemed by directly using carbon credits. 13.25% participants selected daily necessities and fewer than 7% participants selected film vouchers, shopping vouchers, tickets for scenic spots, food coupons, and public donation. In addition, 18.88% participants have not used carbon credits form prize redeeming. It is also suggested that all carbon inclusion and carbon account platforms design more incentive mechanisms and consumption coupons or cash vouchers-based users' actual usage scenario, so that users can enjoy the rights and interests brought by carbon inclusion activities easily.

<sup>2</sup>This question is a multiple choice, and the percentage of multiple choice options = the number of times this choice is selected/the number of valid questionnaires.



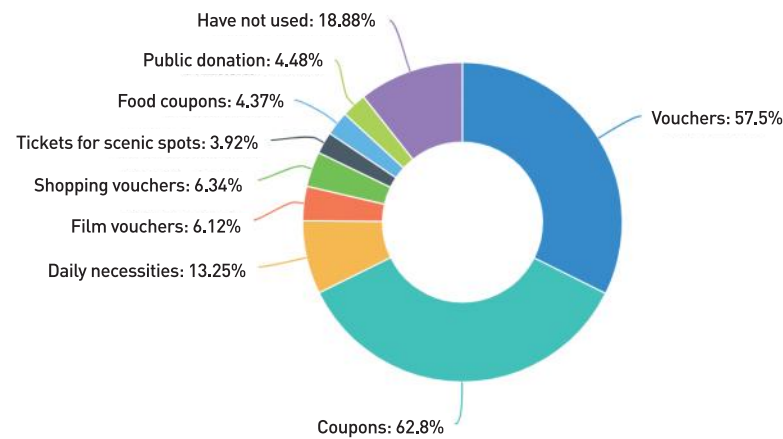


Figure 5.5 Result of "Items that Participants have Redeemed for with Carbon Credits"<sup>3</sup>

In terms of the main role of carbon inclusion in improving personal and social low-carbon awareness and actions, 80.19% participants believed that their awareness of low-carbon can be cultivated by participating in carbon inclusion activities, 61.79% argued that carbon inclusion can guide low-carbon actions, 62.54% thought that carbon inclusion is helpful for the development of green and low-carbon action habits, 39.44% felt that carbon inclusion is helpful for low-carbon technological innovation and 12.2% proposed that carbon inclusion is helpful for the development of low-carbon scenarios. In the meantime, 18.25% participants agreed that carbon inclusion can accelerate the goal of carbon neutrality. Therefore, according to such data, carbon inclusion is of great significance for improving the public and society's low-carbon awareness and will promise remarkable contribution to the goal of carbon peaking and carbon neutrality in China.

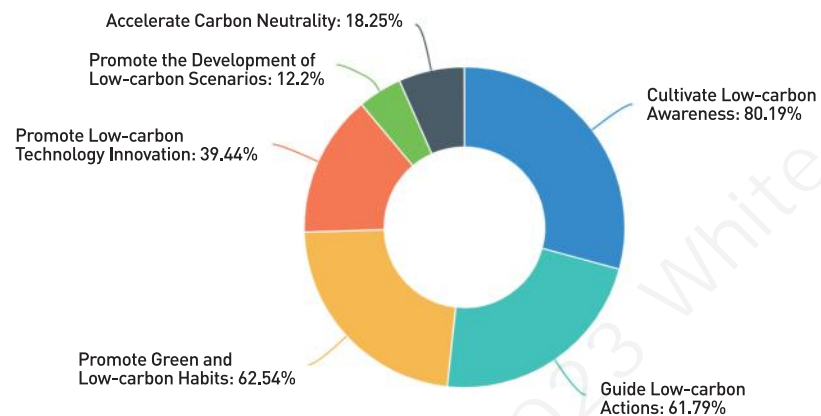


Figure 5.6 Statistics of the areas in which users perceive the roles of carbon inclusion in raising both individual and public low-carbon awareness and promoting low-carbon behaviors<sup>4</sup>

<sup>3</sup>This question is a multiple choice, and the percentage of multiple choice options = the number of times this choice is selected/the number of valid questionnaires.  
<sup>4</sup>This question is a multiple choice, and the percentage of multiple choice options = the number of times this choice is selected/the number of valid questionnaires.

Regarding ways of the government and enterprises to strengthen the promotion and application of carbon inclusion, 73.96% of users believed that online publicity should be strengthened, 60.82% believed that more offline activities should be carried out, 46.72% suggested creating more carbon inclusion scenarios, 56.27% suggested providing more incentives, 32.46% suggested offering more commodities that can be exchanged for carbon credits, and 16.57% mentioned improving the experience of platforms. It is evident from the statistics that the government and enterprises should step up their efforts to publicize carbon inclusion and carry out more offline activities themed around carbon inclusion, so that the public can gain senses of involvement and personally experience the fun of getting involved. Besides, it can also be concluded that more carbon inclusion scenarios should be developed, more incentives should be provided, and more redeemable commodities should be introduced, so as to engage more public in the carbon inclusion activities.

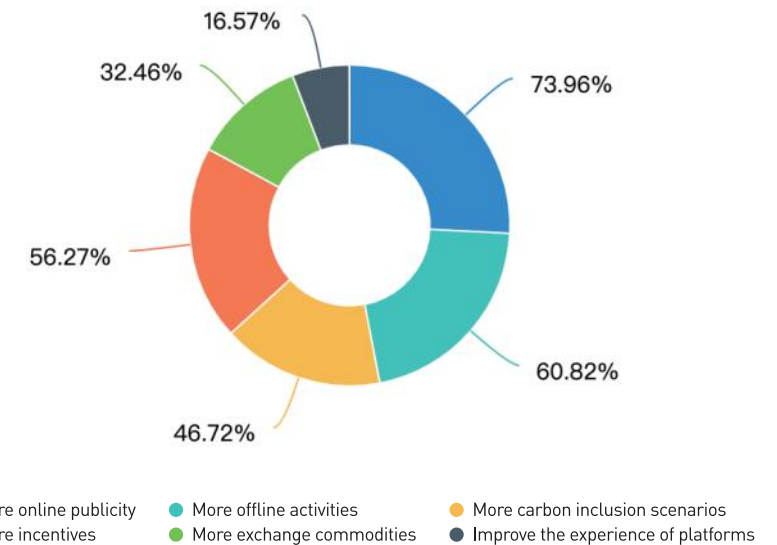


Figure 5.7 Statistics on what users think governments and enterprises should do to strengthen the promotion and application of carbon inclusion<sup>5</sup>

Regarding whether or not they would encourage others to participate in carbon inclusion activities, 86.9% of users would recommend others to participate, while only 13.1% said they would not, which indicated that the vast majority of the public has a strong willingness to be a participant and facilitator of carbon inclusion activities.

<sup>5</sup>This question is a multiple choice, and the percentage of multiple choice options = the number of times this choice is selected/the number of valid questionnaires.

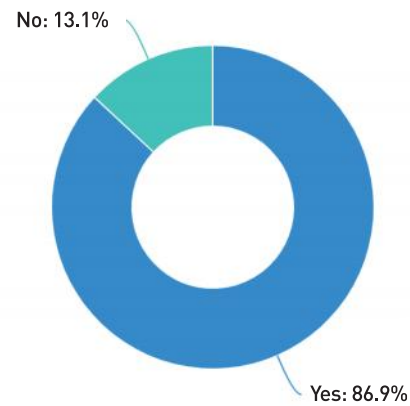


Figure 5.8 Statistics on whether users would recommend others to participate in carbon inclusion activities

## 5.2. Analysis on Low-Carbon Behaviors of the Public

### a) User engagement in low-carbon behaviors and scenarios

From the data provided by the various authoring units and organizations of this White Paper, currently, the low-carbon behaviors and scenarios with the most user engagement is the green travel, followed by the green consumption and the green catering, and these three scenarios are also the most common lifestyles. Taking green travel scenarios as an example, the low-carbon behaviors with the highest user engagement, in descending order, are walking, travel by subway, cycling, travel by bus, and EV charging/driving. Among other qualitative carbon inclusion sub-scenarios, public participation in cleaning plate campaign and garbage classification is relatively high. Public participation in different green and low-carbon scenarios may vary in different cities, different time periods, and different publicity and promotion efforts. From the public data of the 31st Summer Universiade & the 19th Asian Games, the top three green and low-carbon scenarios in terms of participation were low-carbon quiz, cycling, walking & low-carbon quiz, cleaning plate campaign, walking.

Ranking of low-carbon and green scenarios based on number of participants during the 31st Summer Universiade (unit: 10,000 times)

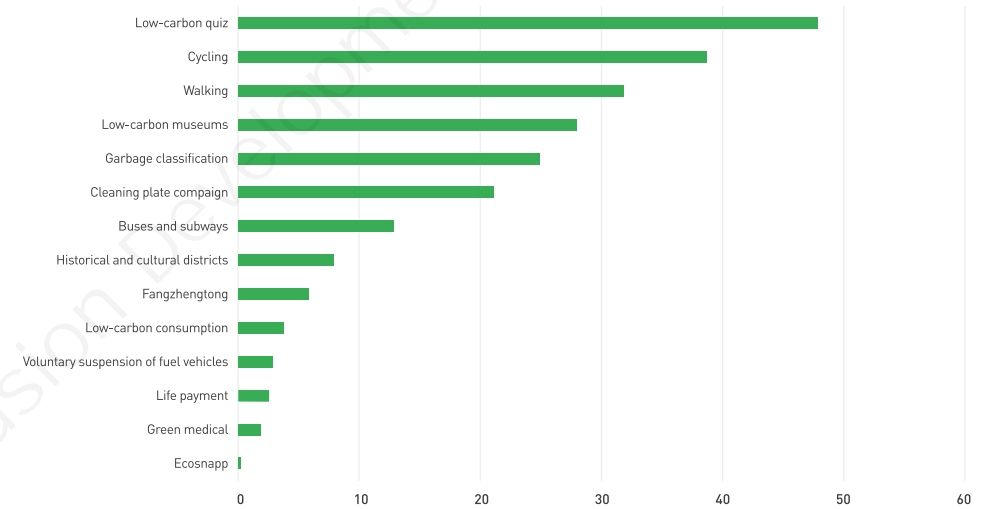


Figure 5.9 Ranking of low-carbon and green scenarios based on number of participants during the 31st Summer Universiade

Data Sources: "Tianfu Carbon Credits" platform

Ranking of low-carbon and green scenarios based on number of participants during the 19th Asian Games (unit: 10,000 times)

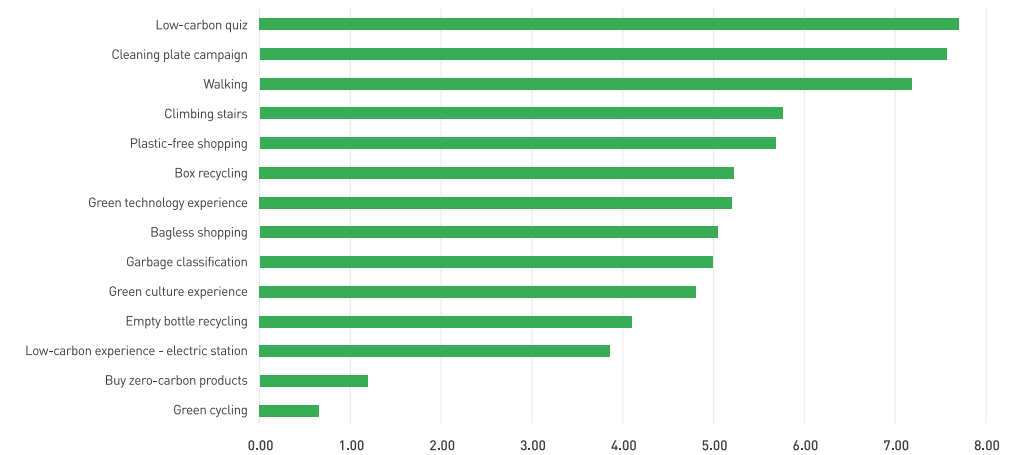


Figure 5.10 Ranking of low-carbon and green scenarios based on number of participants during the 19th Asian Games

Data Sources: "Low-Carbon Account" of Asian Games Cloud Village platform by Alibaba Cloud Energy Expert



### b) Carbon emission reductions from low-carbon behaviors and scenarios

The extent to which low-carbon behaviors contribute to carbon emission reduction is influenced by three key factors: the carbon reduction methodology employed, the level of emission reduction achieved compared to the baseline unit of the scenario, and the number and frequency of participants involved in the scenario. According to the data provided by each of the authoring units of this White Paper, the low-carbon behaviors and scenarios with the highest emission reductions are the green travel scenarios. Judging from the specific emission reduction data of different emission reduction scenarios, taking "Qingtanxing", as of October 2023, users of "Qingtanxing" App have reduced more than 38,000 tons of carbon emission through green and low-carbon travel, 85.58% of which are achieved by traveling by subway. Taking "NewLink" as another example, through EV charging and digital refueling, a cumulative total of 2.159 million tons of carbon emission reduction were accomplished in 2022. According to Alibaba Cloud Energy Expert in the Asian Games Village, users reduced carbon emissions by a total of 16 tons during the 19th Asian Games by participating in low-carbon activities within the low-carbon account. Such activities include cleaning plate campaign, package box recycling, and PSB-free shopping. From the data released by Wuhan carbon inclusion platform, the top three carbon emission reduction behaviors are travel by subway, cycling, and travel by bus.

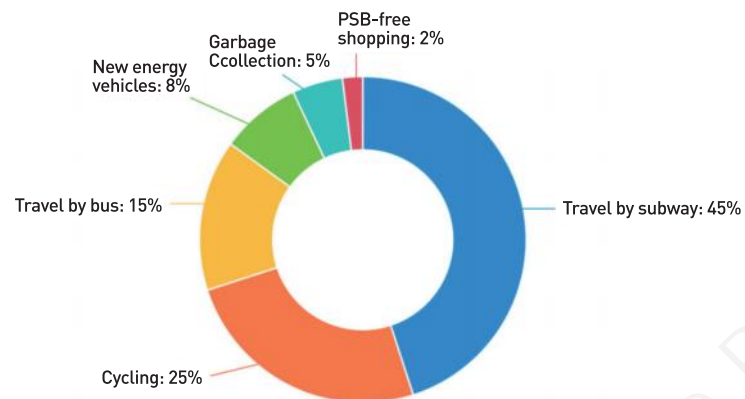


Figure 5.11 Percentage of carbon emission reduction by low-carbon green scenarios on Wuhan carbon inclusion platform

Data Sources: Wuhan "Zero Carbon Together" platform

However, when it comes to quantifying carbon emission reduction in current carbon reduction scenarios, there is still a lack of carbon inclusion methodologies in China, particularly in scenarios beyond green travel. Furthermore, the existing methodologies primarily focus on local carbon inclusion with limited applicability. Moreover, the definitions for similar low-carbon behaviors varies from one place to another. Therefore, it is crucial for institutions at all levels to collaborate and develop a unified methodology that is suitable for public life scenarios.

### c) Cities with top user engagement in low-carbon behaviors

In terms of the city ranking of user engagement in low-carbon behaviors, based on the number of people served by the platform and the number of registrants, the city with the top user engagement is Beijing, followed by Qingdao, Chengdu, Chongqing, and Shenzhen. This is attributed to the large population base of these cities, as well as their significant efforts in promoting the concept of carbon inclusion through extensive publicity and promotional campaigns. In addition, users in these cities can easily participate in green behaviors through the digital carbon inclusion platform, record green behaviors, and receive incentives and rewards that promote green initiatives.

Ranking of registered users of the carbon inclusion platform by city (unit: 10,000)

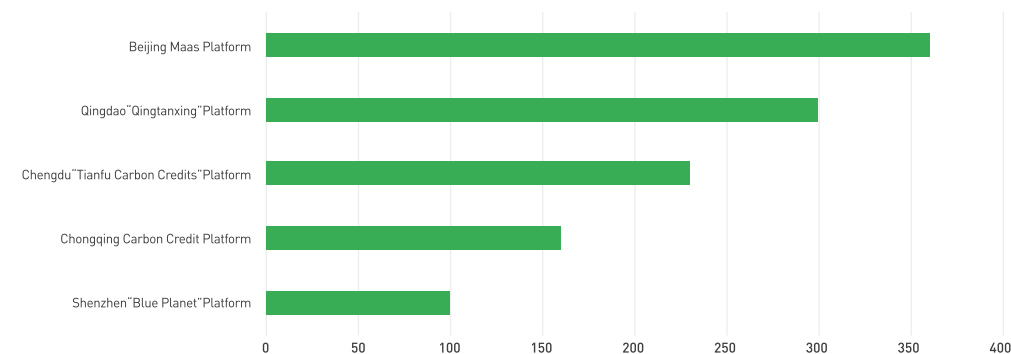


Figure 5.12 Ranking of registered users of the carbon inclusion platform by city

Data Sources: Publicly available data on the Internet



### 5.3. Analysis on Carbon Credits Consumption of the Public

Currently, most carbon inclusion platforms utilize relevant carbon emission reduction methodologies to quantify the carbon emission reductions of carbon inclusion behaviors and establish a fixed exchange ratio between emission reductions and carbon credits, so as to facilitate the users' access to and conversion of their rights and interests.

#### a) Scenarios in which carbon credits are most redeemed

There are certain differences in the credit consumption scenarios and commodities available for redemption due to variations in urban infrastructure construction, platform planning and rules, business types, and cooperating partners across different platforms. Take "Kuaidian" platform as an example, the total amount of redemptions, in descending order, are cash deduction, platform activities, product exchange and lucky draw. In typical user-oriented carbon accounting systems of such enterprises, users can directly redeem carbon credits through business scenarios, which better motivates users and simplifies the process of user participation.

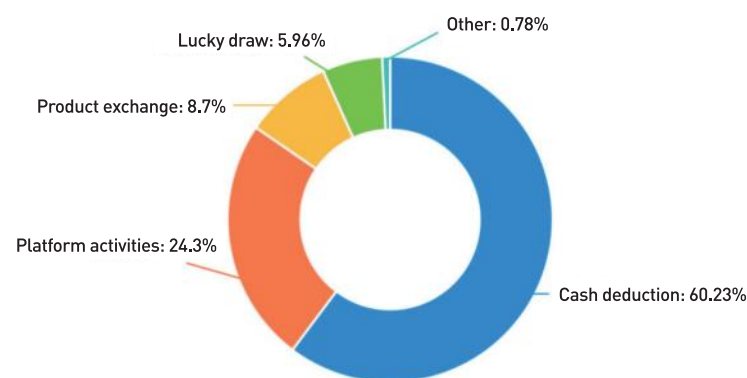


Figure 5.13 Overview of carbon credit redemption scenarios on "Kuaidian" platform

Data Sources: "Kuaidian" platform

#### b) Top carbon credits redeemed items

When it comes to redeeming carbon credits for tangible goods, these goods can be further categorized based on different redemption scenarios and types. For instance, users have the option to redeem coupons for subway rides, shared bike rides, new energy vehicle charging, and takeaway discounts. Moreover, they can also redeem coupons for food, VIP access to movie and TV platforms, attraction tickets, daily essentials, and automotive supplies. Take Wuhan's carbon inclusion platform as an example, top carbon credits redeemed items on the platform are coupons for subway ride, accounting for 30% of the total.

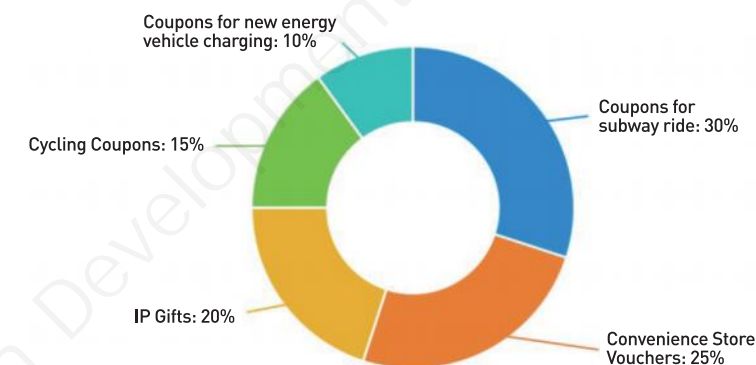
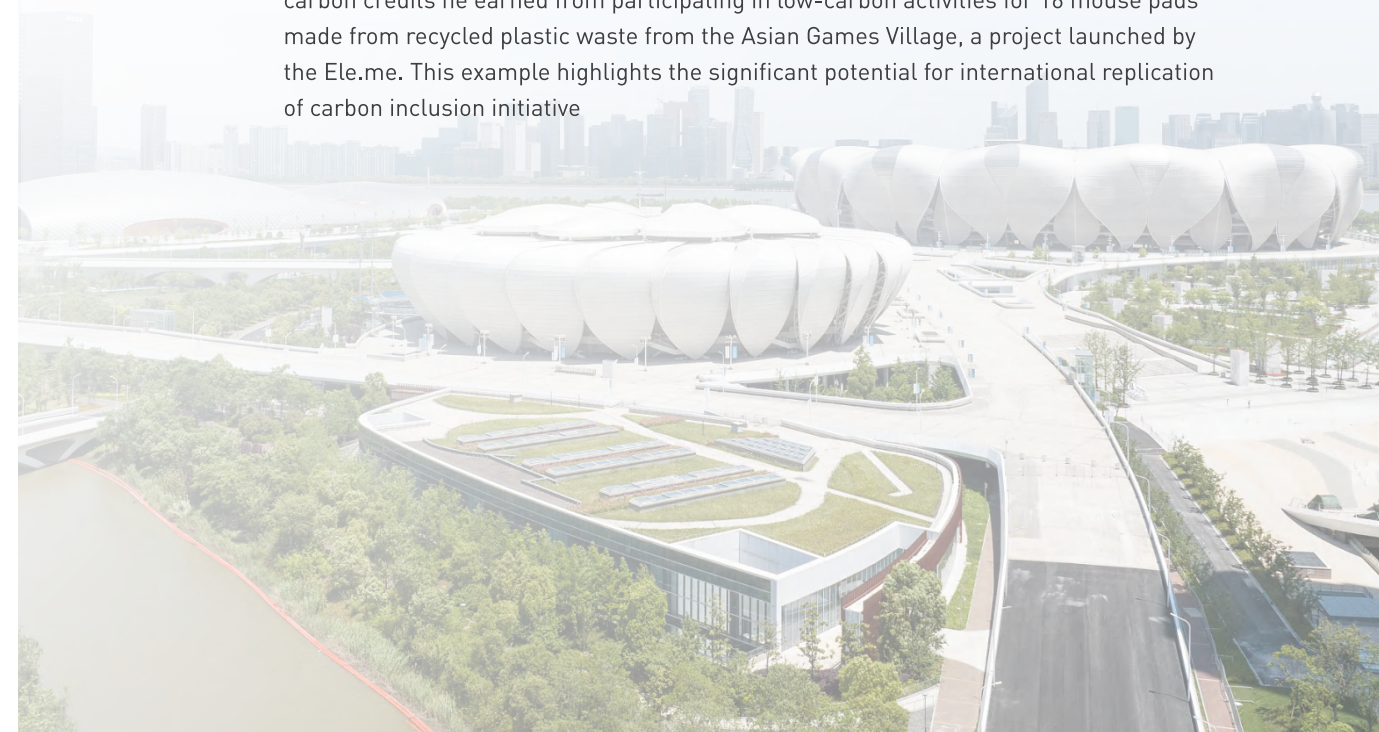


Figure 5.14 Percentage carbon credits redeemed items on Wuhan carbon inclusion platform

Data Sources: Wuhan "Zero Carbon Together" platform

In some special scenarios, cultural products unique to the specific platforms and low-carbon products are also more popular among the public. Taking the 19th Asian Games as an example, a total of 78 low-carbon credit redeemable items have been put on the shelves within the low-carbon account of the Asian Games Village, and the most exchanged commodities are mainly products related to the IP of the Asian Games, including the mascot of the Asian Games, Frisbees, badges, and low-carbon products made from recycled materials. In particular, the Asian Games badges, as the most popular items in the Asian Games Village, have been warmly received by almost all the athletes. It's particular worthy mentioned that there was a Filipino athlete who redeemed carbon credits he earned from participating in low-carbon activities for 16 mouse pads made from recycled plastic waste from the Asian Games Village, a project launched by the Ele.me. This example highlights the significant potential for international replication of carbon inclusion initiative





### c) Cities with the highest carbon credits consumption

Let's take the "Kuaidian" platform as an example to look into the consumption scenarios of carbon credits in various cities on the carbon inclusion platform with commendable use base. According to the statistical data, the city with the highest carbon credits consumption is Chengdu, which may be attributed to Chengdu's high ownership of EVs. By the end of August this year, Chengdu has over 550,000 EVs, ranking the sixth in China and first among cities with no automobile purchase restriction. It is also thanks to Chengdu's strong publicity for the carbon inclusion. The "Tianfu Carbon Credits" platform has two million users, reflecting strong desire among Chengdu residents to participate in carbon inclusion initiatives. Shenzhen and Wuhan rank the second and third in terms of carbon credit consumption. From the policy side, both Shenzhen and Wuhan have introduced policies related to carbon inclusion; in terms of EV ownership, the two cities take the second and eleventh place respectively. From the perspective of construction of municipal carbon inclusion platforms, both cities have launched multi-scenario carbon inclusion platforms for residents.

Top 10 cities with the highest carbon credits consumption on Kuaidian (unit: 10,000)

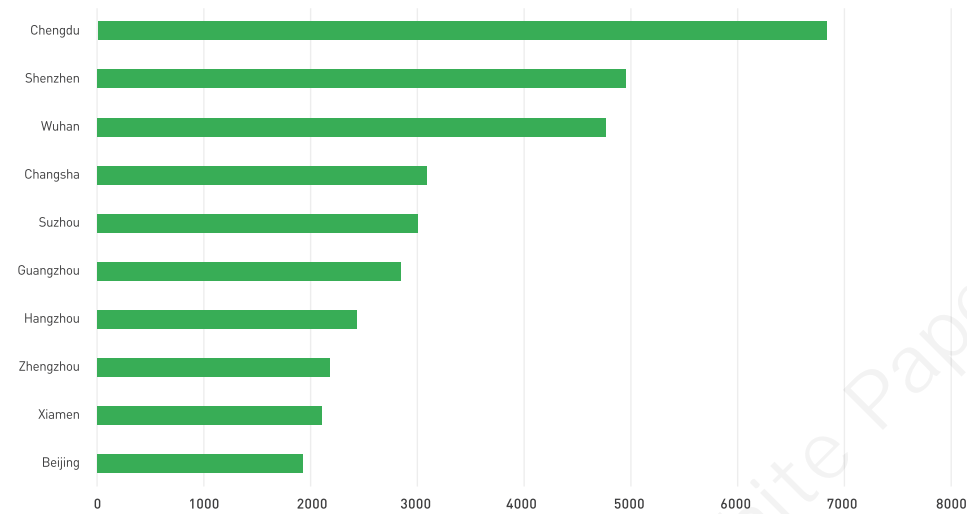


Figure 5.15 Top 10 cities with the highest carbon credits consumption on "Kuaidian" platform

Data source: "Kuaidian" platform

# 06

## Trading Models and Applications of Carbon Inclusion



## 6. Trading Models and Applications of Carbon Inclusion

Both trading models and applications of carbon inclusion and carbon emission reductions are still in the exploration and development stage, with relatively slow advancements. Based on actual cases where a closed loop of consumption has been formed, we have identified three common types, namely: spot trading at carbon emission exchanges, voluntary carbon trading between enterprises, and carbon neutrality of large events.

### 6.1. Spot Trading at Carbon Emission Exchanges

#### a) Carbon inclusion trading in Shenzhen

In 2022, under the guidance of the Shenzhen Municipal Bureau of Ecology and Environment, Shenzhen Tong Company, Shenzhen Bus Group Co., Ltd. and the Shenzhen Emission Rights Exchange worked together, launched the "Low Carbon Public Transportation Carbon Inclusion Project" in Shenzhen, and build the "Carbon Glory for All" platform. The project is the first carbon inclusion project launched by Shenzhen in implementing the national strategy of "carbon peaking and carbon neutrality" as well as the concept of green and ecological development. On November 18, 2022, the first version of "Carbon Glory for All" was officially launched. As of August 15, 2023, "Carbon Glory for All" has over 13.65 million registered/authorized users. In H12023, Shenzhen approved the first batch of three carbon inclusion and carbon emission reduction projects, namely Tencent Zhenyi (Shenzhen) Low-Carbon Public Mobility, Shenzhen Tong Low-Carbon Public Mobility, and Harrow Shared Bicycle Riding.

On August 11, 2023, Shenzhen Tong "Glory for All" Carbon Inclusion project was officially listed and traded on Shenzhen Emission Rights Exchange, becoming the first of its kind to be listed. It is reported that "Glory for All" achieved a good start after its listing, with its opening price increasing by 10% for three consecutive days before closing at a halt. As of the close of trading on August 15, "Glory for All" registered a cumulative turnover of 38,340 tons and around RMB 141.02 million yuan.

#### b) Carbon inclusion trading at Beijing MaaS platform

Beijing launched the China's first Mobility as a Service ("Beijing MaaS") platform in November 2019. The platform relies on public travel service platforms such as Amap and Baidu Maps to provide the public with real-time public transportation information, bus/subway congestion inquiries and other functions, effectively improving the seamless experience of "public transportation + walking" and other urban mobility modes. In September 2020, the carbon inclusion incentive mechanism for green travel was introduced to Beijing MaaS. After signing up for the "MaaS Travel to Green the City" campaign on Maas, citizens who choose to travel by public transportation, rail transit, walking, or cycling can have their carbon emission reduction amount tracked. The

reduction amounts can then be used to redeem public transportation cards or vouchers, or even donated to environmental protection public welfare activities available on the MaaS platform. As of June 2023, MaaS has over 30 million registered users, and serves an average of more than 4.5 million environmentally conscious travelers every day. The platform has more than 3.75 million users registered with their real names for carbon inclusion. Those users have collectively reduced over 500,000 tons of carbon emission, with 120,000 tons already completed for market trading. All of the proceeds from the transaction were distributed back to the users who engaged in green travel in the form of equity.

#### c) Carbon inclusion trading in Guangzhou

On November 6, 2023, the Guangzhou Carbon Inclusion & Voluntary Carbon Emission Reduction Registration Platform ("Registration Platform") was officially launched and successfully completed its first carbon inclusion project transaction. The Registration Platform serves as the unified platform for holding, changing, clearing and canceling of carbon inclusion emission reductions, in Guangzhou province. The launch of this platform is a significant endeavor of Guangzhou in actively addressing the national strategy of "carbon peaking and carbon neutrality", and a crucial measure to promote Guangzhou's carbon-inclusion closed-loop development, expand emission reduction consumption channels, and realize value conversion.

Following the prescribed methodology, Guangzhou Harrow Shared Bicycle Riding Carbon Inclusion Project completed its first issuance of carbon emission reductions, with a total of 10,363 tons of emission reductions issued. GAC AION New Energy Automotive Co., Ltd., United Microelectronics Corporation and Guangzhou Carbon Emission Trading Center completed the initial subscription of Guangzhou carbon inclusion and emission reductions. The total subscription amount exceeded RMB 400,000, with a transaction price of RMB 40 per ton. GAC AION will utilize all of the Guangzhou carbon inclusion emission reductions it has acquired to achieve carbon neutrality for its zero-carbon automotive manufacturing facility while United Microelectronics Corporation allocate the purchased quantity towards reducing emissions resulting from its smart manufacturing production project. There were several other enterprises expressed their intentions to subscribe a total of 40,000 tons of emission reductions.

### 6.2. Voluntary Carbon Trading between Enterprises

#### a) Carbon inclusion transactions in Suzhou Industrial Park

With distributed PV as the starting point and certification, transaction and utilization of carbon emission reductions as the focus, Suzhou Industrial Park Administrative Committee, together with State Grid Suzhou Power Supply Company and Shanghai Environment and Energy Exchange, jointly explored and built an carbon inclusion system in the park



for regional market-based voluntary carbon emission reduction transactions in an innovative manner, aiming to bridge the supply and demand sides of the carbon emission reduction. Suzhou Industrial Park Administrative Committee particularly compiled and issued two core documents about the implementation plan and management methods of the carbon inclusion system, clarifying the main subjects including the carbon inclusion management system, carbon inclusion emission reduction projects and market transaction system. Led by the State Grid Suzhou Power Supply Company, a carbon inclusion operation center (affiliated with Suzhou Industrial Park) was established to standardize methodology management, emission reduction project management, emission reduction quantity management and other daily operations.

On November 16, 2022, the Suzhou Industrial Park Carbon Inclusion Trading System was officially launched, being the first market-based carbon inclusion system that has realized voluntary emission reduction transaction in China. It provides enterprises in the industrial park with convenient carbon emission reduction certification and transaction services, promoting the transformation of green and low-carbon production patterns.

Zooming New Energy has completed certification on more than 10,000 tons of carbon emission reductions through the carbon inclusion platform, and stroke a deal of 4,000 tons with a demanding enterprise on the first day of launching the carbon inclusion system.

#### **b) Enterprise carbon trading under Chengdu "Tianfu Carbon Credits" mechanism**

On November 7, 2022, the Ecological Environment Bureau of the Pidu District and the Management Committee of the Green Hydrogen Industry Functional Zone of the Pidu District in Chengdu reached an ecological carbon emission reduction subscription agreement. Guided by the Ecological Environment Bureau of the Pidu District, this batch of ecological carbon emission reduction is developed by using the afforestation management, Tianfu greenway and other carbon emission reduction project methodologies issued in line with the mechanism of "Tianfu Carbon Credits". There are 13 carbon emission reduction projects in several categories, including the drinking water sources of Pidu District, farmhouse forests in western Sichuan, greenways around Xuyan River and Baitiao River, Jingju Lake wetland in Yunqiao and testing soils for formulated fertilization. After review, the annual carbon emission reduction reached 6,470 tons. Management Committee of the Green Hydrogen Industry Functional Zone, the subscriber, plans to seize the opportunity of creating the city's first batch of near-zero carbon emission parks. These carbon emission reductions will be signed to partially offset the carbon emissions generated in the production process of the parks. Based on the transaction reference price, the total transaction amount is estimated to be about RMB 278,000. This also marks Chengdu's first ecological carbon emission reduction transaction.

On the same day, Chengdu Data Group Co.,td, Sichuan Faw Toyota Motor CO., Ltd. and Industrial Bank Co.,Ltd Chengdu Branch signed an agreement for carbon emission reduction subscriptions by alternative energy sources. According to the contract content, Sichuan Faw Toyota Motor CO., Ltd. will subscribe 15,000 tons of carbon emission reductions by alternative energy sources from Chengdu Data Group Co.,ltd, to offset all carbon emissions generated in the production process of the company in 2021. It is calculated that this subscription is equivalent to the amount of carbon dioxide absorbed by 36,000 mu of afforestation in a year.

### **6.3. Carbon Neutrality of Large Events**

#### **a) Beijing Winter Olympics**

On January 19, 2022, by taking the opportunity of the Beijing Winter Olympics, the event organizer launched a WeChat mini program to encourage and guide the social public to practice a green and low-carbon lifestyle and cultivate their sense of responsibility and honor in carbon emission reductions. By the end of February 2022, the initiative had registered 2.7 million participants, more than 90 million actions and around 19,000 tons of carbon dioxide reduction equivalent in total, playing a positive and exemplary role in promoting the green and low-carbon concept and lifestyle in the whole society.

#### **b) 31st Summer Universiade**

On August 29, 2023, Chengdu Municipal Bureau of Ecological Environment announced at a press conference that the city had basically achieved carbon neutrality in the ecological environmental conservation efforts at the 31st FISU Summer World University Games. The total carbon emissions in the entire process of preparation, hosting and post-event of the Universiade were calculated about 370,000 tons, which were fully offset through the national certificated carbon emission reduction and forestry carbon sink means and the "Tianfu Carbon Credits" mechanism, reducing carbon emissions by about 26,000 tons, thus becoming the first carbon-neutral sports event in the western region of China. The "Tianfu Carbon Credits" mechanism falls under the category of carbon inclusion emission reduction.

Combined with the Chengdu Universiade, the "Tianfu Carbon Credits" green public welfare platform had included a low-carbon Universiade special column. The platform successively launched seven activities involving knowledge contest, public carbon credits donation, city culture demonstration and other subjects, and introduced rich incentive prizes for the column, in order to stimulate the public enthusiasm in low-carbon engagement.

During the Universiade, the "Tianfu Carbon Credits" platform actively advocated the "135" green and low-carbon travel concept. Citizens could participate in the carbon

emission reduction activities through the Chengdu Metro App and gain green travel credits, which could be used to exchange free single trip subway and bus cards, shared bicycle riding coupons, EV charging discount vouchers and other benefits. The objective of this initiative was to reduce the traffic pressure of the city through advocating green and off-peak travels, ensuring that the proportion of green travels in the central city and competition areas reached about 70% during the event.

#### c) 19th Asian Games Hangzhou

The relevant responsible party of the Asian Games Hangzhou Organizing Committee proclaimed that the carbon neutral Asian Games did not mean no carbon dioxide emissions, but minimizing carbon emissions through implementing green actions during the games. For some unavoidable carbon emissions, measures such as carbon quota, carbon credit and carbon inclusion donation by organizations and individuals were carried out to achieve carbon offset and carbon neutrality. As of the end of July, Hangzhou Asian & Asian Para Games had received 1.068 million tons of carbon sink donations from 45 organizations in total, covering donations of carbon quotas, China Certified Emission Reduction (CCER), international certified carbon credits and carbon inclusion quantities. Among them, Anji Liangshan Cooperative donated 21,046.4 tons of carbon emission reductions, all of which were generated from carbon sinks of bamboo forests. The games also obtained carbon sink donations of 20,100 tons from Lishui City and carbon emission reduction donations of 1,148 tons from Yuhang District.

Apart from enterprises, the green and low-carbon lifestyle concept promoted by the Green Asian Games initiative also deeply resonated with the public and attracted many citizens to enable a carbon neutral event. As of July, more than 100 million people participated in the "1 Kilogram Per Person to Support Carbon Neutrality at the Hangzhou Asian Games" activity, and the "Plant Trees for the Asian Games" campaign had seen participation of more than 18 million people, plantation of more than 48 million trees and construction of 26 carbon neutral forests.

#### d) China International Import Expo (CIIE) in Shanghai

On November 8, 2022, the CIIE-China International Economics and Technology Administration Summit with the theme of "Embracing the Digital Age and Building a Zero Carbon Future Together" was held in Shanghai. Supported by NaaS (NASDAQ: NAAS) and its strategic partner Kuaidian, the summit pioneered the industry by achieving carbon neutrality through EV charging carbon emission reduction means, and obtained the Carbon Neutrality Certificate issued by the China Beijing Green Exchange, enabling closed-loop value exchanges of voluntary carbon inclusion emission reductions and effective implementation of carbon neutral projects.



Figure 6.1 Carbon Neutrality Certificate Issued by the China Beijing Green Exchange

#### e) China Wealth Forum

On July 30, 2022, Qingdao Local Financial Supervision Bureau, on behalf of the municipal government, purchased a certain quantity of public carbon emission reductions from "Qingtanxing" via e-CNY electronic payment, in order to offset the carbon emissions generated by the 2022 Qingdao China Wealth Forum to achieve carbon neutrality for the forum. This was not only the first time a large conference had achieved zero carbon, but also pioneered the application of e-CNY electronic payment in the field of carbon inclusion, demonstrating the leading and modeling role of "Qingtanxing" in conducting and promoting green consumption carbon inclusion activities.



## 07

## Carbon Inclusion Innovation Cases

## 7. Carbon Inclusion Innovation Cases

The innovative characteristics of carbon inclusion can be reflected and designed from policies, products, patterns, transactions, incentives and other aspects.

## a) Carbon inclusion and e-CNY

Carbon inclusion and e-CNY are universally accessible to all people basically. To address the national carbon peaking and carbon neutrality strategic goal and enable national e-CNY pilot projects, Shujin Public Service (Qingdao) Co., Ltd. has developed and launched China's first e-CNY settlement carbon inclusion platform "Qingtanxing", and released another extended version of "Hutanxing" for Shanghai. The "Qingtanxing" and "Hutanxing" calculate the public carbon emission reductions from low-carbon travel modes such as subway, bus, bicycle and EVs into corresponding credits by certain methods, and then privately and reliably store the data throughout the life cycle relying on the blockchain technology. Using e-CNY as pricing and payment means, they aim to advocate practicing the green and low-carbon production and life style in the public.



Figure 7.1 Partial Page of "Qingtanxing" Platform

By October 2023, the platform had registered nearly 3 million users, carbon emission reductions of more than 50,000 tons, and more than 100 online and offline green and low-carbon activities. Cooperating with e-CNY operators, it had issued more than 3.6 million yuan of e-CNY red packets and more than 15 million yuan of low-carbon equities in total. By combining carbon inclusion development with e-CNY pilot program and blockchain technology, it has successfully developed new carbon inclusion business models, innovative e-CNY pilot scenarios and a new pattern featuring coordinated development of digital finance, green travel and smart life, generating a significant demonstration and catalyst effect in terms of domestic green travel and low-carbon emission reduction.

## b) Diversified and sustainable carbon inclusion patterns

At the beginning of the carbon inclusion system construction, Wuhan City authorities had recognized that this initiative has practical significance in promoting building an environmental governance system led by the government, dominated by enterprises and involving social organizations and the public. To this end, the city has been actively exploring diversified and sustainable carbon inclusion innovation patterns. Compared with other cities, the carbon inclusion system of Wuhan has unique characteristics. First, it has established the first state-owned enterprise specializing in carbon inclusion operation in China to explore a self-sufficient and sustainable development pattern with Internet-based operation concepts. Second, it is committed to achieving market-based transactions of carbon emission reductions by relying on the carbon trading market of Hubei Province, so as to enable emission-controlled enterprises to reduce the compliance costs. Third, individual low-carbon behaviors cannot only be quantified and recorded but also verified and signed online, greatly enhancing the public experience and rewards. Fourth, in addition to encouraging citizens to reduce carbon emission, the city also launched an online carbon accounting platform for small and medium-sized enterprises such as parks, banks and office buildings. Through the integrated carbon asset management and consulting services provided by the platform, enterprises can enhance their competitiveness in the digital transformation of green production.

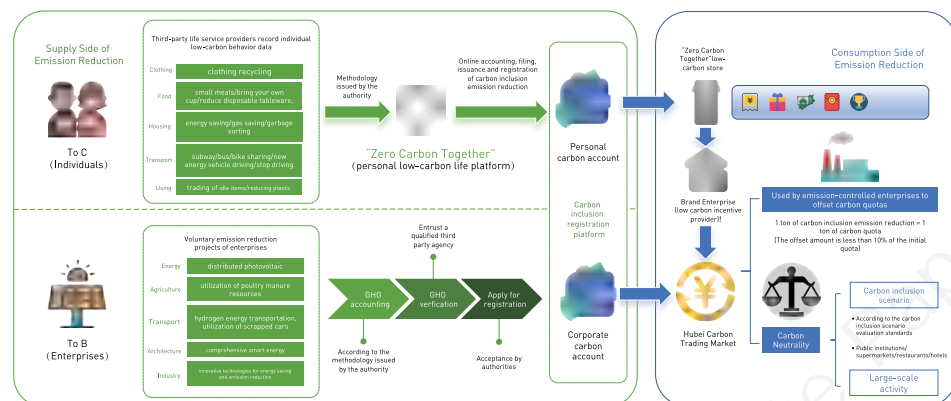


Figure 7.2 Introduction of Carbon Inclusion Pattern of Wuhan

For the uptake of emission reductions, by experimenting with emission-controlled enterprises in Wuhan City as a starting point, the government of Hubei Province is exploring to use carbon inclusion emission reduction as a supplementary mechanism of the provincial carbon market, to increase the liquidity of the carbon market and drive more entities to reduce emissions actively. In November 2023, Department of Ecology and Environment of Hubei Province issued the provincial “2022 Annual Carbon Emission Quota Allocation Plan (the Plan)”, officially incorporating carbon inclusion emission

reductions into the carbon quota offsetting mechanism. The plan proposes to “encourage voluntary greenhouse gas emission reduction activities such as carbon inclusion. The enterprises in Wuhan can use the carbon inclusion emission reduction issued by the municipal Department of Ecology and Environment under the Wuhan carbon inclusion system to offset their actual carbon emissions in 2022. Enterprises with quota gaps can use the carbon inclusion emission reduction offset method, but the offset quantity shall not account more than 10% of their initial annual carbon emission quotas or exceed the quota gaps.”

## c) Carbon inclusion SaaS platform

To enable the national carbon peaking and carbon neutrality strategy and implement the two top-level designs, the “Opinions of the Central Committee of the Communist Party of China and the State Council” on the complete, accurate and comprehensive implementation of the new development concept to do a good job in carbon peaking and carbon neutrality and the “Action Plan for Carbon Dioxide Peaking before 2030” it is important to accelerate the formation of an environmentally conscious lifestyle embraced by the public, deploy “Green and Low-Carbon National Action” and advocate energy conservation and carbon emission reduction in the lives of community residents. And enhancing the awareness of conservation, getting everyone involved and forming a green lifestyle also play a vital role in the carbon peaking work.

Meanwhile, the “Emissions Gap Report 2020” released by the United Nations Environment Programme points out that the current greenhouse gas emissions of household consumption account for about two-thirds of the total global emissions (using a consumption-based greenhouse gas emissions calculation method), and accelerating the transformation of public lifestyles has become an inevitable choice to mitigate climate change. From the perspective of China's carbon emission structure, 26% of the national energy consumption are directly intended for public lives, and the resulting carbon emissions hold a percentage of more than 30%.

Under this context, the Alibaba Cloud Energy Expert team has developed a carbon inclusion SaaS platform integrated with carbon emission reduction management, carbon account and carbon inclusion functions, designed to mobilize public participation in the carbon emission reduction process through empowering offline scenarios, and provide a compass for organizations with sustainable development and carbon neutral demands. The compass refers to visualizing the carbon emission reduction process and carrying out scientific calculations of carbon emission reductions. The platform provides matched certification methods and standards for many carbon footprints in our daily lives, helping organizations gain control over the carbon emission and even become the carbon neutrality demonstration unit. Moreover, in terms of technological innovation, cloud computing and big data analysis have also been introduced to help community residents see, clarify,



quantify and analyze household energy consumptions. The functional architecture of the carbon inclusion SaaS platform is as follows:

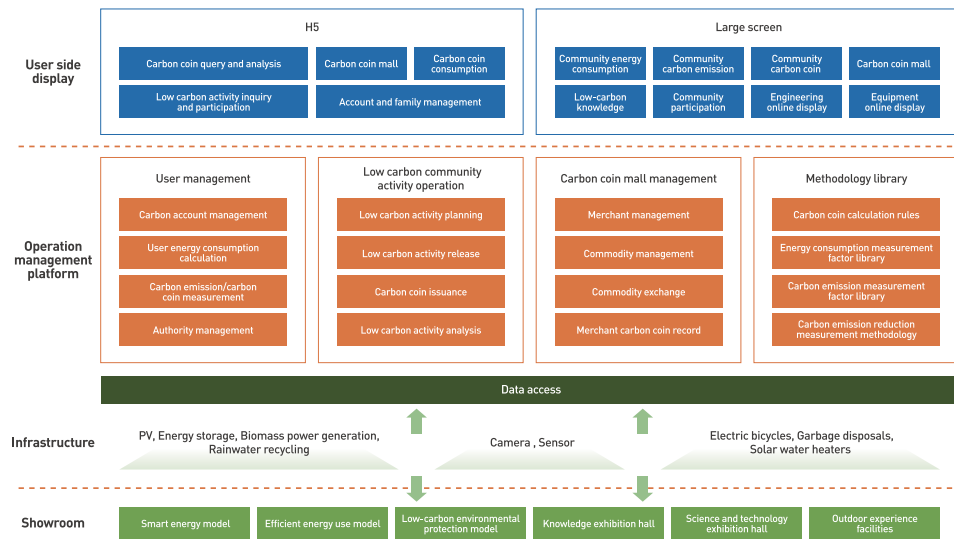


Figure 7.3 Functional Architecture of the Alibaba Cloud Carbon Inclusion SaaS Platform

#### d) Carbon inclusion digital finance platform

Statistics suggest that 7.352 million and 7.28 million EVs had been manufactured and sold nationwide respectively between January and October 2023, up 33.9% and 37.8% from a year earlier, with a market share of 35%. As of March 2023, the cumulative number of charging infrastructure nationwide was 7.954 million units, of which 2.525 million units were held by public charging piles. As of September 30, NaaS had covered more than 767,000 chargers and 73,000 charging stations, with a cumulative charging volume of 1,383 GWh in 2023, a year-on-year growth of 66%, accounting for 21.8% of the national public charging capacity in China. In the field of EV charging, relevant methodology shows that EVs can effectively reduce carbon emissions by 0.5kg-0.8kg /kWh of charging, depending on different power grid areas.

Based on this, NewLink Carbon Neutrality team has developed a carbon inclusion digital finance platform, which can provide all-around online services of record, calculation, registration, certification, review and trading for carbon inclusion emission reductions from EV charging pile owners and charging users, enabling them to get real benefits from their green behaviors. Furthermore, by connecting with financial institutions, the platform also opens carbon credit accounts for charging pile owners and users, records their carbon emission reduction quantities and authorizes low-interest loan insurance and other financial services for those with high ratings. The underlying platform powered

by blockchain technology makes the entire chains of data, information and transactions clearly visible to ensure the green entitlements of all participants.

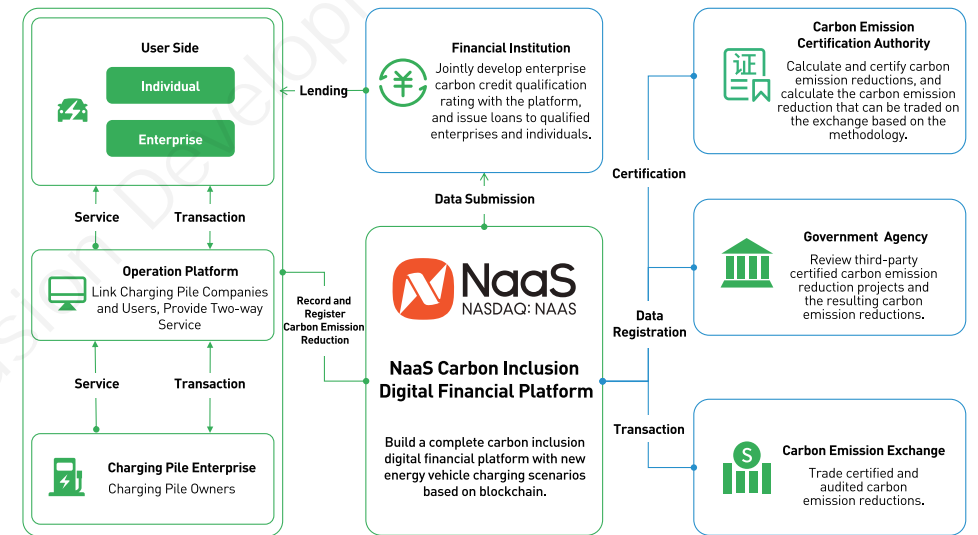


Figure 7.4 Introduction of NaaS Carbon Inclusion Digital Financial Platform

#### e) "Carbon Inclusion Rights Center" for all business scenarios

China UnionPay Merchant Services'(UMS)"Carbon Inclusion Rights Center" takes innovative carbon inclusion mechanisms as its main path to promote green and low-carbon actions among the people, connecting commercial retail, cultural tourism, transportation, energy, general health and other industries in pilot cities. In all business scenarios such as travel, entertainment and shopping, it produces "carbon rights" through low-carbon behaviors, giving people environmental value and rights.

UMS' "Carbon Inclusion Rights Center" uses personal carbon rights, carbon accounts, carbon credits, carbon mall, and carbon applications as its core carriers to connect with the carbon application platforms of various pilot cities. Utilizing the advantages of UnionPay's "Silver Code" that connects all online and offline payment systems, it creates a "Carbon Identity Code" that runs through all consumer payment related scenarios. UMS' "Carbon Inclusion Rights Center" expands the carbon rights system and carbon commercial marketing system on the basis of the integrated management and control platform, and is based on the "carbon credits" account system as the basic trading system of the green carbon rights platform. By continuously improving the basic system construction of the green carbon rights and interests platform, including cooperative



enterprises and business management, data center, service management, settlement management, etc., they can realize the entry of platform partners and service providers, platform service procurement, supplier service provision, Full-process management of rights and interests of cooperative enterprise users, including user consumption, service provider write-off, and "carbon credits" settlement. At the same time, through the open API interface, the system access capabilities of "user import", "carbon acquisition", "carbon trading" and other scenarios are realized. The core participants of UMS' "Carbon Inclusion Rights Center" include three roles: users, service providers and operation platforms. The online unified rights and interests portal system based on the WeChat mini program provides the expansion of online rights and interests scenarios such as business district display, activity display, task display and coupon display.

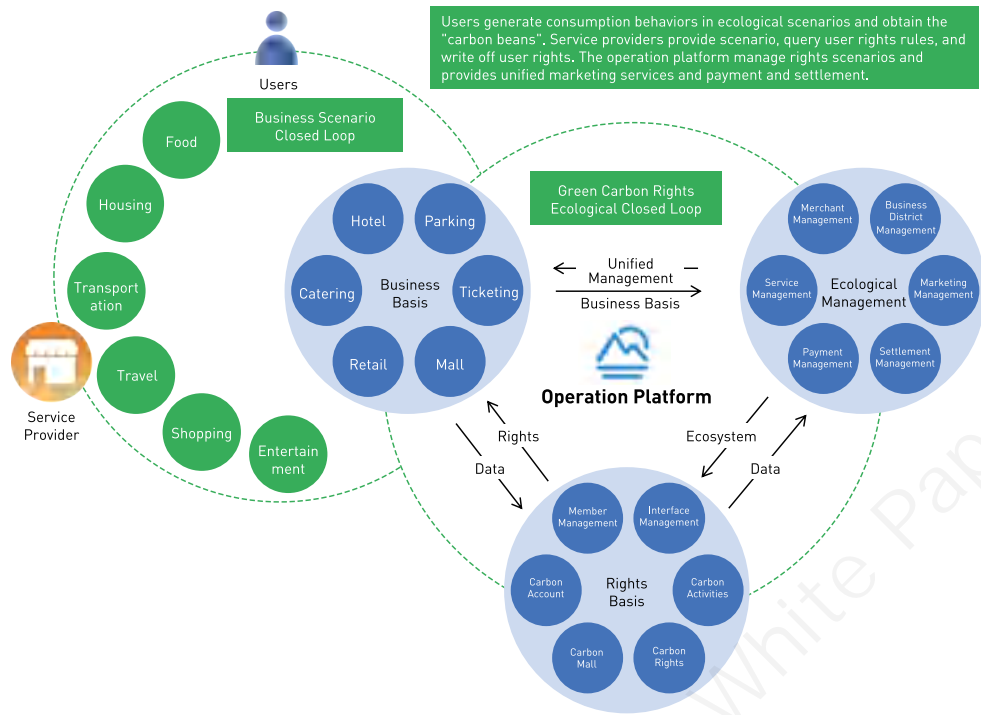


Figure 7.5 Introduction of UMS' "Carbon Inclusion Rights Center"

# 08

## Integration of Carbon Inclusion and Innovative Technologies





## 8. Integration of Carbon Inclusion and Innovative Technologies

The integration of carbon inclusion and innovative technologies provides new opportunities to promote green and low-carbon development. Thanks to emerging technologies such as blockchain technology, artificial intelligence (AI), Internet of Things (IoT) and big data, we can better monitor and measure carbon emissions, achieve data storage and traceability and provide a more powerful service platform for using carbon emission data. This integration not only ensures accurate management of carbon emissions, but also provides new tools for incentivizing green and low-carbon living.

### a) Application of blockchain technology in carbon inclusion

As a distributed database technology, the core of blockchain technology lies in achieving data security, transparency and immutability in a decentralized manner, which has broad application prospects in carbon inclusion.

#### 1) Automatic record of carbon inclusion data

Combining with the IoT technology, blockchain technology can automatically record carbon inclusion related data onto the blockchains. This reduces human intervention and ensures the authenticity of the data. Moreover, blockchain technology can automatically perform relevant transactions according to the pre-set intelligent contract contents and trigger conditions, such as automatically issuing rewards or credits based on carbon emission reduction data.

#### 2) Data privacy protection

Blockchain technology can protect the privacy of participants. The anonymity of addresses on the blockchain ensures that regular individuals cannot access personal information solely through an address. This will satisfy the privacy protection requirements of some carbon inclusion participants, especially for enterprises possessing core and sensitive data.

#### 3) Data tracing

Blockchain technology can also be used for carbon emission reduction certification and tracing. By recording the detailed information and verification data of emission reductions onto the blockchains, the authenticity and effectiveness of the projects can be guaranteed, and users can track the sources and processes of emission reduction behaviors to increase the credibility and reliability of participants. Blockchain can also ensure the uniqueness and non-replicability of carbon inclusion assets and prevent the repeated use.

#### 4) Incentive system

The financial function of blockchain also enables a carbon inclusion incentive system, allowing every active participant to earn certain token points, which can be promoted based on an intelligent agreement as their engagement increases, thus boosting the impacts of carbon inclusion.

The application of blockchain technology in carbon inclusion can help achieve the goals of data enhancement, process efficiency, data privacy protection and user incentive, providing new possibilities for the development of carbon inclusion.

### b) Application of artificial intelligence technology in carbon inclusion

Artificial intelligence technology can also be widely combined and applied with carbon inclusion mainly in the following aspects:

#### 1) Image recognition

It is necessary to use artificial intelligence technology to identify the pictures involving public low-carbon participation and calculate carbon emission reduction quantities for credit determination under some low-carbon scenarios such as cleaning plate campaign and restriction of ICE vehicles. In addition, for some carbon knowledge and popularization activities, individuals can also obtain the average carbon footprint values from the surrounding items by taking a picture of them, thus increasing carbon inclusion engagement.

#### 2) Data analysis

Artificial intelligence technology enables to deeply dig and analyze carbon inclusion big data, discover the rules and patterns of carbon emission reduction and provide data support for policy-making.

#### 3) Prediction model

The technology can also build carbon emission reduction prediction models through machine learning algorithms, to predict future trends and provide decision references for governments and enterprises.

#### 4) Intelligent recommendation

Artificial intelligence can provide personalized carbon emission reduction suggestions and solutions according to public behaviors and preferences, and encourage more people to participate in carbon emission reduction activities.

#### 5) Automatic processing

Artificial intelligence can automate some complex carbon inclusion tasks, such as data entry, audit and settlement, thus improving productivity and reducing costs.

## 6) Intelligent customer service

Artificial intelligence can provide users with 24-hour consulting services as an intelligent customer service, to answer the problems encountered by them when using the carbon inclusion platform.

The adoption of artificial intelligence technology will improve the productivity and accuracy and promote the development of carbon inclusion.

## c) Application of IoT technology in carbon inclusion

Originated in the media field, the Internet of Things (IoT) technology is considered as the third revolution in the information technology industry. IoT refers to connecting anything to the network by using the information sensing devices based on agreed protocols, and performing information exchange and communication by resort to certain medias, to achieve intelligent identification, positioning, tracking, supervision and other functions. These functions can be widely used in carbon inclusion.

### 1) Data collection

IoT devices can collect and upload carbon emission reduction-related data in real time, such as energy consumption and transportation data, which can be used to calculate carbon emission reductions for institutional or individual carbon inclusion activities.

### 2) Automated management

IoT technology enables remote device monitoring and control. For example, smart home systems can automatically regulate the household energy use, thereby reducing carbon emissions.

### 3) Intelligent feedback

IoT technology can provide real-time feedback, allowing users to view their carbon emission reductions in real time through mobile apps and increase enthusiasm in these activities.

The integration of IoT technology can greatly improve the data collection effectiveness and accuracy of carbon inclusion.

## d) Application of big data technology in carbon inclusion

Big data technology processes and analyzes large, diverse and rapidly changing data involved in the collection, storage, management, analysis and application processes, which can be infused with carbon inclusion in the following aspects:

### 1) Establish data model through data analysis

Big data technology enables to deeply dig and analyze massive carbon inclusion data, and discover the rules and patterns and establish prediction models for relevant projects and scenarios.

### 2) Assistant decision

Moreover, combined with artificial intelligence technology, big data technology can predict future trends in carbon inclusion related fields, and provide decision reference for governments and enterprises.

The consolidation of big data technology can effectively improve the efficiency of carbon inclusion platforms. These analyses and discoveries based on data technology will provide users with more suitable services, as well as theoretical data support for governments' policy making on carbon inclusion.

## e) Application of virtual reality (VR) and augmented reality (AR) in carbon inclusion

Applications of virtual reality (VR) and augmented reality (AR) in carbon inclusion mainly include the following aspects:

### 1) Education and propaganda

VR and AR technology can create an immersive environment for users to more intuitively understand the impacts of carbon emissions and the harms of environmental disruption and enhance their consciousness of environmental protection. By simulating the energy conservation and carbon emission reduction activities in relevant carbon inclusion fields, users can find pleasure in the direct experience of a low-carbon way of life and dive into immersive experiential learning.

### 2) Data analysis and visualization

VR and AR technology can exhibit complex carbon emission data and environmental protection information in an intuitive way, helping platforms and enterprises optimize data analysis and facilitating users to better understand and learn this information.

### 3) Visualization of carbon inclusion projects

VR and AR technology can visualize the implementation processes and results of carbon inclusion projects for enhanced transparency and credibility.

It is conducive to improving public environmental awareness and user experience.

The integration of carbon inclusion and innovative technologies can achieve a win-win situation that facilitates both green and low-carbon development and progress and application of digital technologies.



# 09

## Challenges in Carbon Inclusion Development

### 9. Challenges in Carbon Inclusion Development

#### a) Lack of complete management systems and standards

While some provinces and cities have already issued carbon inclusion construction plans, corresponding management methods, and supporting policies, there remains a lack of unified and comprehensive management systems and standards backed by top-level national carbon inclusion designs.

#### b) Repeated carbon credit calculation resulted from repetitive platform construction

At present, there are more than 20 carbon inclusion platforms in various provinces and cities across the country, but the scenarios are basically the same for those that have been put into operation. Meanwhile, some enterprises have also begun to build internal carbon inclusion platforms, leading to massive repetitive construction work. In addition, due to data separation between respective platforms, a user's carbon emission reduction data from the same green behaviors may be calculated repetitively, thus resulting in undeserved entitlement beyond the actual credits mistakenly. For example, for a cycling user, the corresponding app will calculate and reward certain carbon credits, as will the local government's carbon inclusion platforms, leading to repeated calculation and issuance of entitlement.

#### c) Difficulty in data collection and no differentiation between quantitative and qualitative user green behavior data

The carbon inclusion application scenarios and green living behaviors are diverse. Carbon reduction scenarios with methodological certifications could be quantitatively calculated, such as walking, cycling and EV charging cases. However, for a single platform that is not connected with major applications or hasn't obtained authorization from users, it is impossible to accurately calculate the user green behavior data. In addition, for qualitative carbon emission reduction scenarios such as cleaning plate campaign, garbage recycling and used clothing recycling, the user data sources and actual carbon emission reductions of related behaviors cannot be precisely guaranteed.

#### d) Single consumption scenario of carbon credits and carbon emission reductions cannot enter the trading market

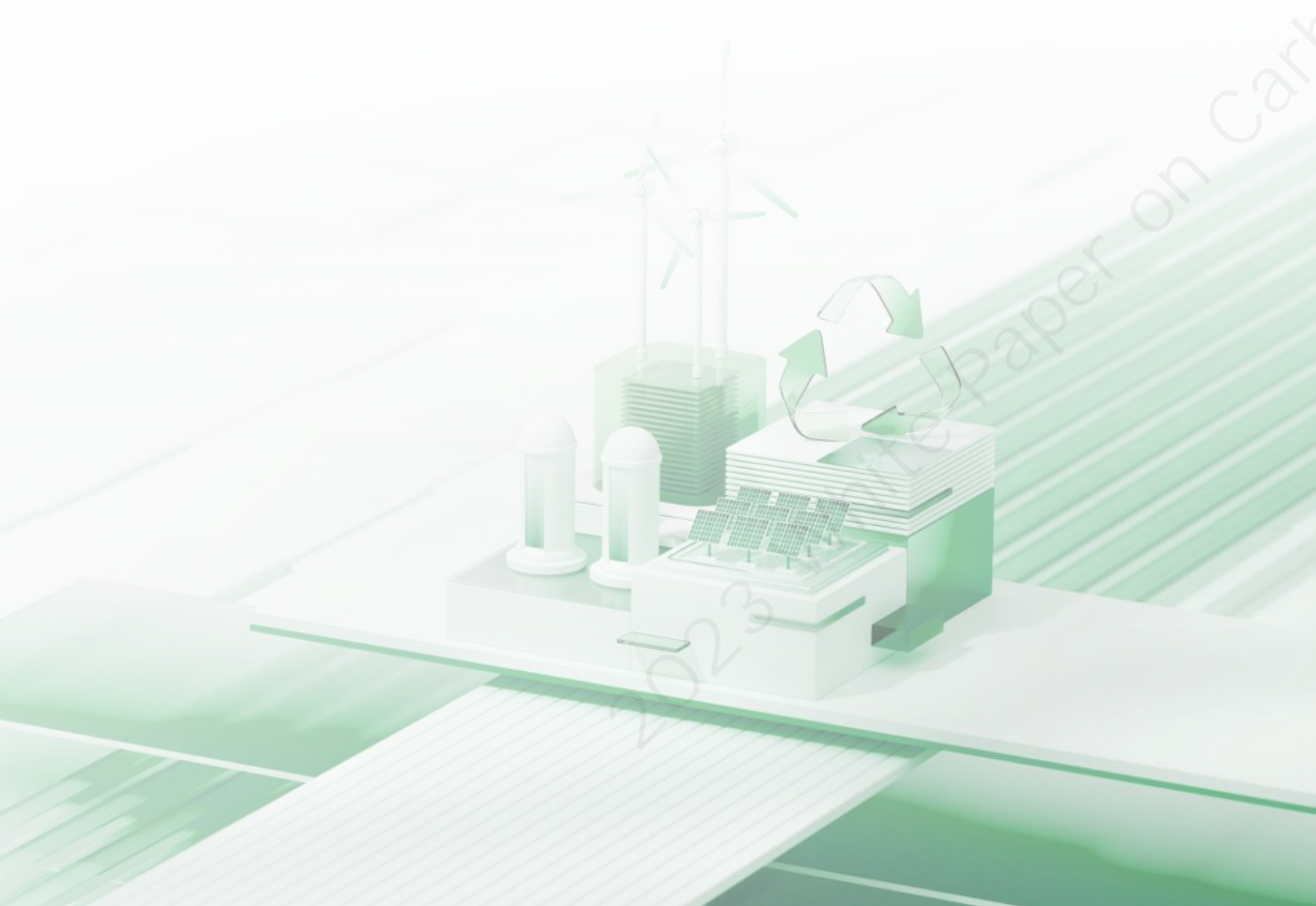
Most existing platforms offer only a single carbon credit consumption scenario, that is, being restricted to exchange limited categories of goods in the credit marketplaces. Moreover, only a small number of carbon inclusion platform users have completed carbon emission reduction transactions, while the vast majority of participants are currently unable to enter the carbon trading market, and the closed-loop trading has not yet put into place.

**e) Low awareness and participation in carbon inclusion for the public**

Due to limited promotion of the low-carbon lifestyle, public awareness and participation in carbon inclusion are not high, especially in the vast third-tier and fourth-tier cities and rural areas.

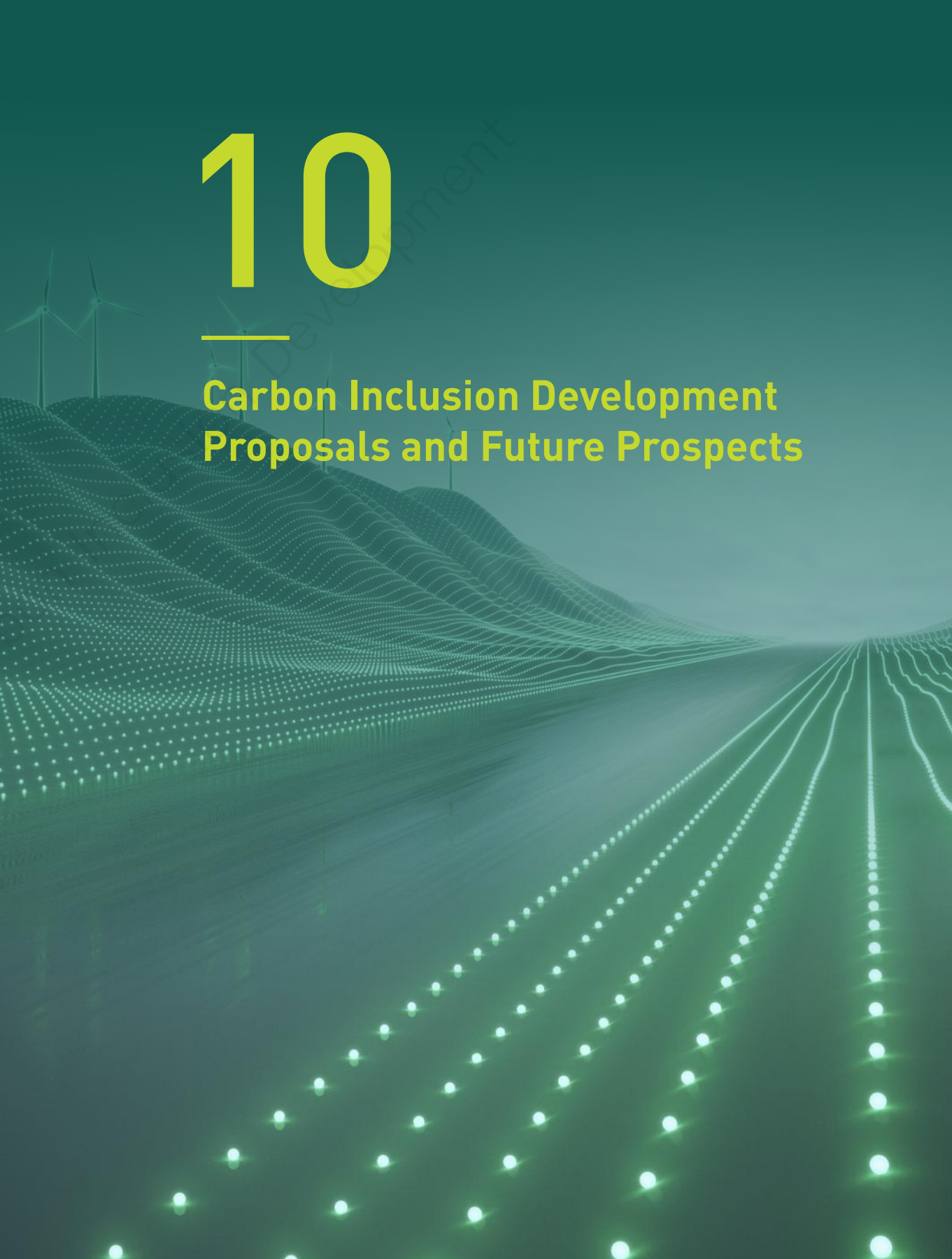
**f) High platform cost and low user activity**

Most current carbon inclusion platforms are segregated individual-oriented sites with high public usage expenses, resulting in low engagement rate, small registered and active user bases.



# 10

## Carbon Inclusion Development Proposals and Future Prospects





## 10. Carbon Inclusion Development Proposals and Future Prospects

To solve the above problems, the government, enterprises and the whole society shall work together to strengthen supervision, regulate the market order and improve the carbon inclusion and incentive mechanisms. Emphases should also be placed on cultivating professionals, promoting technological innovation and driving the development of carbon inclusion.

### a) Introduce top-level design policies for carbon inclusion mechanisms

Top-level national design policies of carbon inclusion mechanisms are advised to be introduced in the earliest time, for an overall planning of system construction and optimization of corresponding schemes and management methods, so as to enable a nationwide unified carbon inclusion platform. Meanwhile, relevant laws, regulations and standards should also be formulated to clarify the definition, coverage and implementation rules of carbon inclusion, and provide legal guarantee and policy support for the projects.

### b) Promote education and training

As the main participants of carbon inclusion mechanisms, public adoption of the low-carbon living and consumption concept plays an important role in the effective implementation of this initiative. Therefore, promoting and educating the public on embracing sustainable and low-carbon living practices will be a significant and long-term task, which necessitates a sound systematic education mechanism and complete incentive mechanism, as well as active participation of all parties. The good practices of some localities might be publicized nationwide, promoting a green community featuring low-carbon living and consumption atmosphere by rewarding individuals and strengthening social influence.

### c) Accelerate development of carbon inclusion methodologies and emission reduction scenarios

Expanding more low-carbon scenarios is the main means to promote public participation in emission reduction, which demands developing more carbon inclusion methodologies. Low-carbon scenarios are the manifestation of carbon inclusion mechanisms, while the relevant methodologies are the cornerstone of the mechanisms. The scenarios and methodologies are integrated and complement each other. Therefore, it is advised to accelerate the development of more carbon inclusion methodologies, set the national standards based on practical ones applicable to common fields such as transportation and supermarkets, unify local standards to adapt to the national carbon inclusion market, and ensure fairness, openness and transparency of the processes. Efforts should also be put in accelerating the creation of individual carbon footprints and carbon accounts under appropriate low-carbon scenarios, ensuring the security of personal

data and promoting the corresponding infrastructure construction, to enable the healthy development of carbon inclusion mechanisms.

### d) Improve carbon inclusion incentive mechanism and develop emission reduction trading market

Improving incentive mechanisms and developing emission reduction trading markets of carbon inclusion are an important direction to promote carbon inclusion system development. First, diversified and complete incentive mechanisms should be established to encourage public participation in carbon inclusion actions. This includes offering material incentives such as coupons, discounts and credits, as well as non-material incentives such as social recognition and enhanced environmental awareness. Meanwhile, it is necessary to develop carbon inclusion emission reduction trading markets, enabling participants to get economic benefits by trading their own carbon emission reductions. This cannot only stimulate public participation in carbon emission reduction activities, but also provide a purchasing channel for enterprises with emission reduction demands. Finally, a carbon inclusion finance system is also needed to feed funds for carbon inclusion projects. For example, financial services such as low-interest loans and guarantees can be provided to participating individuals and enterprises, so as to promote the implementation of carbon inclusion mechanisms.

### e) Encourage enterprises to actively participate in carbon inclusion construction

The overall construction of carbon inclusion mechanisms demands active participation of both individuals and enterprises. The extensive promotion of these projects by the enterprises will motivate more employees to contribute to carbon inclusion green initiatives. By participating in carbon inclusion construction, enterprises can also demonstrate their commitment and practices in environmental and social responsibilities, thereby enhancing their social image and reputation. These activities will also drive the sustainable growth of themselves and achieve coordinated economic, social and environmental development, which is of great significance to the long-term development and future competitiveness of enterprises.

### f) Strengthen financial institutions' support for carbon inclusion mechanisms

Financial institutions can assist in the establishment of individual and corporate carbon accounts, record their carbon inclusion emission reduction activities, and perform assessment and certification on their carbon credits. Those with high carbon credit ratings are given priority in terms of performance ranking and financial support. Financial institutions are encouraged to actively participate in carbon inclusion investment and financing services, and provide preferential financial products and services for those with excellent carbon credits. Carbon inclusion related financial products and services such as green credit cards, green financial products and carbon trading financial products are developed to meet the diversified green consumption and invest-

ment needs of the public, giving full play to the role of finance in guiding and supporting the development of low-carbon fields. Financial institutions are also motivated to provide financing support including loans, bonds and equity investments, to promote the implementation of carbon inclusion projects and the realization of carbon emission reduction targets. Furthermore, these institutions should also actively involve in the carbon trading markets to promote transactions of carbon quotas and voluntary emission reductions, providing enterprises and individuals with more carbon asset management and trading options.

#### **g) Actively integrate new technologies and explore innovative models**

By actively integrating new technologies such as blockchain, artificial intelligence, IoT, big data and VR and AR, efforts should be put in exploring innovation models under the carbon inclusion mechanisms, so as to build more accurate and efficient carbon inclusion operation management platforms and safer transaction scenarios with wider public participation, further promoting the innovative development of carbon inclusion mechanisms.

#### **h) Strengthen international cooperation**

Carbon inclusion cooperation with other countries and regions should be strengthened to establish the corresponding mechanisms for joint contribution to global low-carbon development. The relevant exchanges and cooperation include promoting technology transfer and diffusion for innovation and application of advanced low-carbon technologies, jointly raising funds to support carbon inclusion projects, and facilitating the formulation and implementation of international carbon inclusion policies. The training of competent talents should also be highlighted to improve the professional level of the global workforce in this field.

Carbon inclusion mechanisms act as an incentive means to foster long-term and enthusiastic public engagement in green and low-carbon actions, enabling the government to observe the implementation and results of policies, learn the overall carbon emission reduction effectiveness on the consumer side, and provide decision-making and long-term technical support for the government. Carbon inclusion mechanisms are an important measure to comprehensively and accurately implement the new development concept. Under the governance systems of green and low-carbon transformation patterns featuring government leadership, market regulation and all-around participation, all types of social resources will be consolidated to form synergy for collaborative win-win outcomes around the goal of carbon emission reduction, to continuously deliver concrete results in energy conservation, pollution control and carbon emission reduction through positive social interaction.

During the 14th session of the National People's Congress in 2023, experts and scholars from all walks of life put forward insights on promoting the law-based, standardized and systematic development of carbon inclusion, which received positive responses and concerns from relevant departments. Among them, the Ministry of Ecology and Environment stated to work with relevant bodies to continuously improve the carbon peaking and carbon neutral measurement systems and standards, so as to provide potent support for carbon inclusion development. Meanwhile, by continuing to encourage all localities to deepen carbon inclusion practices, and combining with the construction of a nationwide voluntary greenhouse gas emission reduction trading market, emphases should also be put on the guidance and standardization of local carbon inclusion work, and a thorough study on the necessity and feasibility of unifying carbon inclusion platforms and establishing a nationwide management and operation structure, in order to enhance the important role of carbon inclusion in motivating public energy conservation and carbon emission reduction actions.

Looking forward to the future, the construction of carbon inclusion mechanisms requires combined efforts from the government, enterprises, social groups and the general population, to nurture a favorable environment for broad societal participation and facilitate carbon inclusion as an important policy instrument for sustainable economic and social development. This will serve as a foundation for promoting the all-encompassing adoption of green lifestyle, accelerating the transformation of green development models, and achieve the carbon peaking and carbon neutrality goal at an early date.