

# Feasibility Study on the Construction of L-P-S-V Personal Carbon Account for College Students under the Background of Carbon Neutral Era

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**Abstract**— The pressure to restart the economy in the two-carbon era urges the construction of individual carbon accounts. In order to solve the problem of personal carbon accounts for college students, it proposes to build the L-P-S-V software platform for personal carbon accounts for college students, namely Legitimacy -- Privacy -- Systematicness -- Versatility. This platform is based on the existing legislation and theory, takes software as the carrier, and based on the existing information collection process of the school, so that the individual carbon footprint into the information management system, not only clarify the individual carbon neutral situation of students, but also help colleges and universities to quantify carbon emissions and promote the process of carbon neutrality. It involves the transmission, maintenance, innovation and development of students' carbon emission information, which is a positive echo of the era of carbon neutrality and the implementation of environmental law.

**Index Terms**— Carbon peak, carbon neutral, personal carbon account

## I. CARBON NEUTRALIZATION, CARBON TRADING, AND PERSONAL CARBON ACCOUNTS

### A. Carbon Neutralization

Since the 1980s, the industrial emissions of human society have led to the phenomenon of global warming, which has produced a series of problems, such as rising sea level and melting glaciers, and carbon emission reduction is imminent. At the end of 2015, China participated in the conclusion of the Paris Agreement, an international treaty on climate, which stated that the world will meet greenhouse gas emissions as soon as possible and achieve net zero emissions in the second half of the 21st century. In order to address global climate change, China, which has always implemented the concept of a community with a shared future for mankind, has taken the initiative to assume international responsibilities consistent with its national conditions, striving to achieve the carbon peak by 2030 and to achieve carbon neutrality by 2060, referred to as "double carbon" goals.

### B. Carbon Trading

In order to cope with climate warming, countries around the world actively integrate into the low carbon emission

reduction. In 1997, the Kyoto Protocol passed the first treaty in human history to limit greenhouse gas emissions. The Protocol allows countries that struggled to complete the reduction of greenhouse gas emissions to buy excess "quotas" from countries that exceeded the task. This is the beginning of carbon emission rights —— carbon trading.

Carbon trading is a market mechanism used to promote global greenhouse gas emission reduction and reduce global carbon emissions. That is, carbon dioxide emission rights as a commodity, thus forming the trading of carbon dioxide emission rights. Since the 21st century, the European Union, the United States, Canada, Japan and other countries have established and improved their own carbon trading markets. From the perspective of the current situation of the global carbon market, it is likely to surpass the oil market and the world's largest market in the future.<sup>[1]</sup>

### C. Carbon Account

The development of China's carbon market started late, and in the 12th Five-Year Plan, the goal of establishing a unified national carbon market was clearly put forward. Since 2013, seven pilot provinces and cities have issued relevant laws and regulations, stipulating the total targets, quota allocation and trading rules for the operation of the carbon market. However, at present, there is no unified standard and absolute total amount in the pilot areas of the domestic carbon market, and the effect of the pilot varies from region to region. There are problems such as imperfect relevant laws and regulations, and unmatched infrastructure and technology.

With the continuous and steady development of China's carbon market and the increasingly active carbon trading, the academic discussion on carbon account is also deepening. At present, there is no clear and unified definition of the concept of carbon account in China, but there are still many experts and scholars who have given their own definitions or descriptions. Some scholars put forward from the perspective of practice that carbon account is a comprehensive record of the carbon emission of relevant economic subjects, including three links of data collection, accounting and evaluation, so that the data must be accurate, scientific accounting and objective evaluation. Some scholars also believe that carbon account is a record and data governance tool to define the carbon footprint of individuals and enterprises, carbon emission right boundary of various social subjects and carbon reduction contribution, and its accounting is closely related to accounting account, value chain account, green responsibility account, financial asset account, etc. Based on the outlook for the development of the carbon market, Zhou Chengjun, director of the Financial Research Institute of the People's Bank of China, proposed that every institution, every market

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entity and every economic activity should have its own carbon account for holding carbon assets, so as to fulfill the contract when necessary and achieve carbon neutrality. At the same time, he proposed that carbon accounts should play four main functions: one is registration and right confirmation, depository and custody, settlement or transfer, and clearing a n d s e t t l e m e n t . [ 2 ]

### II. CARBON ACCOUNT STATUS & MAJOR ISSUES

#### A. Present Situation

Previously, there have been few studies on the construction mechanism of personal carbon account at home and abroad.<sup>[3]</sup> How to make the personal carbon account more reasonable, universal and popular is a problem to be solved by relevant researchers. Since 2015, personal carbon accounts have been practiced for many years. In August 2016, Alipay platform launched the "personal carbon account" — Ant Forest for 450 million users, which is the personal carbon account with the largest number of users in China. In pay treasure to the client, carbon account is designed as "ant forest" public welfare activities, the user through the client to collect personal low carbon behavior virtual energy, when the energy accumulated to a certain amount can ants through public welfare organizations, environmental protection enterprises, planted a tree in the real world, so as to realize the effect of carbon and oxygen emission reduction. As of May 2020, ant forest participants have reached 550 million. After the development of recent years, the existing personal carbon account system mainly from the "clothing, food, living, line, with" consumer side emissions, through the bank or Internet app platform to collect user data into carbon account balance, build to "integral in rights" positive incentive environment, attract users to actively emissions activities, eventually lead to personal way of life to green low carbon direction. Since this year, the development of individual carbon account in full swing, more than ten institutions have launched individual carbon account, and on the basis of the original further the personal carbon account and pratt & whitney financial practice, such as individual carbon account integral more the corresponding the higher the credit rating, the credit upgrade, preferential credit products can enjoy more incentives.

#### B. Primal Problem

##### 1) There is no unified standard for the collection and accounting of carbon emission data

Statistical accounting of carbon emissions is an important basis for carbon peak reaching and carbon neutrality, and an important basis for policy formulation, promotion work, assessment and negotiation. In August 2022, the National Development and Reform Commission with relevant departments jointly issued by the "about to speed up establishing a unified standard carbon emissions statistical accounting system implementation plan", to accelerate the establishment of a unified standard carbon emissions statistical accounting system to conduct a comprehensive work deployment, to consolidate carbon emissions data base, support carbon peak carbon neutral goal is of great significance. From the perspective of the development of

carbon account, the wide application and large-scale promotion need a unified accounting standard system, rather than an "independent and self-contained system". It is suggested that the existing carbon account system should closely follow the policy guidance and implement the accounting methods and standards issued by the state. For areas and activities that have not yet issued unified accounting standards, it is recommended to refer to similar standards as far as possible and reach consensus with industry organizations.

##### 2) The current carbon account data applications lack a connectivity mechanism

From the perspective of the development of existing carbon accounts, the establishment of a unified database is an inevitable trend to break down barriers and realize the efficient use of data. The national or industry authorities shall establish a unified national or industry-wide database system, or implement the existing database after the endorsement of the government to realize the full integrated utilization of data resources and improve the liquidity of the "carbon assets" behind the carbon account. Such as in the banking system, suggested by the People's Bank of China to establish a unified carbon emissions database and the corresponding enterprise and project carbon account system, both help to avoid data omission or double calculation problems, can also be carbon account as a green financial development infrastructure, promote related financial policy implementation, support to promote green financial products diversified innovation.

##### 3) Data security and risk control are lack of mechanism guarantee

Since September 2021, our country have issued "data safety law" and the personal information protection law, which emphasizes that data security is not limited to data storage security represented by static data security, all links of data processing (including data collection, storage, use, processing, transmission, provide, public, etc.) shall ensure security. On this basis, the carbon account system should build a data security guarantee mechanism from the perspective of promoting data development and utilization, actively use cloud computing, blockchain and other technical means, strengthen the data collection and use supervision from both aspects of system and technology, to ensure data security. In the process of cohesion with green financial, financial institutions should be as far as possible to perfect the risk control mechanism construction, for government departments and regulatory subject in risk sharing policy support, in the innovation and strengthening the construction of project informatization, standardization, standardization, for "carbon account" financial derivatives from pilot innovation to provide guarantee, so as to promote the comprehensive green transformation of economic society.

### III. THE URGENCY OF BUILDING COLLEGE STUDENTS' PERSONAL CARBON ACCOUNTS

Carbon accounts are a basic tool to record information about the carbon emissions of individuals or enterprises. As carbon peak carbon and the work of deepening, carbon account application scenario will be more widely: from the key emissions of carbon market, to a high social responsibility, active commitment and to carry out the target of enterprise units, and is committed to guide the green low

carbon investment financial institutions and actively practice low carbon lifestyle of individuals, carbon account can help them better understand their own or the project of carbon emissions, guide all kinds of subject in the decision-making process into more green low carbon concept, make production and living mode more in line with the carbon peak carbon neutral goals, It further plays an important role in promoting the multi-dimensional green transformation of the society.

However, the development and implementation of the action plan by 2030 requires not only the positive action of enterprises, but also the efforts of every natural person. Authoritative research shows that the greenhouse gas emissions such as carbon dioxide caused by household consumption have accounted for 52% of China's total greenhouse gas emissions, and this data is also on the rise with the continuous improvement of living standards.<sup>[4]</sup> From the voluntary emission reduction platform of Beijing Environmental Exchange in 2015, to the establishment of "Ant Forest" by Ant Financial in 2016, to the launch of "Carbon Account 4.0" by Shenzhen Green and Carbon Low-carbon Development Foundation, all parts of China are gradually paying attention to the construction of carbon account. However, there are also legal questions: how to stimulate the positive externality of individual low carbon behavior; how to balance the comprehensiveness of individual behavior in the system and the protection of personal privacy... but at present, the laws and regulations for personal carbon accounts in China are relatively scattered, lacking a complete legal system, the construction of personal carbon accounts of college students has not entered the pilot state, let alone a set of internal carbon account system. At the beginning of 2022, China has entered the post-epidemic era. The economic and social development requires individuals to actively respond to the two-carbon policy and move more carbon quotas for economic construction.

#### IV. INTERNATIONAL EXPERIENCE

At present, the carbon trading markets of all countries in the world are mostly dominated by enterprises, and the carbon trading based on personal accounts is mostly in the initial exploration and experiment stage, and a complete development system and mature development model have not been formed yet. However, some countries have also carried out pilot studies, and achieved certain results in the practice process.

##### A. Allocate individual carbon quotas and cap total emissions

Carbon quota refers to a single consumer can obtain a certain carbon emission rights, stored in their personal carbon account, as an individual carbon emission quota. Due to the different income level, consumption level and consumption preferences of each participant, under the carbon trading mechanism, the unused carbon quota owned by individuals can be freely traded through the carbon account, and the ceiling of the total carbon emission reduction is kept unchanged. Currently, the UK, Australia, the Netherlands, Ireland and other countries are trying to set up carbon quota accounts for personal carbon trading. In 2019, the Netherlands launched a personal carbon trading system in the

city of Lahti. Researchers set weekly carbon emission quotas based on local carbon emission reduction targets, distributed the quotas equally to the carbon accounts of citizens, and then appropriately increased the emission quotas for individual residents according to individual circumstances, but no more than 30% of the average allocation. Australia launched a three-year personal carbon trading program on Norfolk Island in 2010. The Australian Research Institute and the local Norfolk government jointly set up a "carbon credit card" account and allocated a certain carbon quota to each account, which people need to use for gasoline and energy purchases.

##### B. Implement environmental protection carbon credits and quantify low-carbon behavior

Every product and every behavior has carbon emissions, and these carbon emission data are called carbon emission factors. Therefore, they can be collected and recorded by users' low-carbon behaviors in their daily life, such as energy saving, green travel, garbage classification and recycling behaviors, and quantified as carbon emission reduction and recorded into the personal carbon account. Currently, countries such as Japan, South Korea and China are simply setting up carbon credits accounts to encourage individuals to participate in carbon emission reduction. Japan implemented the "environmental protection points system" from 2009 to 2010, where people can get 5-10 percent of the commodity price if they buy energy-saving home appliances such as air conditioners, refrigerators and digital TVs that meet certain energy-saving standards. South Korea launched a "green credit card" in 2011, where cardholders receive low-carbon points when using public transport (10% to 20% green points) or buying certified green products (1% to 24% green points). In 2018, China carried out a pilot research on personal carbon account in Quzhou, and relied on the carbon emission reduction saved by various business types in bank accounts to convert into carbon credits in personal accounts.

##### C. Enrich the application scenarios, and improve the reward and punishment mechanisms

The establishment of carbon account is to restrain and guide low-carbon behavior. Therefore, it is necessary to establish a complete set of restraint or incentive mechanism to regulate individual behavior by adding externalities of behavior, and encourage the public to actively choose energy-saving and carbon reduction behaviors to carry out low-carbon life. If there is a surplus in the personal carbon account of the Dutch city of Lahti, it can be used to exchange for coffee, fitness vouchers and swimming vouchers on the APP. Norfolk Island, can be used for cash, which will face fines. Japan's environmental protection points can be used to redeem 271 products and services, including commodity vouchers and passenger cards, or for the next purchase of home appliances. South Korea's carbon points can be exchanged for cash, public transport or discounts. Personal carbon account points in Quzhou, China can be used for physical goods. When the carbon points are accumulated to a certain extent and become a "dark green" customer of the bank, they can also enjoy certain loan concessions.

##### D. Promote low-carbon emission reduction and help the dual-carbon targets

The ultimate purpose of establishing a carbon account is to guide users to consciously practice low-carbon behavior and



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reduce carbon emissions in the field of living consumption. The Dutch municipal government of Lahti plans to convert more than 50 percent of its travel to sustainable transportation by 2030 through a personal carbon trading system, reaching 44 percent by October 2020. From May 2009 to the end of March 2011, the environmental protection credits system increased the sales of three kinds of home appliances by about 2.6 trillion yen, achieved economic results of 5 trillion yen, and reduced carbon dioxide emissions by about 2.7 million tons per year. By the end of December 2016, South Korea had issued more than 15 million green credit cards, reducing about 2.5 million tons of carbon dioxide emissions equivalent. By the end of March 2021, 26 banking financial institutions in Quzhou, China had opened 5,446,200 personal carbon accounts, reducing carbon emissions by 5,345.95 tons.

### V. ACHIEVE PATH OUTLOOK

The topic of this project is specific to the construction of personal carbon account for college students, investigates the willingness and expectation of campus students for the construction of personal carbon account, explores the feasible mode of constructing college students' personal carbon account, and proposes the construction attributes of college students' personal carbon account: Legitimacy- -Privacy- -Systematicness- -Versatility.

The legitimacy includes the consent of the account subject, the permission of the carbon footprint collection means, and the legitimacy of the collection content, which is an important prerequisite in the whole account construction process; the privacy covers the identification method, encryption method and preservation time limit of the account subject information; the system includes linking the important data in the personal carbon account with the data platform of various universities and automatically uploading to the university cloud platform; the versatility refers to the various forms of energy saving and emission reduction knowledge and publicity function and construction, which is the key issue in the software design of the project.

#### A. Legality

First, personal carbon account registration should be required to inform students of the obligations of the kind of information that may be collected, and the resulting risks are incurred. Before collecting information, the software platform shall collect the purpose of information through publicity, and sign a notification letter of rights and obligations with the account subject by email, which shall be kept by the software after the signing. At the same time, students have the right to check the types of information collection, and to close the authority of information collection at any time.

#### B. Privacy

The behavior activities with similar carbon emissions are classified and classified, and then the corresponding QR code is generated according to the obtained carbon emission level, so that the information collection points to a certain kind of behavior rather than a specific behavior, and immediately converted into carbon emission data upload. The carbon footprint behavior category data will be automatically deleted after the upload ends.

#### C. Systematicness

Carbon account platform into the university campus information management system, and open to colleges and universities, through college student registration system, the binding of student identity account, accurate identification, record students during reading activities of carbon footprint, and upload to the school end formation unit carbon emissions data, generate quarterly, annual efficient carbon neutral report.

#### D. Versatility

Personal carbon account software platform in addition to the basic records, calculate carbon footprint, and open the energy conservation and emissions reduction knowledge and environmental protection law knowledge propaganda function, and set up the environmental protection law case sharing platform and legislation make recommendations platform, strive to promote environmental protection law from abstract law to college students' daily life experience, by focusing on the realistic situation to promote environmental protection law development mature.

#### E. Offline operation

The carbon account system is open to the school end of colleges and universities. Through the college student registration system, the account of student identity is bound to identify and record the carbon footprint of students during the reading period, and it is summarized and uploaded to the university end to form the unit carbon emission data of colleges and universities.

It should be noted that the L-P-S-V attribute personal carbon account needs to be operated both online and offline.

- 1) *The school should set up a special department to operate the software system.*
- 2) *Regular personal carbon account publicity. In daily life, the university should maintain the publicity work of college students' personal carbon accounts four times a semester, and publish the relevant work on the campus public information platform. The software platform will also launch a corresponding knowledge contest on the dual-carbon policy and environmental protection law.*
- 3) *Instant release of campus carbon emission data dynamics, as well as carbon emission change warning.*
- 4) *Establish environmental law school teachers and students practice group. Law majors or related majors and departments should set up "environmental law practice groups" and implement the shift system. Students who are interested in environmental law knowledge and have questions about the calculation method and accuracy of the carbon account system should answer them professionally online.*

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