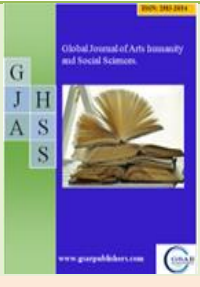
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Research on the Integration Development Path of Green Finance and Dual-Carbon Economy in Sichuan Province

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Abstract

The report of the 20th National Congress of the Communist Party of China proposed that the realization of the "double carbon" goal cannot be separated from green financial support. In recent years, the Sichuan provincial government has closely followed the goal of "double carbon" and continuously promoted the supporting role of the province's green finance policy system in high-quality economic development and the realization of green development and low-carbon transformation, but certain problems have also appeared in the specific implementation process. This paper analyzes the development status of green finance and dual-carbon economy in Sichuan Province, and finds that there are some problems such as incomplete policies and regulations, single product types, large external environmental risks and low social participation. Based on the theory of sustainable financial development and the theory of green economic growth, the integrated development path is designed, and it is proposed to enhance the awareness of subject participation by improving policies and regulations, strengthening market supervision, innovating the system of green financial products, strengthening risk management, improving the environmental information disclosure mechanism and the training of professional talents, improving the incentive and compensation mechanism, and strengthening the construction of green culture. Drive the integrated development of green finance and dual-carbon economy in Sichuan Province.

Key words: Green Finance; Dual Carbon Economy; Integrated Development; Enhancement Path

1. Integrated development is an inevitable trend of green finance and the development of dual carbon economy

From the perspective of China's actual situation, the achievement of the "dual carbon" goals requires the support of finance, and green finance is a key factor in supporting the realization of the "dual carbon" goals. A complete green financial system can guide various factors and resources to flow into the green sector, which is conducive to providing long-term funds needed for the development of a low-carbon economy [1]. The dual-carbon economy is a new economic form supported by advanced low-carbon technologies, centered on the low-carbon transformation of industries and the development of low-carbon industries, and driving high-quality economic and social development. The development of the dual-carbon economy is conducive to promoting sustainable development and the green transformation

of the economic structure. Therefore, analyzing the integrated development of green finance and the dual-carbon economy is of great significance. This paper aims to study the integrated development path of green finance and the dual-carbon economy in Sichuan Province, in order to accelerate the promotion of green development and high-quality economic development. By analyzing the current situation and difficulties of the development of green finance and the dual-carbon economy in Sichuan Province, it provides an integrated development path to contribute to the early realization of the "dual carbon" goals in China and the economic development of Sichuan Province.

2. Analysis of the current situation of green finance and dual-carbon economy development in Sichuan Province

2.1 Development status of green finance in Sichuan Province

2.1.1 Green transformation of industrial structure



Sichuan Province is a major economic and clean energy province in China. In recent years, Sichuan Province has consistently adhered to the theory of sustainable development and successively issued relevant policy documents on the development plan of green finance in Sichuan Province, providing a basis for the development of local green finance^[2]. Sichuan Province closely follows the "dual carbon" goals, adheres to the path of green and low-carbon transformation that serves the overall national strategy and supports the future development of Sichuan, and focuses on the development of green energy to promote high-quality economic development. Sichuan Province is steadily advancing the development of hydropower bases in the Jinsha River, Yalong River and Dadu River, concentrating on the development of wind energy in Liangshan Prefecture and solar energy in the "Three Prefectures and One City", building a national natural gas (shale gas) production capacity base of over 100 billion cubic meters, promoting the development of the photovoltaic industry of crystalline silicon in Chengdu, Meishan and Leshan, striving to build Chengdu into a "Green Hydrogen Capital", and establishing a battery industrial base with global influence. It aims to newly establish about 5 provincial-level green finance innovation pilot areas by 2025 and achieve a total installed capacity of renewable energy of 129 million kilowatts.

2.1.2 Improvement of the green finance system

Since 2016, the People's Bank of China, in collaboration with relevant departments, has strengthened and improved the top-level design for the development of green finance, and led the issuance of the "Guiding Opinions on Building a Green Financial System"^[3], initially establishing the "five pillars" of green finance development, namely, the green finance standard system, environmental information disclosure, incentive and constraint mechanisms, product and market systems, and international cooperation. Sichuan Province has fully implemented the national decision-making and deployment, gradually strengthened the green finance system adapted to the "dual carbon" goals, and optimized the evaluation methods for green finance. In 2022, based on the existing provincial-level green finance innovation pilot projects, Sichuan Province, relying on five provincial-level green finance innovation pilot cities including Chengdu, Nanchong, Guangyuan, Ya'an, and Aba, carried out innovations in areas such as green financial technology empowerment, carbon accounting for financial institutions, and the construction of a green credit system, and achieved a number of experiences with local characteristics and highlights. As shown in Table 1, taking the trend of changes in the balance of green loans in Chengdu over the past five years as an example (the end of 2019 saw the outbreak of the novel coronavirus across the country, which had a significant impact on the economy, thus the balance of green loans did not increase but decreased at the beginning of 2020), it can be seen that the green finance in Sichuan Province has continued to increase steadily in the "dual carbon" economy. By the end of 2022, the balance of green loans in Sichuan Province reached 897.84 billion yuan, increasing by nearly 31.77% year-on-year, which was 1.25 percentage points higher than the national average; the balance of various green bonds was nearly 50 billion yuan, increasing by nearly 30.38% year-on-year. By the end of September 2022, under

the support of the "carbon emission reduction" policy, Sichuan Province had issued 5.944 billion yuan in loans, an increase of 4.529 billion yuan year-on-year, and cumulatively reduced 1.9891 million tons of carbon dioxide emissions.

Table 1 Balance and growth rate of green loans in Chengdu from 2018 to 2020

year	Green Loan Balance (100 million yuan)	Loan balance growth rate (%)
In 2018	3545	16.2
Early 2020	3245	-8.5
End of 2020	3766	16.1
In 2021	4858.1	29
In 2022	6582	35.5

Source: Chengdu Municipal People's Government

2.1.3 Green finance innovation

Sichuan Province will adhere to the new development concepts, fully utilize the "Green Rongrong" green finance comprehensive service platform, strengthen the green finance assessment of financial institutions, guide banks and other financial institutions to innovate and develop green finance and transition finance products, and provide long-term, low-interest loans to green and low-carbon projects. In 2022, Sichuan's first "Sichuan Carbon Quick Sticker" will provide interest rate concessions through three measures: "quota priority, processing priority, and interest rate concession", handling a total of 754 businesses totaling 5.186 billion yuan, corresponding to an annual carbon emission reduction of 1.0387 million tons, and a discount weighted average interest rate of 2.54%, which is lower than the average discount rate of financial institutions in the province in the same period. In August of the same year, Chengdu Rural Commercial Bank Chenghua Branch completed the first CCER pledge loan in Sichuan Province, which saved the loan costs of energy-saving, low-carbon and other related businesses of enterprises, revitalized the carbon assets of enterprises, and greatly promoted the high-quality development of the economy under the "double carbon" goal.

2.2 The current situation of the development of dual carbon economy in Sichuan Province

2.2.1 Policy implementation under the "dual carbon" goal

In May 2022, the Ministry of Finance issued the "Opinions on Financial Support for Carbon Peaking and Carbon Neutrality", which clearly requires "provincial financial departments to improve the working mechanism and study and formulate policies and measures for financial support for carbon peaking and carbon neutrality in the region". In order to fully implement the national policy, Sichuan Province has proposed a "1+N" policy system for carbon peaking and carbon neutrality according to the actual situation. The focus will be on establishing a green and low-carbon fiscal and taxation policy system, and guiding the policies of financial departments at all levels, so as to promote the overall green and low-carbon transformation of economic and social

development. On this basis, the Sichuan Provincial Department of Finance has continuously innovated and improved policies and systems, comprehensively used government green procurement and other measures to promote the development of the dual-carbon economy, and implemented preferential tax policies to support the construction of ecological civilization, such as exemption from vehicle purchase tax for new energy vehicles, VAT on comprehensive utilization of resources, and preferential corporate income tax for comprehensive utilization of resources, so as to reduce the financial pressure of enterprises related to ecological and environmental protection. In addition, the Sichuan Provincial Department of Finance also continues to improve the government's green procurement policy, improve the implementation mechanism of the government procurement policy for energy-saving and environmental protection products, and implement item list management for government-procured energy-saving products and environmental label products.

2.2.2 The development of the carbon financial market under the "dual carbon" goal

Unlike other economic models, the dual-carbon economy features diversification and technology-driven characteristics. It is manifested in the improvement of carbon productivity and is achieved through various means such as optimizing the energy structure, upgrading the industrial structure, innovating low-carbon technologies, and improving the institutional system. Its goal is to achieve sustainable economic and social development. Since the opening of the Sichuan carbon finance market in December 2016, the trading volume has been rising steadily every year. Since the launch of the "Green Rongrong" green comprehensive service platform, more than 120 green financial products have been released on the platform, with a financing amount approaching 5 billion yuan. As of April 30, 2023, the Sichuan carbon market had cumulatively traded nearly 36.82 million tons of nationally certified voluntary emission reductions (CCER), ranking fourth in the country on a comparable basis. The trading market had over 2,000 accounts opened and 90 projects listed. The three types of projects with the highest trading volumes were hydropower, wind power, and coalbed methane power generation projects. With the large-scale opening up of new energy projects, the prospects for the carbon financial market in Sichuan Province are very broad.

Table 2 Cumulative transactions of nationally certified voluntary emission reductions (CCER) in the Sichuan carbon market from 2016 to 2022

year	CCER cumulative trading volume (10,000 tons).
December 2016	36.30
In 2017	199.65
In 2018	592.17
In 2019	1430.21

In 2020	1617.04
In 2021	3406.42
In 2022	3614.53

Source: Sichuan United Environmental Exchange

3. The dilemma faced by the integrated development of green finance and dual-carbon economy in Sichuan Province

3.1 The policies and regulations of integrated development are not comprehensive and the policy effect is not good

In order to promote the integrated development of green finance and the dual-carbon economy, the Sichuan Provincial Government has issued a series of relevant policies and regulations, such as the "Sichuan Green Finance Development Plan". However, the policies and regulations introduced at this stage are still relatively one-sided. Some policies and regulations are just theoretical piles and simple framework regulations, without detailed explanations and practical plans that can be implemented. There are also some policies and regulations that are not highly targeted, resulting in no corresponding solutions when facing some minor problems, and the policy effect is not good.

Cities in Sichuan Province have also issued the "Administrative Measures for the Identification of Green Enterprises and Green Projects", but there is a certain gap between the implementation of these enterprise and project identification management measures and the expected results, and some enterprises and projects are inconsistent with policy standards in the implementation process.

Moreover, most policies and regulations only focus on the green financial market and green financial products, and there are few policies and regulations that specifically propose the integration of green finance and the dual-carbon economy.

3.2 The development of integration is slow, and the product type is single

Looking at the situation of the integrated development of green finance and the dual-carbon economy across the country, relatively speaking, Sichuan Province started relatively late in this regard and has developed relatively slowly. To a certain extent, the development of financial products in Sichuan Province lags behind the national level and cannot keep up with the pace of demand for the integrated development of green finance and the dual-carbon economy.

The types of green financial products related to Sichuan Province are not comprehensive and the structure is relatively single. Sichuan Environmental Exchange, in collaboration with its partner institutions, has launched a series of green financial products such as Greenrong Intellectual Property Loan, Greenrong Quick Loan, Greenrong Science and Technology Loan, Greenrong Leasing, and Greenrong e-Insurance. However, these mainly focus on green credit and green leasing. Green financial products are far from limited to these aspects. Other green financial products and services have not been well promoted or widely applied.

3.3 The external environment risks are threatened, and the risk management mechanism is insufficient

Rising global temperatures and climate changes have caused frequent meteorological disasters, causing serious environmental impacts and bringing great risks to the sustainable development of society and economy.

There are also deficiencies in relevant risk management mechanisms. In particular, a good environmental information disclosure mechanism supports the integrated development of green finance and ecological economy, which can prevent the risks caused by information asymmetry to a certain extent in advance and alleviate the threat caused by external environmental risks from the source. However, at this stage, the environmental information disclosure mechanism in Sichuan Province is not perfect, there are no clear provisions stipulating environmental information disclosure rules, and the disclosed data is not sufficient and comprehensive. This may lead to situations such as when banks conduct asset valuation and credit pricing, due to incomplete environmental information disclosed and some data is not perfect, which increases the difficulty of bank evaluation and may also lead to inaccurate final decisions⁴.

3.3 The main type of integrated development is single, and the degree of social participation is low

Green finance projects generally have a long investment cycle, low return on investment, and high investment risks. Due to the characteristics of capital seeking benefits and avoiding harm, financial institutions and enterprises consider returns and risks, so there is less investment in green finance, and the participation and enthusiasm are generally low, while the proportion of financial institutions and enterprises integrating green concepts into investment activities is lower.

Moreover, Sichuan Province has a single main type of participation in the integrated development of green finance and dual-carbon economy, mainly commercial banks, while other types of financial institutions and enterprises have a low degree of participation.

4. The integrated development path of green finance and dual-carbon economy in Sichuan Province

4.1 Theoretical basis

The first is the theory of sustainable financial development. It comes from the sustainable development of the economy and society, which means that if the economy and finance can operate efficiently and steadily in the long term, it is necessary to follow the objective law of development and future trends. To achieve the integrated development of green finance and dual carbon economy, we must not only look at short-term effects, but also focus on long-term sustainable development.

The second is the theory of green economic growth. It follows the concept of sustainable development, emphasizes the coordinated development of economy and environment, and is consistent with the concept of green environmental protection. To achieve the integrated development of green finance and dual-carbon economy,

it is necessary to make economic growth greener, make more effective use of natural resources, and develop sustainable environment.

4.2 Integrated development path

4.2.1 Improve policies and regulations and strengthen market supervision

1. Formulate a unified standard system

A unified standard system is conducive to the standardization and healthy development of the integrated development path of green finance and the dual-carbon economy. First, it is necessary to clarify and unify the standard system. The regulations of the system must be standardized and clear, and the areas that are likely to cause doubts must be explained in detail, and there should be no ambiguity in the text. Second, give full play to local advantages and respect objective laws. The formulation of the standard system needs to fully investigate and analyze the objective conditions and local advantages of Sichuan Province's development, and continuously update and improve the standard system according to the development law to prevent the incompatibility of policies and regulations with the development of the times and the overlapping of some regulations.

2. Improve the market supervision system

The Sichuan provincial government can strengthen the legal constraints and institutional arrangements for the integrated development of green finance and the dual-carbon economy through clear policies and regulations. Comprehensively supervise the market transaction process, make the whole process more transparent and open, and strictly punish violations. And make the supervision subject more comprehensive, not only the market supervision department, but also all market participants can become a member of the supervision, while supervising others, improve their own normative consciousness, so as to make the integrated development of green finance and dual-carbon economy in Sichuan Province more standardized and stable.

4.2.2. Strengthen innovation leadership and promote the diversification of product systems

1. Innovate green financial products

Green financial products are not only green credit and green leasing, Sichuan Province can vigorously develop other financial products and services such as green bonds and green economy to make up for shortcomings and make green financial products more comprehensive and diversified.

While developing other green financial products, we should also continuously improve green credit and green leasing and innovate. Vigorously promote the cooperation between financial institutions and Sichuan United Environment Exchange, and innovatively launch products such as "green innovation loans", "low-carbon loans" and "ecological loans" to make the types of green financial products more complete.

2. Promote the construction of green product information platforms

The construction of green product information platform provides a medium for green financial products and is conducive to their faster development.

Sichuan Province needs to further play the role of platforms such as "Green Rongrong" and integrate information on various green financial products. publicly punishing illegal products to serve as a warning; Publicly commend innovative products and play an exemplary leading role, which is conducive to the healthy development of the product system and accelerating the pace of innovation.

4.2.3. Strengthen risk management to ensure the safety of the integrated development path

1. Improve the environmental information disclosure mechanism

First, it is necessary to formulate an environmental information disclosure system that is clear, standardized, and quantifiable⁵, making it more standardized and better implemented in practice.

At the same time, improve the disclosed environmental information. By integrating environmental information, pollution, emission reduction, and violations of laws and regulations are made public on the information platform. And update the information in a timely manner to prevent information lag.

Finally, establish an environmental prediction platform. By summarizing past environmental information, we can find certain laws and predict the future trend of environmental changes to prevent possible risks in advance.

2. Strengthen the training of relevant professionals and teams

Only by strengthening the training of relevant professionals and teams and giving full play to their advantages can we achieve safer and high-quality integrated development.

Universities in Sichuan Province can offer courses and lectures related to the integration of green finance and dual carbon economy to cultivate students' interests and professional abilities from the source, and provide a foundation for the cultivation of relevant talents. Financial institutions and enterprises can carry out induction training, targeted training on relevant professional knowledge, risk crises, etc., so that talents and teams can be more professional, and can respond more quickly and better when encountering risks.

4.2.4 Stimulate the enthusiasm of investors and enhance the awareness of subject participation

1. Improve the incentive and compensation mechanism and streamline the approval process

The Sichuan Provincial Government can appropriately increase financial support for relevant green finance projects and encourage major social entities to invest in green finance projects in the form of financial incentives. At the same time, in terms of taxation, certain tax incentives and compensation will be given to investors in green finance projects, so as to reduce investment costs and stimulate investors' enthusiasm for investing in green finance projects.

Streamline the approval process related to green finance project investment and improve the approval efficiency, thereby saving approval time and saving investors a certain amount of time and

cost, thereby helping to improve the awareness of subject participation.

2. Strengthen the construction of green culture and enhance the awareness of green development in society

The Sichuan provincial government needs to increase publicity on the integrated development of green finance and the dual-carbon economy, and strengthen the construction of green culture. By learning green concepts, enterprises can establish relevant green awareness. Give commendations and rewards to relevant green financial institutions and enterprises, and play an exemplary and leading role. Enterprises can make production green by improving the green industrial chain, such as introducing green materials and equipment; Conduct green culture training for employees to make the green concept deeply rooted in the hearts of the people. Through these measures, we will enhance the awareness of green development in society and make subjects more consciously and actively participate in the integrated development of green finance and the dual-carbon economy.

5. Research conclusions and prospects

5.1 Research conclusions

By analyzing the current situation of green finance and dual-carbon economy development in Sichuan Province, as well as the dilemmas and paths of integrated development, this paper draws the following conclusions:

First, due to the late start of green finance development in Sichuan Province, the policies and regulations issued at this stage are relatively one-sided, and there is a lack of specific implementation rules, resulting in difficulties in implementation and implementation of relevant policies and regulations. Therefore, it is of great significance to revise and improve relevant policies and regulations point-to-point according to the existing implementation situation and problems encountered to promote the integrated development of green finance and the dual-carbon economy.

Second, a unified standard system and perfect market supervision are of great significance to the integrated development of green finance and the dual-carbon economy. In addition, vigorously developing other financial products and services such as green bonds and green economy can diversify economic development under the "dual carbon" goal.

Third, in order to ensure the safety of the integrated development path of green finance and dual-carbon economy, this paper proposes to formulate a series of quantifiable environmental information disclosure systems to prevent enterprises from illegally reducing emissions and polluting the environment by publishing relevant violations of laws and regulations and establishing an environmental prediction platform. On this basis, we should also strengthen the construction of relevant talent teams, jointly build a learning platform for the integration of green finance and the dual-carbon economy through universities and institutions, and gradually expand the professional research team, in order to better respond to major risks encountered in development.

To sum up, through the study of the integrated development path of green finance and dual-carbon economy in Sichuan Province, it can provide a reference for the transformation of green economy and high-quality economic development. At the same time, the development of the economy under the "dual carbon" goal is facing many challenges, such as single products, imperfect incentive and restraint mechanisms, etc., and the relevant responsible departments of Sichuan Province still need to improve and innovate in policy formulation and technology research and development.

5.2 Research Prospects

The construction of the integrated development path of green finance and dual-carbon economy in Sichuan Province also needs to combine internal and external influencing factors to strengthen product innovation, risk management and green culture construction. Specifically, it is necessary to continuously revise, formulate and improve policies and regulations on green finance and the development of the dual-carbon economy to further promote the integrated development of the two. In addition, since the development of green finance and dual-carbon economy in Sichuan Province is still in its infancy, it is necessary to further strengthen the supervision of the green finance market. Therefore, we should take into account the actual situation, Improve green finance and The integrated development of the dual-carbon economy system, Clarify the rights of all parties to protect the environment, and provide strong institutional and legal guarantees for relevant enterprises². Relevant financial institutions should keep pace with the times, Change the traditional way of development, looking for new economic growth points, Innovate green financial instruments and other green financial products, Implement green credit policies and try to expand green credit business for financing carbon emissions and emission rights, promote the sustainable development of Sichuan Province's economy.

In summary, the integrated development of green finance and dual-carbon economy in Sichuan Province has a long way to go, and this paper only makes a preliminary analysis of this field, and more in-depth research is needed on the specific implementation of green finance and dual-carbon economy. It is hoped that this article

can provide useful reference for relevant departments in Sichuan Province to promote the integrated development of green finance and dual-carbon economy.

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