



*Review*

## **International comparison of green credit and its enlightenment to China**

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**Abstract:** Green credit is the innovation of financial concept, embodies the sustainable development of economy and society. It is the trend of modern financial development. This paper compares the international and Chinese green credit products, the application mode of green credit products in commercial banks and the international development of green credit policies, so as to draw inspiration for China from these three aspects: first, in the product aspect, green credit products should be diversified development, and the promotion of green credit products should be increased; second, in terms of product application mode, active innovation of green credit products should be strengthened, and green credit professional institutions should be set up within banks; third, in the aspect of credit policy development, it is necessary to establish and perfect the relevant legal system, build the green credit incentive mechanism, connect with the international community and follow the “Equator Principle” which is generally accepted in the world.

**Keywords:** green credit; application mode; international comparison

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### **1. Introduction**

With the development of global society and economy, the wealth of human society keeps increasing, but the problems of climate and environmental pollution caused by the mode of industrial economic growth also become increasingly prominent (Dawson et al., 2016; Ganda, 2019; Gritzas & Kavoulakos, 2016). At the end of the 20th century, the United Nations Framework Convention on Climate Change was issued to reduce global emissions of carbon dioxide and other greenhouse gases. The subsequent supplement, the Kyoto Protocol, set clear standards for reducing carbon dioxide

emissions. Countries around the world have paid increasing attention to energy conservation, emission reduction and air pollution, and adopted a variety of measures to develop green economy to deal with environmental pollution.

In the process of China's economic development, the governance of the environment has become a problem that can not be ignored in sustainable economic development. For a long time, China mainly relied on extensive economic model to promote economic development, which inevitably caused pollution to the environment and had a great negative impact on people's lives. Now, China is committed to developing a green economy and improving the atmospheric environment. It has launched a series of policies on green credit and developed green credit products that have an important impact on its economy while developing the banking industry, making commercial banks important participants in the development of green credit.

However, the gap between domestic and foreign commercial banks in the development of green credit is the reality that China needs to face. At present, 88 banks in 37 countries follow the Equator Principle which is a financial industry benchmark to determine, assess and manage the social and environmental risks involved in the project financing process. On June 4, 2003, the Equator Principle was established and adopted by ten large international commercial banks. But so far, the Industrial Bank and Bank of Jiangsu are the only two commercial banks in China that adopt the Equator Principle.

It can be seen that as the sustainable development becomes more and more urgent, China's implementation of green development is imminent, and it is particularly necessary for commercial banks to provide financial support for green development. Therefore, from the macro level of green credit policy and the micro level of commercial banks, this paper lists the definition of the concept of green credit products in the world, and it compares the green credit products in the world, the application mode of green credit products in commercial banks and the development status of green credit policies, combing out the current situation and problems of developing green credit between China and other countries in the world. Through the practice comparison of various periods and countries, we can get the enlightenment of promoting the development of green credit in China, and then put forward the relevant measures. It is of practical and theoretical significance to further improve the development of green credit in China.

## **2. Green credit defines international comparison**

The differences in the definition of green credit by commercial banks internationally have a direct impact on the implementation details and effects of green credit. However, the difference in the definition of green credit by commercial Banks is mainly reflected in the discrepancy in the definition of the word "green" (Awadh, 2017). As developed countries have already completed the industrialization process, the environmental problems generated in the process of industrialization have been basically solved. Therefore, when judging whether the financing project is "green", more attention should be paid to the impact of the project on climate change and whether the project has an impact on the original ecological environment (Grydehoj & Kelman, 2017).

However, in terms of the definition of "green" in green credit, China pays more attention to the effect of pollution prevention and treatment. In contrast, commercial banks in developed countries have a stricter definition of "green". For example, the Industrial and Commercial Bank of China listed the project loan to Gansu TH hydropower development co.ltd. as a green credit, which has a total installed capacity of 215,000 Kilowatt and an annual generating capacity of more than 886.58 million kWh.

However, Barclays Bank believes that large hydropower projects will have an impact on the cultural and natural environment around the project, so it puts hydropower projects on its list of projects that it refuses to finance. For another example, foreign large commercial banks consider all projects involving the use of fossil energy as “non-green” projects, while Chinese commercial banks believe that financing projects that help reduce the consumption of fossil resources or can recover the heat generated by the consumption of fossil resources are green credit projects. The differences of green credit definitions between domestic and foreign commercial banks are shown in Table 1.

**Table 1.** Green credit definition comparison table of domestic and foreign commercial banks.

Countries	Definitions of green credit	representative banks
China	The definition of “green” pays more attention to the anti-pollution effect of the project, and the concept is broader. Loans to specific industries that comply with the CBRC guidelines on the disclosure of green credit statistics can be regarded as green credit; There is a broad definition of green credit, but there is a lack of uniform and more specific rules on financing projects implemented by banks.	Industrial and Commercial Bank of China and other Chinese commercial banks
The United States, Britain and other developed countries	The definition of “green” focuses more on climate change, protection of the original ecological environment and humanistic care, and it defines the scope of “green” more strictly. Banks refer to relevant international standards, green credit, green products more detailed provisions.	Barclays Bank, Standard Chartered Bank, etc.

As commercial banks in developed countries pay more attention to the environmental problems brought by economic development earlier, the definition of green credit and related green products are more detailed and mature. At the same time, Non-Governmental Organizations (NGOs), environmental organizations and other groups have greater influence on commercial banks, leading to a more stringent definition of “green” by the international commercial banks. Many of the projects listed as green credit in China are excluded from the list of international commercial banks. In contrast, China’s green credit development time is shorter, and the definition of green is not as mature as foreign commercial banks. At the same time, China is still among the developing countries, and economic development remains an important task for the country. In formulating relevant policies, China pays more attention to balancing economic and environmental benefits. Therefore, Chinese commercial banks have different definitions of green credit compared with international commercial banks.

To sum up, green credit has developed for many years in foreign countries and is gradually becoming more mature. The research on the connotation of green credit tends to be specific in environmental protection standards, and more relevant theories such as “equator principles” are used to analyze green credit. Green credit products abroad species diversity, and the application of the green products in the commercial bank credit model is also increasingly mature, but domestic green credit business is at the beginning stage, and until now, there are few green credit products and innovation. Neither a complete system of green credit products has been formed, nor personalized

green credit products have been provided for the demanders of green credit; From the perspective of the development process of green credit policy, combining the development experience at home and abroad, this paper makes an international comparison between the government and banks, providing suggestions for the development of green credit business in the banking industry in China, innovation of green credit products, and better and faster development of green credit business in Chinese commercial banks.

### 3. International comparison of green credit products

#### 3.1. International comparison of design objects of green credit products

The development of China's green credit products has become a relatively more mature part of the green financial system. As of 2017, green credit development has entered a new stage, with the size of the market achieving steady growth and environmental benefits continuously showing. The current situation of China's commercial green credit products is illustrated by the seven products shown in table 2.

As of 2016, the number of green credit product innovations of Chinese businesses is shown in table 3.

However, some developed countries' banks began to focus on environmental issues early. For them, green credit is no longer a kind of responsibility, but an inevitable choice of sustainable development. Therefore, in this context, different areas spawned many different green credit products. Table 4 is the summary of the green credit products in developed countries.

**Table 2.** List of major green credit products of China's commercial banks.

The product name	Object	Use
Green building mortgages	Individuals, households, businesses	To buy green buildings, passive buildings, and prefabricated buildings
Green auto consumer loans	Individuals, families and small and micro businesses	To buy green buildings, passive buildings, and prefabricated buildings
Green label products consumer loans	Individuals, families and small and micro businesses	To buy a green label product
Green credit card	consumers	To advocate "low-carbon" life, to encourage joining the ranks of green environmental protection, and to promote green consumption
Green photovoltaic loan	Homes that need photovoltaic power	To cover the cost of complete equipment for a photovoltaic power station
Green inclusive agriculture and forestry loans	Farmers and forest households	For forest mortgage and ecological agriculture loans
Green energy-saving loan	Small and micro-businesses, individual businesses and individuals	For equipment upgrade, process improvement, and process transformation etc. to achieve the purpose of energy-saving and emission reduction and enterprise upgrade

**Table 3.** Quantity table of green credit products of Chinese commercial banks in 2016 (unit: PCS).

Bank name	Quantity of green credit products	Bank name	Quantity of green credit products
Industrial and Commercial Bank of China	8	Industrial Bank	24
Agricultural Bank of China	12	China Merchants Bank	14
The Bank of China,	12	Huaxia Bank	9
China Construction Bank	10	Everbright Bank	12
Bank of Communications	8	China Citic Bank	1
China Pudong Development Bank	17	Bohai Sea Bank	7

Note: Source: according to the statistics of social responsibility reports of banks.

Through the above comparison of the design objects of green credit products, the following conclusions are drawn:

China's green credit products mainly for small enterprises and individual customers, and China's commercial banks are not aimed at making a detailed classification of loan types for different customers. However, for different customers, funds for energy conservation and environmental protection project are different. Some customers belong to the energy conservation and environmental protection equipment R & D and manufacturing enterprises, while others belong to enterprises to implement national policies, reduce environmental pollution and upgrade environmental protection equipment.

Globally, the international commercial banks, according to the type of the borrowing enterprise, have developed a variety of green credit products to attract all types of customers to participate in the green financial practice, which has produced a good effect, aroused the enthusiasm of the public participation in environmental protection, and made banks develop rapidly in the field of all kinds of green consumption business (Illankoon et al., 2017; Illankoon et al., 2017; Nassani, Aldakhil et al., 2017). Therefore, in terms of the design of green credit products, domestic commercial banks should divide the types of borrowing enterprises in detail (Shaw et al., 2016). For different enterprises, banks should design different green credit products to make the products more targeted and more suitable for the needs of various enterprises.

**Table 4.** Table of green credit products of international commercial banks.

Green credit product name	Category	Content
Green credit for ecological housing	Construction products and services	This product encourages people to buy or build eco-friendly houses. For buyers or new buyers, banks will provide them with preferential loans at interest rates lower than normal market rates.
Home equity loan		This product is a cooperation between the bank and the energy-saving service company. The energy-saving service company will provide energy saving and environmental protection devices for residents, and the bank will provide preferential loans with interest rates lower than the market rate for residents, so as to encourage people to change their lifestyles and advocate low-carbon and environmentally friendly life.
Developer construction loan		This green credit product is designed for property developers
Green credit for auto consumption	Transportation products and services	Green credit for auto consumption refers to preferential auto loans offered by banks to buyers of low-emission or fuel-efficient vehicles
Green credit for transport		This green credit is mainly aimed at transportation companies. By providing preferential loans to transportation companies, Banks urge them to improve fuel economy technology and improve energy efficiency. By improving fuel economy technology, transportation companies can reduce costs and provide a new way for transportation companies to repay loans.
Climate green credit card	Credit card products and services	The card, launched by a Dutch bank, encourages people to actively use their credit cards to consume green products and services. Every year, the bank will count their consumption in green areas and donate a certain proportion to a wildlife fund to save endangered animals.
Breathing credit card		Launched by a UK bank. The card gives customers a discount on green products and services, and the bank donates half of the annual profits to clean energy projects around the world
bond	Capital products and services	The bonds are designed to attract investors, offer a higher yield, and are intended to provide technology and equipment to help companies cope with natural disasters and to provide companies with emergency funds in the event of a disaster.
fund		Green funds offer low returns, but investors can get a tax break, so banks can finance green projects at less cost.

### *3.2. International comparison of green credit product pricing*

It can be seen from China's green credit products that most of the green credit products are simple and straightforward, without giving certain preferential treatment to the lender. In contrast, when pricing green credit products, most foreign commercial banks will consider giving certain discounts to lenders, such as: eco-housing green credit products, which are widely implemented in the UK, Germany and Canada, are typified by such loans from UK-based United Financial Services, Deutsche Bank, Montreal Bank, Canada and Imperial Bank. Montreal Bank of Canada and Imperial Bank offer customers who meet these criteria an installment period beyond the normal maximum repayment period and a refund of 10% of the premium. Green funds in Netherlands offer low returns, but investors get a tax break, so banks can finance green projects at less cost.

It can be seen from the international comparison of pricing of green credit products that China's green credit products do not offer certain concessions to lenders, which also weakens the enthusiasm of borrowers to some extent (Rezaee et al., 2017; Saxena et al., 2017). Banks' green credit is not only for its own profit. Today, when the construction of ecological civilization has been promoted to the national strategy, every individual should be actively supporting the construction of ecological civilization. Therefore, when banks price green credit product, they should give lenders some preferential to make more customers be willing to commit to the green movement.

### *3.3. International comparison of green credit product promotion*

The development period of green credit products in China is still short, so the promotion of green credit products is limited to enterprises or individuals who go to commercial banks for consultation, rather than banks' active promoting. Many enterprises that need funds to carry out energy conservation and environmental protection projects will only choose ordinary loans or other financing methods because they are unfamiliar with green credit products, which also leads to the slow development of green credit business of Chinese commercial banks (Hu, Jiang, & Zhong). For example, in the "8+1" innovative financing project mode of industrial bank, the financing plan designed for the environmental protection derivative industry is difficult to implement and promote due to the relatively low attention paid to the services of the environmental protection derivative industry (Li et al., 2018). The reason is that commercial banks do not pay enough attention to the innovation of green credit products. Many products are launched out of task-oriented rather than substantive content.

The international promotion of green credit products has been relatively mature, and the publicity of various aspects has been integrated into all aspects of social life (Hinson et al., 2019). Citibank has recruited and trained a number of regional supporters and advocates of environmental and social risk management policies, focusing on enabling all companies to internalize environmental impacts as part of the opportunities and challenges that may present to their business. HSBC China promotes its green credit philosophy and policies at all levels of the community and improves its reputation and standing in the industry by organizing environmental activities, funding research and training programs, and actively organizing and participating in high-level forums. Japan attaches great importance to environmental education for government officials, managers of financial institutions, bank employees and the general public, and it has basically formed a professional and non-professional environmental education system with its characteristics (Panja & Mondal, 2020).

To sum up, it is the top priority for Chinese commercial banks to promote green credit products and make them fully play their functions.

#### **4. International comparison of application modes of green credit products**

##### *4.1. International comparison of application modes of green credit products in commercial banks*

China's green credit starts relatively late, so far, many commercial banks in the application of green credit products still develops slowly, at the same time, there is no unified standard of information disclosure, the information disclosure of green credit of each bank is incomplete, and the disclosure content is inconsistent, which also leads to the failure of the outside world to obtain the detailed information about the bank's green credit. Table 5 selected several representative of the commercial banks in the field of green credit and made a brief introduction (Weber, 2017).

Most large commercial banks in the United States have good business innovation abilities, and at the beginning of the green credit business development, they realized the climate environment problems will be closely linked with the financial industry, therefore, the green credit in commercial banks business development faster. The banks focus on green energy projects development and form a professional green credit departments, according to energy conservation and environmental protection, renewable energy and other projects in the field of finance capital. For instance, the United States Citibank has signed an agreement with the Sharp Group to provide low interest rate of financing for customers to buy the solar energy equipment; The Bank of America is working with local governments to launch a small transportation enterprise loan program to support small transportation enterprises to improve energy-saving technologies, purchase energy-saving devices and improve environmental pollution. The Wells Fargo Bank uses the "energy and environmental design certification" to evaluate commercial building loans and support the development of "green" commercial building projects in the form of waiving the initial insurance premium for "green" buildings. Nepal's central bank offers cheap, concessional loans to influential green-building developers; when the developer's green buildings are LEED certified and refinanced, Wells Fargo bank will provide the first mortgage to reduce the developer's operating costs (Awadh, 2017; Rastogi et al., 2017; Wu et al., 2016; Wu et al., 2017). Bank of America works with the department of environmental protection and the department of transportation to provide such quick loans to transportation companies, which also get access to energy-efficient technology and equipment provided by the department of transportation (Emerick et al., 2016). In addition, Bank of America has also launched such products, and the bank has opened a green shortcut for transportation companies to issue such loans so that the enterprise capital can be quickly in place, improving the utilization of funds.



**Table 5.** Application of Chinese green credit products in commercial banks.

product	Banks (for example)	object	use	Specific application model
Green building mortgages	Industrial Bank	Individual clients and families	A home mortgage loan for the purchase of green building, passive building, prefabricated building housing.	Industrial Bank gives differentiated resource arrangement and credit policy. Individual customers and families can also enjoy flexible repayment method and repayment grace period treatment, and at the same time, on the premise of meeting regulatory policy requirements, they can enjoy appropriate preferential treatment based on its current mortgage interest rate.
Green car consumer loans	China Citic Bank	personal	Offer preferential interest rate loans for the purchase of green and energy-efficient vehicles.	In 2015, Citic Bank entered into a strategic cooperation with Tesla, the US. electric car manufacturer, in the auto consumer loan business, offering its owners a variety of financing options, including a minimum down payment of only 20%, a maximum maturity of five years, and a variety of flexible balance payment options. At the same time, Citic loan customers can enjoy “Tesla” in the first luxury car brand launched a “store the promise” service.
Green label products consumer loans	Ma An Shan Rural Commercial Bank	Customers who buy homes	Used for purchasing green household articles, energy-saving home appliances and other supporting facilities.	The product differentiates the interest rate margin according to the green certification level of the customer’s purchase. At the same time, matching green consumer loans, used for the purchase of green household supplies, energy-saving home appliances and other supporting facilities.

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product	Banks (for example)	object	use	Specific application model
Green credit card	Pingan Bank (Green card)	consumers	Green consumer credit business into the personal consumption sector.	This product has two ways to support the green and low-carbon economy. One is to advocate consumers to develop the habit of low-carbon and environmental protection to achieve their own “carbon neutral”. Second, commercial banks directly contribute part of their profits to energy conservation and environmental protection projects or organizations.
Green photovoltaic loan	Huaxia Bank	Enterprise legal person, farmer household, individual	Invest in the construction and operation of photovoltaic power generation projects	Huaxia Bank photovoltaic loan. The bank takes the income from the grid connection of individual farmers of distributed photovoltaic power stations and the subsidy from local governments at all levels of the state, provinces and cities as the first source of repayment. Meanwhile, according to the individual credit status of farmers and their actual needs, it adds the joint guarantee of individuals or related personnel. The loan funds are used to purchase photovoltaic power stations and are paid to photovoltaic distributors or manufacturers.

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product	Banks (for example)	object	use	Specific application model
Green inclusive agriculture and forestry loans	Industrial Bank (forest right mortgage loan)	Farmers, individuals	Investment in construction and investment in inclusive agriculture and forestry projects	The Sanming branch of the Industrial Bank established a series of short, medium and long forest right mortgage loan products through the tripartite cooperation with Fujian investment and production management company and Zhongmin company, which can provide forest farmers with a maximum maturity of 30 years.
Green energy-saving loan	Anji Rural Commercial Bank	Small micro-enterprise	It will provide special funding support for small and micro-businesses to reduce emissions, increase efficiency, and transform and upgrade	“The boiler transformation loan” is a special roll out green credit product the Anji Rural Commercial Bank launched for county small boiler clean energy upgrade for small micro-enterprises that need transformation and upgrade of boilers, and it takes the financial subsidies obtained after the boiler transformation is completed as the repayment source and leverages the transformation and upgrading of green energy through financial leverage.

ABN-AMRO Bank is the first to launch the “Equator Principles” and join the Equator Banks with a number of other banks, providing international norms and clarifying Principles for global commercial Banks to develop green credit business. After launching the “Equator Principles”, ABN-AMRO has also co-authored the “global compact” with many banks to integrate environmental factors into bank development decisions and promote global climate and environmental governance.

Fortis Bank of Belgium has developed a large number of green consumer credit businesses related to carbon emission trading, settlement, financing and consulting, and is actively engaged in the carbon emission market.

The Bank of Ireland has established a cooperative relationship with the power plant to pay close attention to the price trend of the carbon emission market and solve the problem of insufficient carbon emission rights for the power plant, so as to help the power plant achieve carbon emission reduction and sound operation.

To sum up, in the world, the application mode of green credit products of commercial banks has been relatively perfect, while in China, green credit started in 2007, and to the present, most commercial banks have few types of green credit products, and there is no innovation nor a complete system of green credit products. They only treat green credit from the perspective of fulfilling social

responsibility, and do not see the business opportunities in the field of green credit, nor can they provide personalized green credit products for green credit demanders. Therefore, the development and promotion of green credit products in Chinese commercial Banks is imperative.

#### *4.2. International comparison of innovation mechanism of green credit products in commercial banks*

According to the statistics of the financial services authority (FSA) in 2014, there are as many as 57 green credit products launched by British commercial banks, and the green credit business accounts for 75.3% of financing projects. Citibank's green credit products and services are not only for large and medium-sized institutional clients but also for its global retail banking business. ANZ offers green loans to farmers in the form of lower interest rates (Tadele, 2017).

At present, the innovation of green credit products in China's commercial banks is seriously insufficient. Green credit products are mainly targeted at large-scale energy conservation, emission reduction and clean energy projects, as well as large environmental protection enterprises, ignoring the fact that environmental protection enterprises in China are mainly small and medium-sized enterprises (Ouyang & Li, 2018). Green credit products in China are mainly for enterprises, while only green credit cards are for individuals and families, and the personal business of green credit needs to be expanded. At present, China's green credit products are constantly enriched, but the pledge of future usury of contract energy management is still in the exploratory stage, the development of intermediate business of green credit is slow, and the development of green credit products is uneven. In addition, China's green credit product innovation independence is not enough: only the Industrial Bank is an equator bank. Shanghai Pudong Development Bank, Agricultural Bank of China and the Ever Bright Bank have launched a wide range of products, while other banks have not been widely involved in the development and innovation of green credit products.

#### *4.3. International comparison of the establishment of full-time institutions in the application of commercial banks*

Among domestic commercial banks in China at present, only the Industrial Bank has set up a dedicated green credit institutions. Industrial and Commercial Bank, Bank of communications and China Merchants Bank have arranged several green credit marketing and management function division. China Construction bank, Bank of China and Shanghai Pudong Development Bank did not disclose relevant information or they haven't set up any, and the agency setting is slightly lagging. The establishment and performance of full-time green credit institutions of various banks are shown in Table 6:

**Table 6.** Table of the establishment of full-time green credit institutions of Chinese banks.

Bank name	Whether a special green credit institution has been established
Industrial and Commercial Bank of China	No
China Construction Bank Industrial Bank	No Yes. The equator principles working leadership group, led by the bank leaders, and China's first sustainable finance office were established to manage environmental and social risks.
Bank of Communications	Yes. The credit management department is responsible for the green credit work of the whole bank.
China Merchants Bank,	Yes. Credit approval department is a member of the head office green credit leading group
The Bank of China,	No
Shanghai Pudong Development Bank	No

In contrast, most commercial banks in the world have set up a full-time green credit institution to take charge of green credit business. This full-time institution is specially set up for green finance business to take charge of green credit product application acceptance, project review, risk control and green credit product innovation. For example, Citigroup has set up an environmental and social risk policy review committee composed of managers from different business units to provide advisory services to relevant departments such as environmental and social risk management (ESRM) departments and environmental affairs departments. HSBC group set up a council for sustainable development; Citibank has established strict environmental management mechanisms, such as environmental and social policy assessment committee, environmental policy and process training mechanism, environmental and social issues risk management mechanism, external public and private affairs cooperation mechanism, and business development mechanism involving environmental protection. The environmental risk management division was established in 1992 and has evolved over the years into a comprehensive environmental and social impact assessment system (ESIA). In 2003, ABN-AMRO Bank also established a sustainable development department. In March 2006, Mizuho Bank of Japan set up a sustainable development room for the implementation of the "equator principles". Some of the staff are environmental professionals and manage the activities around the world.

To sum up, China's commercial banks are not professional institutions or departments to be responsible for the green credit business, and this has largely affected the application of the green products in the commercial bank credit, therefore, to set up professional institutions or departments is very important for the development of China's green credit of commercial banks.

## 5. International comparison of green consumer credit policy development

### 5.1. International comparison of green credit policy normative system

With the gradual improvement and development of policies, the development of green credit business has been driven by the general trend, and the country's attention to green credit has become the inevitable development of green credit (Tiwari et al., 2018). As shown in Table 7, since 1981, China has introduced many policies to support and encourage the development of green credit.

**Table 7.** Timeline of China's green consumer credit policy.

Policy introduction time	Issued by department	Policy name	Policy-related content
In 1981	The State Council	Decision on strengthening environmental protection during the period of national economic adjustment	It clearly proposes the use of economic policies to promote energy conservation, emission reduction and environmental protection.
In 1995	People's Bank of China	Notice on issues related to the implementation of credit policies and the strengthening of environmental protection	The earliest policy document on green consumer credit in China.
In 2005	The State Council	The decision on implementing the scientific outlook on development and strengthening environmental protection	Financial institutions are required to guide their own credit behavior with the scientific outlook on development.
In 2007	The State Council	Comprehensive work plan for energy conservation and emission reduction	Local governments and People's Bank are required to control the excessive growth of industries with high energy consumption and high pollution. Major commercial banks should make full use of financial leverage to promote industrial restructuring, and actively promote the innovation of credit management systems and financial products for industries that save energy, protect the environment and promote low-carbon circular economy.

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Policy introduction time	Issued by department	Policy name	Policy-related content
In 2007	The China Banking Regulatory Commission	Opinions on implementing environmental protection policies and regulations to prevent credit risks	The document marks the official application of green consumer credit policies to China's environmental governance efforts. "Commercial banks should support environmental protection and control credit to polluting enterprises as an important part of fulfilling their social responsibilities," the document said.
In 2007	The China Banking Regulatory Commission	Guidance on energy conservation and emission reduction credit granting	Commercial banks are required to effectively prevent credit risks while promoting green credit, so as to promote the construction of green credit system and its implementation.
In 2008	Jointly issued by the ministry of environmental protection, the China Banking Regulatory Commission and the People's Bank of China	Notice on standardizing the provision of enterprise environmental illegal information to the credit investigation system of the people's Bank of China	The environmental performance information of enterprises is required to be included in the credit investigation system of the People's Bank of China.
In 2009	The People's Bank of China, China Banking Regulatory Commission, China Securities Regulatory Commission and China Insurance Regulatory Commission	Guidance on further improving financial services to support the readjustment and revitalization of key industries and curb overcapacity in some sectors	Financial institutions should increase the supply of credit for low-carbon circular economy, and implement credit control for industries that fail to meet environmental standards.

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Policy introduction time	Issued by department	Policy name	Policy-related content
In 2011	The China Banking Regulatory Commission	Notice on comprehensive summary of credit granting for energy conservation and emission reduction and good work related to green credit (banking regulatory office [2011] no. 60)	It requires all regulatory departments and some financial institutions to improve the statistical monitoring system of green credit and promote the establishment of environmental and social risk assessment mechanism. At the same time, all policy banks, state-owned commercial banks, joint-stock commercial banks and postal savings banks are required to determine the main departments responsible for green credit business according to their business development strategies and business needs, further encourage banking financial institutions to promote green credit, and promote energy conservation, emission reduction and industrial restructuring.
In 2012	The China Banking Regulatory Commission	Notice on the issuance of green credit guidelines (bank supervision [2012] no. 4)	Financial institutions are required to support the development of green and low-carbon economy to a greater extent, improve their own green credit service level, and strengthen the construction of green credit capacity.
In 2013	The State Council	Opinions of the state council on accelerating the development of energy conservation and environmental protection industry (guo fa [2013] no. 30)	It is needed to vigorously develop green credit in the energy conservation and environmental protection industries and actively innovate financial products and services.

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Policy introduction time	Issued by department	Policy name	Policy-related content
In 2013	The China Banking Regulatory Commission	Opinions on green credit work (no. 40 [2013] issued by the banking regulatory commission)	Banking financial institutions are required to further improve the green credit policy system, establish a green credit statistics system, and improve the green credit assessment system.
In 2014	The China Banking Regulatory Commission	Key indicators of green credit implementation	To carry out “the comprehensive energy saving and emission reduction during the twelfth five-year plan period”, “The 12th five-year plan for environmental protection” “Opinions of the state council on accelerating the development of energy conservation and environmental protection industries”; to implement the “Green credit guidelines” and other regulations; to promote banking financial institutions to carry out green credit work.
In 2017	National Development and Reform Commission	National carbon emission trading market construction plan (power generation industry)	Starting from the power industry, a national carbon emission trading system will be gradually established.

Note: Sources: ministry of environmental protection, people’s Bank of China, China Banking Regulatory Commission.

The United States is one of the first countries to accept the “equator principles”, and it has accumulated rich experience in green credit development and achieved certain results. Specifically in the following several aspects. First, the United States is very famous in the world for its environmental protection and has established a relatively complete environmental legal system. Since the 1970s, the U.S. congress has passed a series of laws on environmental protection. American first special financial environment law was the Superfund Act of 1980, which imposed severe penalties on the public and businesses that pollute the environment. Citibank is one of the first financial institutions to sign the UN environment statement. The most prominent feature of green credit development in the US. is Citibank’s green credit management system and incentive mechanism.

Britain is one of the countries advocating a low-carbon economy. Since the 1970s, the legal system of environmental protection in Britain has become more and more mature (de Araujo et al., 2019). In the UK, enterprises that pollute the environment have to bear social responsibilities. If commercial banks provide loans to heavy polluters, they will face punishment from the

supervision and management department. Therefore, the bank of England attaches great importance to environmental review. Barclays bank has issued a green credit card that gives customers who buy green products issued by the company low interest rates and other benefits. Many financial institutions in the UK have made great efforts to develop green credit. For example, in 2003, Barclays Bank of the UK accepted the “equator principles” and based on its own experience developed credit guidelines covering a wide range of industries, which helped other banks to develop green credit business. HSBC is one of the first banking institutions to join the “equator principles”. It strongly supports low-carbon economy, supports environmental protection and energy saving industry, implements sustainable development credit, implements strict green credit policy for high-polluting enterprises, and takes a low-carbon and environmental protection road (Campiglio, 2016).

Japan attaches great importance to environmental protection. It is the first country in Asia to accept the “equator principles”. Japan issued the “Environment Law”, “Basic Law of Establishing a Circular Economy”, “Pollution Prevention Law” a series of environmental protection laws and regulations, which bring green credit into the law, implement strict legal penalties for the destruction of the environment, and use legal means to enhance people’s environmental protection consciousness, so Japan’s ecological environment will be better and better. In 2004, Japan promulgated the “environmental assessment system”, and in 2007, Japan launched the “environmental rating discount loan”. Thirdly, Mizuho Industrial Bank, Bank of Tokyo-Mitsubishi and other financial institutions in Japan have joined the “equator principles”. In accordance with the requirements of the “equator principles”, they have actively adopted and implemented relevant policies, increased credit support for environment-friendly and resource-conserving environmental protection enterprises to innovate green credit products, and promoted the development of green credit.

According to the history of green credit policy development, China attaches more and more importance to green credit in the banking industry. In order to respond to the policy call of environmental protection, energy conservation and emission reduction, a detailed credit guidance policy has been formulated and implemented throughout the whole operation process (Gharaei et al., 2019). However, compared with the development history of green credit policies in developed countries, green credit started relatively late in China, lacking development experience and relevant laws and policies introduced are not detailed enough, without considering the differences among enterprises, resulting in low implementation capacity (He et al., 2019). In addition, under the situation of increasingly accelerated international operation of domestic commercial banks, green credit policies still formulated in accordance with domestic macro-control policies may not be suitable for the operation environment of overseas institutions, thus affecting the implementation of unified risk management policies and strategies.

## *5.2. International comparison of green credit policy concepts*

The internationally accepted green credit policy concept is the “equator principle”, which is established by major international financial institutions in accordance with the guidelines agreed upon by IFC and the World Bank. Its purpose is a voluntary financial industry standard for judging, evaluating and managing environmental and social risks in project financing (Jia et al., 2020). At the same time, the equator principles of bank must match with the principle of bank lending policies and procedures, and on the environmental and social problems of project financing fulfill the duty carefully review survey. Only when it can be proved that the project of the applicant is responsible

for the society and the environment in the implementation and strictly abide by the equator principle can the project be financed (Kok et al., 2018).

The “equator principles” have been widely recognized internationally. By 2011, a total of 72 financial institutions in the world have announced to join the “equator principles”. Most Banks in developed countries have joined in, such as HSBC, Standard Chartered Bank, Bank of America and many other world-renowned financial institutions. Take the Citibank of the United States as an example, it is one of the first financial institutions to sign the United Nations environmental statement, leading banks such as Barclays Bank and ABN AMRO to reach a consensus on studying the environmental and social risk management mechanism generally applicable to banking project financing, and becoming a founding member of the equator principles in 2003.

In contrast, Industrial Bank is the only Chinese bank to adopt this principle. The implementation of the equator principle has demonstrated to the public its positive attitude towards social responsibility, which has brought new vitality, taking a leading position on the road of sustainable development mode and a model of China’s commercial banks.

To sum up, “equator principle” is internationally recognized as the green credit risk evaluation standard, and commercial banks in most countries have become equator banks (Monasterolo & Raberto, 2018). Commercial banks in developed countries widely apply the equator principle to the environmental risk management of project financing (Kang et al., 2020). However, China has not yet formulated a relatively unified and authoritative green credit standard, and only the Industrial Bank has become an equatorial bank in China. In the context of globalization, Chinese commercial banks and other financial institutions should join the “equator principles” to establish a good corporate image. Therefore, domestic financial institutions with conditions should be encouraged to take the initiative to join the equator principles and to engage in international credit competition.

### *5.3. International comparison of green credit policy incentive system*

The incentive policy made by the US. government is an important guarantee for the sustainable development of green credit in the US.. Take tax policy (Taghizadeh-Hesary & Yoshino, 2019), the Energy Tax Act of 1978, for example, it deducts 30 percent of the first \$2,000 and 20 percent of the next \$8,000 for the purchase of clean energy equipment, such as solar and wind power.

The UK government has developed a systematic policy to encourage green behaviour. The government’s loan guarantee program, for example, is mainly to guarantee environmentally friendly enterprises, a model of development of clean production, environmental protection enterprises. Even small-scale enterprises with weak loan ability can obtain loans of up to 75000 pounds from financial institutions under the guarantee plan, and the government promises to guarantee up to 80% of the loans. As the guarantee subject, the government is also the risk responsibility body, and must first assess the environmental risk of the enterprise investment project, thus eliminating a large number of small and medium-sized polluting enterprises, and a large number of environmentally friendly small and medium-sized enterprises thus get more bank loan support (Ghisetti et al., 2017).

The Japanese government and related departments have implemented a series of incentive measures such as financial subsidy, tax exemption, preferential interest rate (government discount interest rate) for green credit enterprises or environmental technology projects. For example, if private enterprises are engaged in the research and development, equipment investment and process improvement of 3R (recycling, recycling and emission reduction) projects, they can enjoy a certain

preferential interest rate under the policy support. Enterprises establishing resource recovery system can obtain medium- and long-term preferential interest rate loans from policy-based financial institutions. Enterprises or projects implementing circular economy can enjoy various tax incentives.

By contrast, China's green finance is still in its infancy. The commercial bank market pressure is very big. Industrial management departments, environmental protection departments, the people's Bank of China, CBRC and other government agencies have not formulated incentive financial policies, credit policies and corresponding supporting policies, so that commercial banks and other financial institutions can not fully mobilize the polarity of green credit business.

## 6. Implications of international comparison of green credit for China

By comparing international and Chinese green credit products, application models in commercial banks and research and analysis on the development of green credit policies, this paper draws the following enlightenment from the following three aspects:

### (1) Green credit products:

First, diversified development of green credit products. Different customer groups are suitable for different green credit products. If the product is too single, it will not be able to develop for a long time. Therefore, we must continue to innovate, dare to break through, and make the green credit products diversified development, so as to make the concept of sustainable development into reality. It can be seen from the previous article that green credit products in China are actually in the initial stage. Among several typical banks in China, only Industrial Bank and Shanghai Pudong Development Bank have formed a relatively complete green credit product system. Although Industrial and Commercial Bank of China has considerable green credit data, it is actually only a simple green field loan, which has not formed its own Green credit product system, which also restricts the development of green credit business to a large extent, so it is urgent to develop new green credit products.

Second, promoting green credit products. It can be seen from the international comparison of green credit product promotion, part of China's green credit products are only for implementing the national policy instead of a important business. Therefore, we should strengthen the promotion of green credit products disclose the bank's green credit situation completely through the social responsibility report, accept the supervision of the society on the one hand, and on the other hand, we should publicize the bank's green credit products through information disclosure; besides, to promote and publicize through activities, such as printing and distributing publicity pages, issuing questionnaires, and promoting and displaying at bank outlets. Finally, the joint government agencies and commercial banks can design different products for different enterprises and promote the products to eligible enterprises through government agencies. The participation of government agencies makes the products more convincing.

### (2) Application mode of green credit products in commercial banks

First, strengthening the positive innovation of green credit products. China's commercial banks and other financial institutions should support green credit field to launch new green credit products. On the implementation of green credit policy, we should create products that meet the needs of customers and their own development characteristics according to different customer needs, and use product innovation to promote the development of green credit business, so as to provide conditions and accumulate experience for the development of green credit. For example, by quantifying and

evaluating the emission of pollutants reduced by some environmental protection enterprises, banks can make them into standardized, tradable and valuable products and sell them to countries or regions with excessive pollutants. In this process, banks can act as financial service providers throughout the process. Currently, an international market has been established for trading carbon emission rights. According to the regulations, the amount of greenhouse gas emission reduced by establishing new energy utilization projects such as wind power generation and photovoltaic power generation in China can be converted into valuable commodities and sold to countries in need. Chinese commercial banks can strengthen communication and cooperation with foreign government organizations and financial institutions, explore the development of more products based on environmental protection, establish China's brand and image in the field of green credit, and win more space for the development of green credit business.

Second, the establishment of green credit full-time institutions within the bank. Drawing on the successful practices of large international banking groups, the establishment of a full-time institution at the decision-making level responsible for the formulation and work guidance of green credit strategy is a necessary institutional arrangement to ensure that the concept of "green credit" is incorporated into the bank's development strategy and long-term planning. The specific implementation of green credit strategy needs to set up corresponding institutions and promote the work of each link. Chinese commercial banks should improve green credit business as soon as possible to the enterprise strategic development plan, establish a special organization or leading group led by the bank leader to promote the development of green credit business. The head office and each branch of the commercial bank should set up an independent "green credit approval" department, which is directly responsible by the bank leader, and is responsible by the internal talents with strong professional environmental risk assessment review and approve green credit or loans involving environmental protection issues. During the credit granting review, we should strictly focus on "green", focusing on the compliance of enterprises' environmental protection approval procedures. Projects and enterprises that do not meet the requirements of environmental protection and green credit should be rejected by a single vote of environmental protection, and loans should be strictly prohibited. Enterprises that have illegal information about environmental protection and have not yet completed the rectification will be identified in the in-line system, and shall be closely monitored. No form of credit support will be provided for new or ongoing projects without prior approval of the EIA report; Carrying out irregular on-site inspection or spot check on the stock loans of the industry that involve high environmental risk on a regular basis to prevent the occurrence of environmental risk on the stock loans.

### (3) Green credit policy development

First, to establish and improve the relevant legal system. Although China has successively introduced many green financial laws, the green credit legal system is not perfect, and law execution is not strong. The lack of binding makes commercial banks lack of understanding of green credit, thus the legislation can be improved from the following two aspects: On the one hand, learning from relevant foreign legal systems and standards. In combination with China's industrial policies and realities, a standard green credit approval system is established; quantifiable evaluation indicators are refined; green credit access mechanism is strengthened, and social and environmental risks are prevented and controlled. Commercial Banks banks can carry out green credit business based on their actual conditions. On the other hand, uniform Unifying information disclosure standards through legislation. Since there is no unified standard for information disclosure, our country commercial banks

information disclosure of social responsibility report caliber is inconsistent, and the disclosure content is not complete. Some banks disclose the green credit percentage of total loans; some banks disclose its balance, and some banks disclose only “two high and one surplus” industry loan balance. Besides, every year, the size of the data bank disclosure is inconsistent. Some banks even made no mention of green credit data, which makes green credit of commercial banks a secret to the outsiders. For some potential customers, it is not necessarily known that there is green credit business in China’s commercial banks. Therefore, it is urgent for the government to legislate to force commercial banks to disclose green credit information and unify the information disclosure caliber.

Second, it should be in line with the international standards and follow the “equator principle”. Through lectures and symposiums on green credit in the bank, relevant environmental protection policies and the concept of “equator principles” are explained to the staff. The staff’s concept of green credit is established, the policy understanding of “green credit” is deepened, and the concept of green and environmental protection is deeply rooted in people’s minds. At the same time of developing green credit, we should improve employees’ awareness of energy conservation and environmental protection, fundamentally reduce environmental pollution, and create a good social atmosphere for the development of green credit. Besides, we should actively promote cooperation and exchange with international financial institutions, timely understand the trend of relevant international environmental protection policies, keep pace with the times, and constantly innovate, and join international environmental protection standards. For example, the equator principle. The participation of commercial banks in the equator principle can draw lessons from the experience of international green credit business. According to the requirements of Equator Principle, commercial banks can better prevent social and environmental risks, improve their own risk control ability, and improve their international influence.

Third, to build green credit incentive mechanism. The development of green credit in China should learn from international experience, and government agencies such as Industrial Management Departments, Environmental Protection Departments, people’s Bank of China, China Banking Regulatory Commission should formulate incentive fiscal policies, credit policies and corresponding supporting policies to fully mobilize the enthusiasm of commercial banks and other financial institutions to carry out green credit business. Regulators and bankers association and commercial banks should build scientific and reasonable index system of green credit performance, evaluation of commercial banks in the performance of the implementation of green credit policy, as the basis of green evaluation and incentive and regularly publish, the implementation of green credit and green product innovation of commercial banks to provide continuous power and pressure. Commercial banks should innovate green credit service profit pattern, expand the scope of service, actively explore the development of green credit products, develop loan of energy efficiency and emission energy-saving income mortgage loans, mortgages, and sustainable financial products, so as to improve the green financial efficiency while fulfilling the environmental and social responsibilities.

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## Conflict of interest

The author declares no conflicts of interest in this paper.

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