Asia-Pacific
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Promoting Innovative Green Financing Mechanisms for Sustainable and Quality Infrastructure Development in the APEC Region

APEC Energy Working Group

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1. Foreword

The development of international green financing is jointly driven by the positive action of the market leader (financial institutions) and the government as well as international cooperation. At the earlier stage, green financing was signified by banks' performance of environmental risk assessment and extension of green loans. In past years, it has gone increasingly more diversified and stimulated rapid development of a broad range of products, methods and tools like green bonds, green index, green rating, green insurance, environmental information disclosure and environmental stress testing. Meanwhile, financial institutions have also substantially enhanced their green financing capacity. At the same time, international cooperation in green financing has also leaped forward. In 2014, the APEC High-level Roundtable on Green Development convened in Tianjin issued a declaration, stressing that all members should strengthen the economic cooperation and capacity by sharing the best practices, continue to realize the facilitation and liberalization of the trade in environmental goods and services (EGS) and support all economies to achieve green and sustainable growth[1]. Moreover, some important international organizations responsible for international financial governance, including the Financial Stability Board (FSB), financial industry associations and regulators covering banks, insurers, institutional investors and stock exchanges have also started exploring the measures to propel green financing. In this context, green financing technology and other new topics have kept emerging.

Out of different motives, financial institutions, governments and international organizations differ in the definition of green financing. The German Development Institute (DIE) contends that green financing should consist of three elements: green investment, financial services provided by the implementation of public green policies and green financial system supporting green investment. The DIE defines the investment in environmental goods and services together with prevention, mitigation and compensation of environmental and climate damages. The International Finance Corporation (IFC) further summarizes the extensive classification of green investment: ecological environment adaptation, carbon capture and carbon storage, energy efficiency, environmental protection, green building, green products and materials, renewable energy, sustainable land utilization, green transport, waste treatment and water resources. Given the unified definition or context, investors, enterprises and banks can more clearly identify green investment opportunities or targets, promote environmental risk management, enterprise communication and policy design under the green financing system, and propel the development of a global green financing market.

At present, there is still a large growth space for green financing in terms of supply and system building, compared to the financing demand for global sustainable development. In the following decade, there will be a huge demand worthy of tens of trillions US dollars in the world's major green sectors (such as building, energy, infrastructure, water and pollution treatment), according to relevant estimates contained in the research reports of the

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1 www.apec.org/-/media/Files/Groups/SustainableDev/20140508_Declaration-APEC-HighLevelRoundtableOnGreenDev.pdf

International Energy Agency (IEA), the World Bank, the Organization for Economic Co-operation and Development (OECD) and the World Economic Forum[2]. However, compared to the severe environmental challenge and green financing demand, the global supply of green financing remains badly deficient, and financial resources invested in green sectors still can't satisfy the vast demand. Statistics reveal that only less than 10% of bank loans are explicitly defined as green loans, which born the green label take less than 1% of the global bonds market, and the ratio of green infrastructure assets to the asset portfolio of global institutional investors is below 1% as well[3]. From now to 2030, both developed countries and developing countries should vigorously develop green financing to satisfy the green financing demand in an number of tens of trillions US dollars, realize the environmental improvement and ensure sustainable growth.

The ability should be improved to communicate and analyze green financing-related information to build a green financing system and promote the green financing development worldwide. Currently, international cooperation plays a positive role in driving cross-border flow of green capital, strengthening the green financing capacity and realizing the sharing of knowledge. If the APEC members understand green financing practices and experience of other countries, international organizations, financial institutions and third-party institutions in different sectors in greater depth and over a broader range, they can better carry forward the innovation and refinement of the green financing mechanism in the APEC Region.

In this report, through classifying different participants in green financing, typical green financing products and service cases advocated by different entities worldwide has been discussed, such as green credit, green equity and funds, green insurance, green bonds and carbon finance, and comb the best practices, experience and lessons related to green financing. Meanwhile, green financing concepts, experience and approaches available for reference in the APEC Region have been summarized to provide a reference for different economies and further drive their sustainable urbanization and infrastructure construction. The concern of this report is major entities or sectors involved in green financing: enterprises, investment banks, asset management institutions and insurance companies.

2. Implementation Cases of Green Financing

2.1 Analysis of cases implemented by enterprises and investment banks

Enterprises and investment banks or wholesale banks usually provide financial solutions for large enterprises, institutions, governments and other public institutions with complex financial demands worldwide. Financial institutions offering enterprise and investment banking services can underwrite bonds on behalf of themselves, enterprises and public sectors, and deliver equity, asset management and M&A consulting services to enterprises. Serving as

[2] The United Nations Conference on Trade and Development (UNCTAD) estimates USD 5-7 trillion should be invested annually in the following 15 years to realize the sustainable development goal. The IEA, OECD, the WB and the World Economic Forum forecast that over the 15 following years, the world should invest about USD 90 trillion in the sustainable infrastructure asset area, and this figure is more than twice the global public infrastructure capital size.

[3] Data source: Green loan data come from the IFC, and green bonds data come from CBI and green infrastructure investment come from the OECD.

a financial intermediary, these banks raise funds (equity capital and debts) through primary market trading of foreign exchange, commodities, warrants and other assets. In the green area, they usually provide project financing, bond issuance, carbon financing and other financial products/services to customers.

Table 1 List of Enterprises and Investment Banking Products and Services

Product	Important product solution and result/potential	Financial institution	Region
Project financing	The special service department is dedicated to the long-term investment in clean energy projects. For one or more renewable energy technologies, some banks also cooperate with those countries that own a clean energy supervision system and encourage the early application of clean technologies.	BNP Paribas (wind energy), Rabobank Group, Barclays, Wells Fargo, Standard Chartered Bank and Westdeutsche Landesbank (biofuel and wind energy)	Global
	In 2006, the bank raised USD 1.5 billion for the wind power market and earmarked nearly USD 650 million to the proprietary asset portfolio. After its launch in 2003, the renewable energy asset portfolio of the bank now comprises an equity investment in an amount of some USD 1 billion made in 26 wind farms. The company has also actively invested in biomass, geothermal and solar power generation.	JPMorgan Chase & Co	America
	Asset portfolio financing technology. It has linked the asset portfolio financing of the renewable energy project to the construction risk related to project development.	Dexia Bank (wind energy)	America
	It is a general coordinator for the financing of a waste renewable energy project, which includes a 25-year loan that based on the waste contract signed with the local government and the enterprise supporting the non-contractual waste treatment.	Bank of Ireland	Europe
Bonds	The Forest Bond is a product designed to finance the restoration of the vast forest in Panama. The reinsurer will insure the 25-year bond, and investors and frequent users of the Panama Canal will buy the	Different types	Latin America

	bond.		
	The Cat Bonds provides auxiliary funds to cover the risk brought by natural disasters. It can bring a higher-than-average yield, enrich the investment portfolio of investors and bolster the industrial reserve.	BNP Paribas, Goldman Sachs and Lehman Brothers	Global
Carbon financing and emission trading	The bank provides equity, loan and/or advance or payment against delivery, and buys carbon credit from the clean development mechanism and the joint implementation project. Most of the banks buy carbon credit to satisfy the compliance demand of their corporate customers, launch a tradable product on their transaction platform or develop credit products backed by carbon subsidy and carbon credit.	Barclays, HSBC, Wells Fargo, ABN AMRO Bank, BNP Paribas, JPMorgan Chase & Co, Goldman Sachs, Citigroup, etc.	Global (mainly Europe)
	The subsidy trading products include without limitation to the discreet placement of physical orders, fixed or floating swaps, futures, subsidy repurchase structure, market making for spot and forward transactions, and price hedge based on cross commodities.	Different types	Europe

2.1.1 Green project financing—Indonesian natural gas project of Mizuho Bank

i. Market size and structure

Considering there is no comprehensive and meaningful review of green financing loans in the market, the IFC has estimated the green project financing market with syndicated loan data from Thomson Reuters. In 2014, 4,412 syndicated loans disclosing the financial standing involved a total amount of USD 1.1 trillion. Of these loans, 3,610 loans (roughly 82%) involved green activities, and the remaining 18% didn't involve green activities at all. Most of these loans involved green activities in number, but by amount, only USD 164.7 billion worth of these loans (about 15%) involved green activities.

Figure 5: Share of green loans per total loans, displayed per number of loans

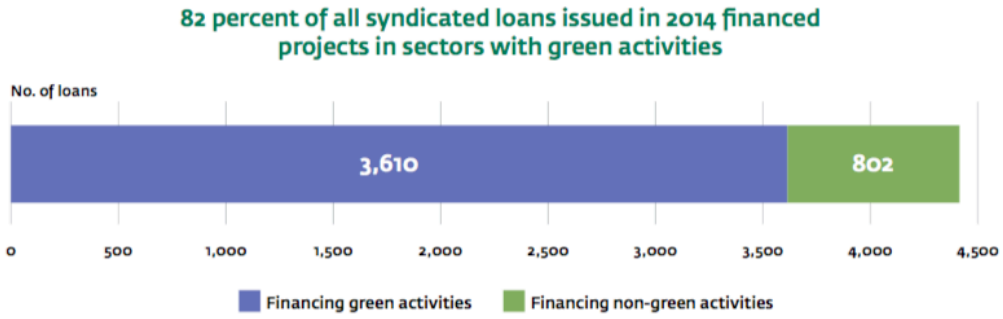

Figure 6: Share of green loans per total loans, displayed per dollar value

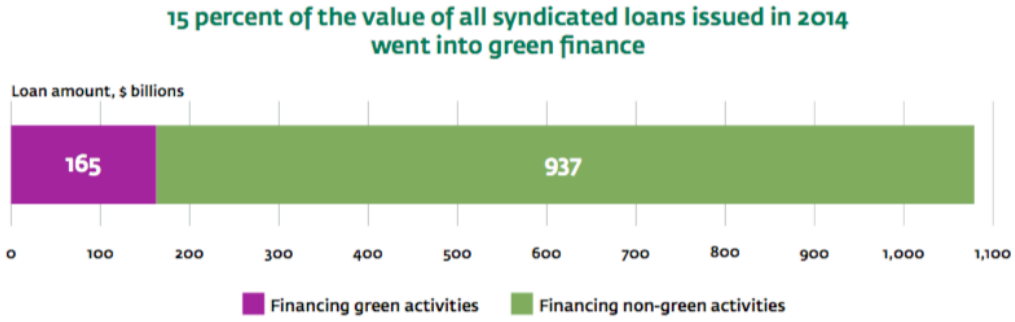

Figure 1 Proportion of Green Project Financing Size (from: IFC Green finance)

In terms of structure, 41% of 3,610 loans financing green activities flowed to real estate; and of the loans of USD 164.7 billion financing green activities, USD 62.4 billion (about 38%) financed clean energy projects, and USD 51 billion (about 31%) funded green building projects.

Figure 7: Distribution of green loans across sectors

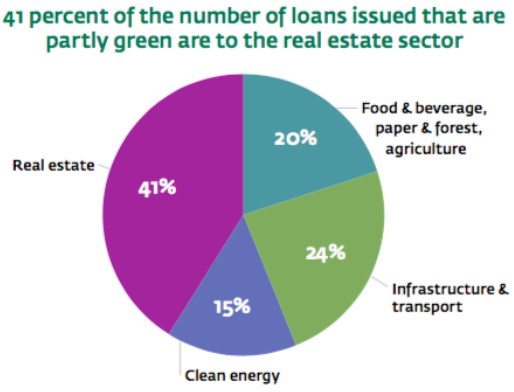

Figure 2 Industrial Distribution of Green Project Financing (from: IFC Green finance)

ii. Case analysis

a) Background

The Tangguh project in Indonesia, an offshore natural gas development project located in the bay area of Papua, comprises construction and operation of offshore gas transmission pipeline, natural gas facility, natural gas tank terminal, involves a total investment of USD 7 billion, a proved reserve of 14.4 trillion cubic meters and an annual output of 7.60 million tons of natural gas. It entails forest felling (including mangrove forest) and marine ecological impact, and directly affects the daily life of 8 local villages, some of which need relocation.

The Equator Principles is the guide used by financial institutions to assess and manage environmental and social risks associated with project financing. In 2003, Mizuho Bank (formerly Mizuho Industrial Bank) became the first bank in Asia and the 18th bank worldwide to adopt the Equator Principles (by the end of 2017, a total of 92 financial institutions from 37 countries have adopted the principles[4]). The bank has actively adopted the Equator Principles, fully assessed the social and environmental risks of the Tangguh project, specified relevant commitment articles in the financing contract, and required the borrower take appropriate actions to mitigate potential risks.

b) Entity

Mizuho Bank is a member of Mizuho Financial Group and one of the three giant banks in Japan. It owns the largest personal banking outlet network (about 466 outlets). Meanwhile, it delivers cross-border and crossover financial services, including overseas banking, corporate banking and project financing, to more than 70% of local large enterprises and multinational corporations, and has established partnerships with these customers[5]. The bank promotes a sustainable economic development for the host economy through green credit, innovation of green financing projects and introduction of carbon trading system to improve the ecological environment.

- **Green credit**

Mizuho Bank offers financial services to enterprises committed to environmental protection. It has launched traditional financial instruments and also financed solar, photovoltaic, wind power generation and other environmental protection-related projects to carry forward environmental protection in different aspects. The bank has actively applied its project financing experience to the financing of renewable energy sectors, including solar, photovoltaic and wind power generation, and required large development projects observe the Equator Principles to ensure environmental protection.

Examples include the Spanish solar power generation project in 2008, the support for renewable energy promotion in Bulgaria in 2009, the wind power generation project in Korea in 2010 and the Spanish photovoltaic power generation project in 2011. It started supporting development of the solar energy industry through project financing and fund in 2013, and building overseas geothermal generation projects in 2014.

- **Innovation of green financing product**

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[4] http://equator-principles.com/members-reporting/
[5] www.mizuhobank.com

Mizuho Bank has developed innovative financial instruments and propelled an environmental improvement in all aspects in order to provide a financial support for those enterprises devoted to environmental protection. When an enterprise implementing environment-friendly operation or actively wanting to improve the environmental issue makes an equipment investment for environmental improvement, the bank will provide an environmental financing project at a lower interest rate than the benchmark – "Mizuho Environmental Aid" – and a bond instrument – "Mizuho Environmental Private Bond".

Since March 2011, Mizuho Bank has assessed the environmental performance of customers with the Mizuho Environmental Rating, an assessment system developed in house, set financing and issuance conditions based on assessment results, and provided the "Mizuho Environmental Aid Plus" and the "Mizuho Environmental Private Bond Plus".

The Mizuho Environmental Rating is a model Mizuho Research Institute has developed to assess the environmental performance of customers. The bank defines an enterprise's sustainable environmental protection as the basic principle, tracks the project for three years after implementation and assesses it in terms of "risk" and "opportunity".

Also, the bank has reduced the interest rate on loans used to renovate green buildings with photovoltaic power generation, or build or buy green houses and buy clean energy vehicles, in a move to support low-carbon consumption of personal customers.

- **Promote ecological circulation through the carbon emission trading system**

Mizuho Bank can deliver a broad range of environmental products and services related to Japan's credit line system for carbon emission (J-Credit Scheme). The Mizuho Ecological Cycle (Figure 3) means that Mizuho Bank delivers the aforesaid products and services to environment-friendly operation of enterprises and environmental protection-related industries. Meanwhile, the bank also extends the same to cover personal customers paying attention to the environmental issue, thereby spreading the responsibility to reduce CO_2 emission to the entire society.

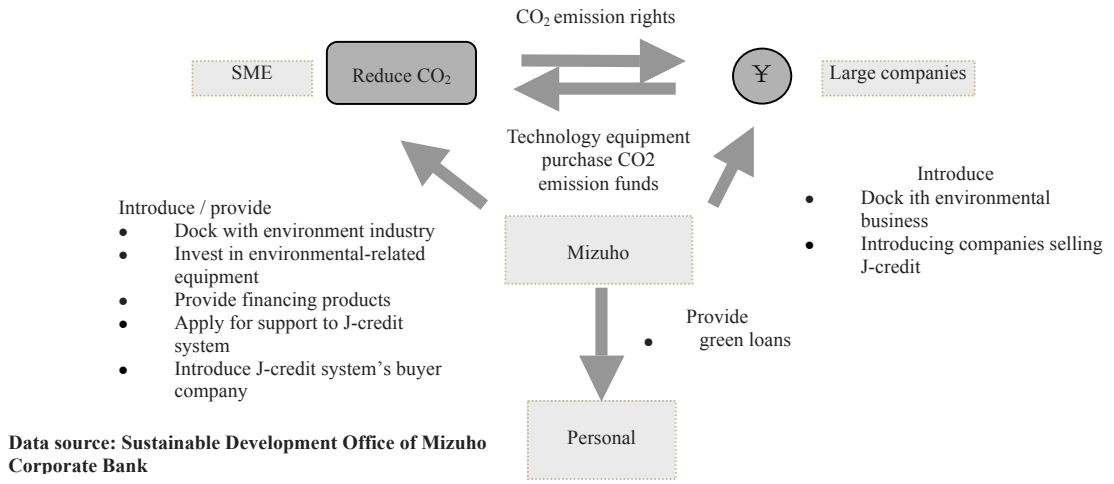


Figure 3 Mizuho Ecological Cycle[6]

[6] Data source: Sustainable Development Office of Mizuho Bank

iii. Content

The Tangguh project is mainly developed by the Indonesian subsidiary of British Petroleum (BP) and also involves with several Japanese enterprises. The bank, the Japan Bank for International Co-operation (JBIC), the Asian Development Bank (ADB) and other international financial institutions extended a syndicated loan of USD 3.5 billion to the project in August 2006 and November 2007. In March 2009, the natural gas pipeline of the project started operation. When implementing a financing project, Mizuho Bank has adopted the Equator Principles as the assessment standard, plays a positive role in propelling environmental protection and reducing the impact on the local community, and sets an example.

iv. Achievement

a) Exert the advantage of the Equator Principles in project assessment and protect the ambient environment in depth

Involving the need to build an oil drilling platform, the Tangguh project has delivered an impact on marine creatures in the ambient ocean area and also needed to fall the mangrove forest in the bay area. The mangrove forest is an important link of the food chain of local coastal creatures. Thus, the felling of the mangrove forest has directly affected the ecological environment and also deeply affected fishery with which ambient villages make a living. Moreover, the onshore land requisition plan involves the need to relocate local residents and has directly affected the life of residents in 8 native villages. Meanwhile, the project has also affected the cultural heritage known as the “holy land”.

At the early stage, the bank assessed the environmental and social impacts triggered by the project in line with the Equator Principles. The Principles varies in the extent of application to projects in different countries and regions (Table 2).

Table 2 Application Standard of the Equator Principles[7]

Application standard	Project location	
	OECD Countries in the high-income economies	Non-OECD countries Countries not in the high-income economies
Social and environmental laws and other licensing policies in host economy of projects	Required	Required
IFC Performance Standards	It is not an absolute standard but applies to specific	Required

[7] Data source: Sorted up by Mizuho Bank based on the webpage of the Equator Principles

	circumstance	
EHS Guidelines of World Bank Group	It is not an absolute standard but applies to specific circumstance	Required

Pursuant to Equator Principle 1, a financial institution shall classify every project financing transaction as A, B or C (Table 3) when assessing the environmental and social impact of the transaction.

Table 2 Classification Standard of the Equator Principles[8]

Type	Classification standard	Potential impact of project
Type A project	A project that may deliver a diverse, irreversible or unprecedented major negative impact on the society or environment	● Deliver a major impact on biodiversity, natural habitat and cultural heritage ● Deliver a major impact on the life of local community (land requisition, non-voluntary relocation and native resident) ● Comprehensive major impact (a single impact is not enough to classify the project as a type A project, but the impact from various factors put together is equivalent to that of a type A project)
Type B project	A project that is possible to deliver certain negative impact on the society or environment. The environmental impact is relatively weak and irreversible in most cases, and only covers the local area. Meanwhile, the impact can be improved with mitigation measures	● A relatively limited impact compared to a type A project ● The impact of the project is basically limited to the project area, and can be improved with technical measures such as public hazard prevention equipment
Type C project	A project that will deliver a very small impact, or no impact, on the society and environment. It is unnecessary to take any other measure for such a project, except	● The environmental or social impact is slight and basically impossible to deteriorate

[8] Data source: Sorted up by Mizuho Bank based on the webpage of the Equator Principles

	for preliminary review.	

b) Highlight "financing management" features and explore the way to mitigate the negative impact

The bank shall work out corresponding measures and management plans after assessing the project according to the Equator Principles. The response measures include: try to avoid, reduce to the biggest extent, and compensate or offset. The bank shall alleviate the negative impact of the project and perform monitoring according to the performance standard. Illustrated below is the application of the Equator Principles at different stages of project financing.

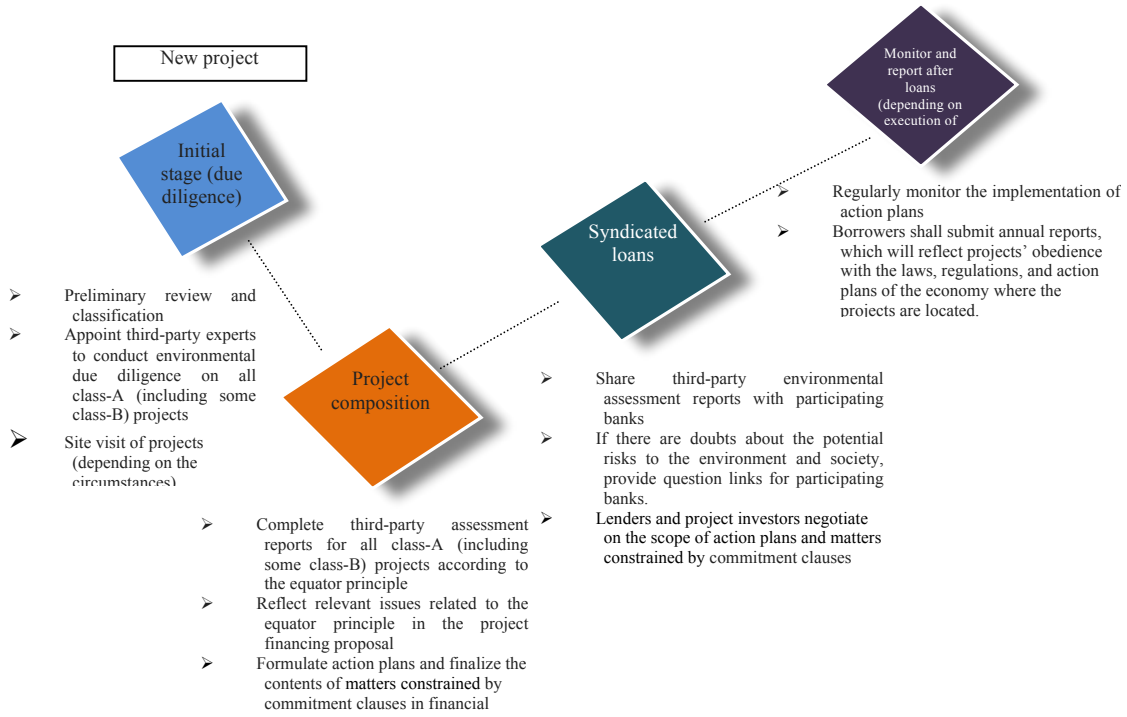


Figure 4 Application of the Equator Principles at Different Stages in Project Financing[9]

c) Conduct full communication and lay down measures after earlier assessment, and perform post-lending monitoring to improve fairness and equality

The lead bank of the syndicated loan, the enterprise and the local government consign a third-party environmental assessment institution to prepare the early assessment report respectively. After which, they shall fully exchange views in relation to the environmental and social impact and determine response measures. This will effectively assure financing and future implementation of the project and strengthen cooperation among the bank, the enterprise, the local government and residents. The bank has supported local agricultural and fishery processing, accelerated power facility construction and promoted local economic

[9] Data source: Mizuho Bank

development.

v. Revelation

a) The bank has adopted the Equator Principles as the assessment standard and mitigated the environmental and social impact of the project

The Equator Principles has defined the assessment framework of environmental and social risk in the project financing area and gradually become the generally accepted international standard. Mizuho Bank has adopted the Equator Principles for the financing of the Tangguh project in Indonesia, and fully reduced the environmental and social risks of the project financing. Also, it has improved the international recognition by adopting the global uniform standard.

b) The lead bank, the enterprise, the government and local residents coordinately carry out the project

To implement the project, the lead bank and the enterprise have designated an environmental assessment institution to perform a prior risk assessment of the project under the framework of the Equator Principles, and introduced equitable third-party indicators to perform regular post-lending assessment, supervision and management.

The application of the Equator Principles has deepened the dialog between the bank and the customer in the environmental risk management area, and better protected the ecological environment and rights of the affected area. Meanwhile, the fairness and transparency of the principles have also helped the bank minimize its reputational risk and improved its international recognition.

2.1.2 Green bonds—Green bonds of Electricite De France (EDF)

i. Market size and structure

Green bonds originated in 2007 in the international market. In 2007-2012, the major sponsors of the green bonds market included the World Bank (WB), the IFC, the European Investment Bank (EIB), member economy governments, municipal governments and member economy development banks. Over the past years, driven by the growing market demand, more diversified issuers and investors have joined the green bonds market, and the issued size of labeled green bonds soared from USD 3 billion in 2012 to USD 155.5 billion in 2017 covered 37 markets, according to the data from the Climate Bonds Initiative.

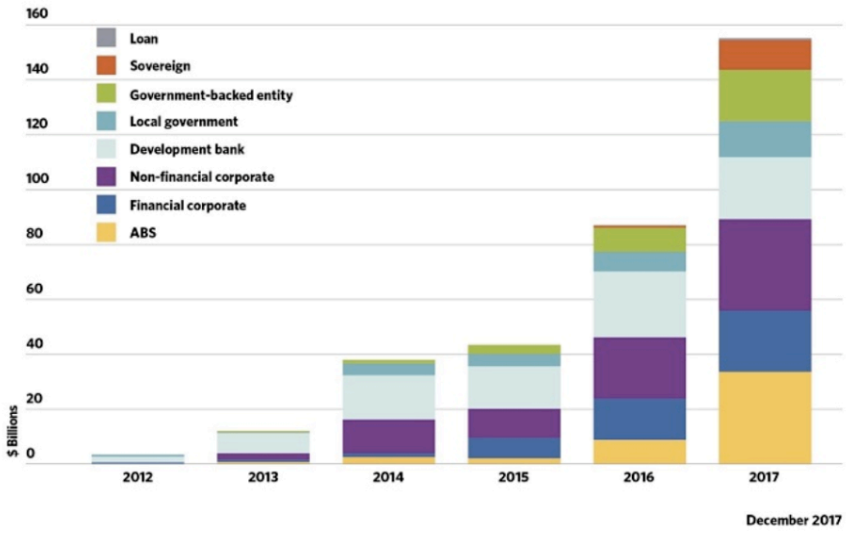


Figure 5 Issued Size of Green Bonds[10]

Labeled green bonds are used to finance a series of theme projects. The biggest part is renewable energy (about 33%), followed by low-carbon building and energy efficiency (about 29%), clean transport (about 15%) and sustainable water management (13%).

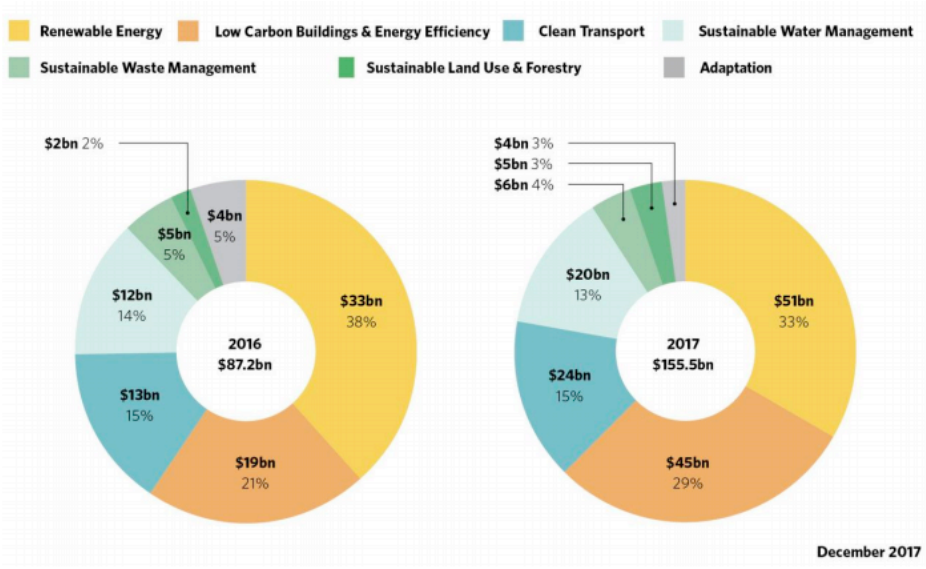


Figure 6 Industrial Distributions of Labeled Green Bonds[11]

Before 2013, global green bond issuers were mainly the WB, the IFC, the EIB and other multilateral development banks. The market leaders WB and IFC cooperated with government and private sectors respectively and offered green bonds to finance public and private investment projects.

In November 2013, the EDF issued a green bond worth EUR 1.4 billion, which was the then

[10] Data source: https://www.climatebonds.net/files/reports/cbi-green-bonds-highlights-2017.pdf
[11] Data source: https://www.climatebonds.net/files/reports/cbi-green-bonds-highlights-2017.pdf

largest of its kind and also the first green bond issued by a large energy company. The green bond was mainly used to fund renewable energy projects and energy efficiency projects, which must pass the third-party assessment in multiple dimensions, including human right, environment, health and social responsibility. The successful issuance of the bond has opened up a new financing channel for the low-carbon development of the EDF and even the international energy industry.

ii. Case analysis

a) Case background

The Green Bond Principles (GBP) was proposed by the GBP Initial Executive Committee composed of green bond issuers, institutional investors and underwriters together with the International Capital Market Association (ICMA) in January 2014 to advise the green bond market development about transparency and information disclosure and promote capital flow to projects benefiting environmental protection. The GBP preliminarily defines the investment scope of green bonds and establishes the framework for basic principles regarding proceeds management, information disclosure and other matters of green bonds. Now, about 200 global issuers, underwriters and investors observe the GBP. The GBP governs green bonds mainly in terms of use of proceeds, project assessment and selection, track and management of proceeds, information disclosure and reporting, assessment and certification. The GBP Initial Executive Committee consists of 24 members from representative issuers, investors and intermediaries, and is responsible for annual update of the GBP. As the secretariat, the ICMA provides organizational, governance consulting and other supports.

b) Case entity

EDF, founded in April 1946, is one of the largest power producers in the world, and its business scope almost covers the upstream and downstream of the power industry, including power generation, transmission, distribution, power trade, sales network and other links. The EDF has become a leading energy carrier with professional team, outstanding R&D capacity, engineering skill and long-term experience. Also, it has provided competitive solutions to coordinate economic growth and climate protection through meticulous customer services. In 2016, the EDF recorded an operating revenue of EUR 71.2 billion, hired 155,000 employees worldwide and served 37.10 million customers. Also, it earmarked an R&D budget of EUR 662 million. In the full year, the EDF recorded a power output of 584.7 TWh, including 78% from nuclear power generation, 8% from hydraulic power generation, and 8% from gas-steam cogeneration, and realized 88% of power generation without carbon dioxide emission[12].

As a global low-carbon energy leader, the EDF owns an installed capacity of more than 29 GW renewable energy such as hydropower, wind power and photovoltaic power. Meanwhile, it incurs a capital expenditure around EUR2 billion for development, innovation and maintenance of renewable energy. As the core of its Strategy CAP 2030, the EDF has set the objective to double its renewable energy installed capacity to 50 GW by 2030. At the same time, after issuing the first green bond in 2013, the EDF has used green bond as a key financing instrument to support renewable energy development.

[12] Data source: https://www.edf.fr/en/the-edf-group/who-we-are/edf-at-a-glance

c) Product and service information

Until the first half of 2017, the EDF has issued a total of 5 green bonds worth EUR 4.5 billion to support its renewable energy business. See the table below for details.

Table 4 EDF's Green Bond Issues[13]

Allocation status of Green Bonds proceeds at 30 June 2017

	Issue date(1)	Maturity (in years)	Nominal amount (millions of currency units)	Currency	Allocated funds as of 30/06/17 (in millions of currency units)	
					Construction of new renewable capacity by EDF EN	Renovation, modernization and development of existing hydroelectric facilities in mainland France
GB1	11/2013	7.5	1,400	EUR	1,400	*Not included in the "Use of Proceeds"*
GB2	10/2015	10	1,250	USD	1,220	*Not included in the "Use of Proceeds"*
GB3	10/2016	10	1,750	EUR	-	83
GB4	01/2017	12	19,600	JPY	-	-
	01/2017	15	6,400	JPY	-	-

Annualized coupon rate: GB1-2.25%, GB2-3.625%, GB3-1%，GB4-1.278%/1.569%.

- **Fund purpose**

The EDF will use the proceeds from green bonds for the following investment activities (qualified projects): renewable energy generation projects developed by EDF Energies Nouvelles (EDF EN); hydropower facilities in Mainland France; upgrade and reconstruction of existing hydropower facilities in Mainland France; modernization and automation of maintenance and operation of modern hydropower facilities in Mainland France; and hydropower development projects in Mainland France.

- **Project assessment and selection procedure**

The EDF has established two project assessment standards, and only a project complies with the E&S standard of EDF EN or the E&S standard for French hydropower projects, can the project benefit from green bond financing. These standards are consistent with the GBP issued by the ICMA and contain operable implementation rules.

When a project is selected, the E&S standard of EDF EN requires that the investor must assess the human right and governance status of the project economy, monitor the environmental impact of the project, ensure the health and safety of all people participating in

[13] Data source: https://www.edf.fr/en/the-edf-group/dedicated-sections/investors-shareholders/investors-analysts/bonds/green-bonds

the project, establish responsibility relations with suppliers and ensure full consultation with regional stakeholders.

The E&S standard for French hydropower projects specifies that when selecting a project, the investor must be dedicated to human resource practices and processes that are ethical, transparent and sustainable; manage the environmental impact of the project and be dedicated to biodiversity and waste treatment; ensure the health and safety of all employees and contractors participating in the project; establish responsibility relations with suppliers, and be dedicated to active dialog and promotion of local economic development.

- **Fund management**

Green bonds fund-raising is managed according to certain procedure to ensure complete traceability of proceeds raised by EDF SA, and ensure these proceeds s will be used to finance qualified projects.

After receiving the proceeds from every issue, the financial department of the financing and investment department of EDF SA will invest the proceeds in the special subsidiary investment portfolio of short-term financial assets ("Green Fund Asset Portfolio") and track the proceeds until these proceeds are allocated to qualified projects. The proceeds will preemptively invest in financial assets identified as "social responsibility investment" by external parties.

- **Information disclosure**

The EDF has opened a special column for disclosing green bonds information on its website and published documents and information related to green bond activities on the column. This includes regular update of the green bond proceed distribution and annual report (including detailed project and impact report). The EDF will report the usage of proceeds from every green bond until the net proceeds are fully used or the maturity date of the bond, whichever is earlier.
(https://www.edf.fr/en/the-edf-group/dedicated-sections/investors-shareholders/investors-analysts/bonds/green-bonds)

- **External assessment**

The EDF has appointed Vigeo Eiris to assess the sustainability of its green bond framework and published the assessment report on its information disclosure platform.

iii. Achievement

Until January 2017, the EDF has invested the proceeds from two earlier green bonds in 15 projects, which are expected to reduce 2.9 megatons of carbon dioxide emission every year.

Table 5 EDF's Investment Allocation and Achievement (from: EDF Green Bonds)

	Funds raised	Funds allocated	Projects having received GB funding	Share funded by the GB	Gross total capacity of GB funded projects (in MW)		Expected output (in TWh/year)		Expected avoided CO_2 emissions (in Mt/year)	
					Gross[1]	Net[2]	*Gross*[1]	Net[2]	*Gross*[1]	Net[2]
Green Bond #1 November 2013	€1.4bn	**€1.4bn**	13 projects[3]	59%	*1,755*	**976**	*7.0*	**4.1**	*3.3*	**1.8**
Green Bond #2 October 2015	$1.25bn	**$500m**	3 projects[3]	60%	*574*	**346**	*2.4*	**1.5**	*1.7*	**1.1**

The EDF has invested all the EUR 1.4 billion raised from the first green bond in 13 projects and held a 59% equity of these projects. These projects have a net installed capacity of 976 MW and are expected to generate 4.1 terawatt hours of power and reduce carbon dioxide emission by 1.8 megatons every year.

The EDF has invested all the EUR 1.25 billion raised from the second green bond in 3 projects and held a 60% equity of these projects. These projects have a net installed capacity of 346 MW and are expected to generate 1.5 terawatt hours of power and reduce carbon dioxide emission by 1.1 megatons every year.

iv. Revelation

a) The first green bond issued by a global large energy company has propelled the low-carbon development of the international energy industry

In November 2013, the EDF offered the world's first green bond issued by a global large energy company, and the bond won twice oversubscription. The successful issuance of the bond has blazed the trail for green bond issuance by large enterprises and terminated the history that only governments or policy-related financial institutions could offer green bonds in the past, and stimulated great enthusiasms of private enterprises to offer green bonds. Several months later, another energy company GDF Suez from France broke the record by issuing a green bond of EUR 2.5 billion. In 2014, Toyota became the first carmaker that entered the green bond market with an initial issuance of green asset-backed bond (ABS) worth USD 1.75 billion in the American automotive asset-backed securities market. In March 2014, Unilever also offered a green bond of USD 411 million.

The green bond issuance of the EDF has broadened a new financing channel for the low-carbon development of itself and even the international energy industry, created a new fund flow and made it possible to navigate funds from traditional fossil energy area to the cleaner direction and develop low-carbon projects in the world.

b) The adoption of the GBP has improved the transparency of the project investment

The GBP publishes the guideline regarding information transparency, disclosure and reporting to enhance the credulity of the green bonds market. Bond issuers disclose necessary information to various market players according to the GBP, for the purpose of increasing the capital allocation to environmental protection projects. Besides, the GBP pays attention to the purpose of proceeds and assists issuers to evolve towards a more environment-friendly and sustainable business model through the support for concrete project.

The issuance of green bonds compliant with the GBP provides investors with an opportunity to hold transparent and reliable green qualification. By encouraging the issuer to actively report the usage of green bond proceeds, the GBP has evidently improved the market transparency and facilitated effective track of fund purpose. At the same time, it has deepened the understanding of expected benefits of the project.

c) The company has designed its own green bond framework and set an example for corporations

The EDF has established the green bond framework containing the E&S standard of EDF EN and the E&S standard for French hydropower projects that are used to assess and select investment projects with green bond proceeds. This framework aims to standardize how to issue green bonds and use proceeds, and extend the solution to new qualified projects.

2.1.3 Carbon finance—Carbon finance service of the Industrial Bank

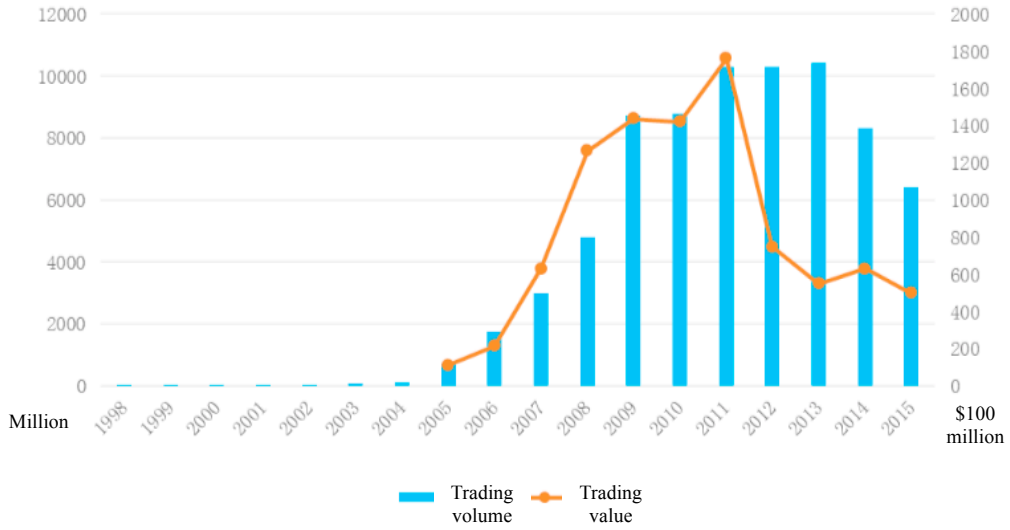
i. Market size and structure

The international carbon finance market has actually grown quickly since the implementation of the EU ETS on January 1, 2005. In 2005-2011, driven by the economic boom, the market grew both in price and volume sharply, the carbon quota trading volume soared from USD 10.8 billion to USD 176 billion within 6 years with an annual average growth rate of 59%, and the trading volume jumped from 329 million tons to 10.4 billion tons with an annual growth rate of 78%, according to the annual report of State and Trend of Global Carbon Market published by the WB since 2005.

However, due to the continuation of the European debt crisis and global economic downturn as well as the uncertainty shading the emission reduction policies of different countries at the second stage of the Kyoto Protocol, the optimistic climate in the international carbon market was quickly replaced by the pessimistic expectation, and the quick decline of carbon price resulted in a trading plunge. In 2013, the trading volume of the global market fell down to USD 54.9 billion, a decrease of more than 36% from 2012, representing 1/3 of the peak level in 2011. Since 2014, the trading volume has kept sliding from the high point in 2013, with a reduction of over 20%.

The global carbon market will possibly embrace a robust growth in the future, stimulated by China's launch of the member economy carbon emission trading system for the power industry and the implementation of carbon pricing in different countries. However, the current international mechanisms such as clean development mechanism (CDM), joint implementation (JI) and voluntary market are not clearly related to the new methods and mechanisms specified by the Paris Agreement[14]. For this reason, the overall international carbon credit demand remains low, and the future demand will also be uncertain.

[14] The Clean Development Mechanism (CDM) is the only flexible mechanism containing the developing countries under the Kyoto Protocol. The CDM allows the developed countries to help the developing countries perform joint implementation (JI) projects that benefit emission reduction or absorption of greenhouse gases as part of the emission reduction indicator of the economy.



Source：The World Bank's Carbon Market Status and Situation Report 2005-2015

Figure 7 Current Status of Carbon Market of World Bank

ii. Case analysis

a) Background

China is the world's largest coal producer and consumer, and coal contributes about 70% of primary energy production and consumption, which is higher than the international level of 27% by more than 40 percentage points. According to Harvard University, China's total carbon emission overtook that of America to rank number one worldwide in 2007, and hit 8.5 billion tons in 2012, representing 25% of the world's total emission and the grand total of America and Europe.[15]

China signed the Kyoto Protocol in May 1998 and approved in August 2002. Also, China has introduced the market mechanism to control greenhouse gas emission and taken an active part in the CDM, the only flexible contract mechanism related to developing countries in the protocol. Coordinated by government authorities, China has formulated the Administrative Measures Regarding Operation of Clean Development Mechanism Projects to promote and regulate CDM project activities. Until July 2017, the world has registered a total of 7,777 CDM projects, among which nearly 50% were from China.

At the end of October 2011, China decided to pilot carbon emission trading in Beijing, Tianjin, Shanghai, Chongqing, Hubei Province, Guangdong Province including Shenzhen. The pilot project covered an equivalent of 1,373 million tons of carbon dioxide from 3,271 responsible enterprises, and defined 2013-2015 as the trail stage. On November 4, 2016, the Paris Agreement formally took effect, and the Chinese government made a solemn commitment to hit a peak value of carbon emission around 2030, strives to hit the peak as soon as possible, and slash the carbon emission per GDP by 60%-65% compared that of 2005.

On December 19, 2017, the National Development and Reform Commission (NDRC) of China held a press conference with plans to implement the Construction Scheme for National

[15] Data source: https://www.belfercenter.org/sites/default/files/legacy/files/carbon-emissions-report-2015-final.pdf

Carbon Emission Trading Market (Power Industry) and build a carbon emission exchange market, signifying the formal start of the member economy carbon market. According to the China Carbon Forum, the power industry, one of the first industries joining the member economy carbon emission trading market, is expected to emit a total of 3.5 billion tons of carbon dioxide, representing 74% of the total emission of the industry, 39% of China's total carbon dioxide emission, which is more than twice than that of the European carbon market. After launch, the carbon trading is expected to gradually spread to various derivatives, including carbon futures and options, the market space is estimated to expand quickly, and China's carbon market is predicted to overtake the EU and become the world's largest carbon market. The preliminary estimate of the NDRC shows that by 2020, China's carbon market will possibly reach RMB 400 billion[16].

b) Entity[17]

The Industrial Bank Co., Ltd. (IB), established in August 1988 and headquartered in Fuzhou City, Fujian Province, is one of the first joint-stock commercial banks approved by the State Council and the People's Bank of China (PBC).

As the first bank observing the Equator Principles and a trailblazer and pioneer of green financing in China, IB is the first that has set up a professional team. Taking root in green financing for one decade, the bank has forged a green product and service portfolio covering a broad range of areas, including green financing, green leasing, green trust, green fund, green investment and green consumption. Until the end of 2015, the bank had cumulatively provided a green financing of more than RMB 1 trillion to more than 10,000 energy-saving and environmental protection enterprises/projects, and recorded a financing balance of nearly RMB 500 billion. The projects it has supported can save 26.47 million tons of standard coal, reduce carbon dioxide emission by 74.08 million tons and save 304 million tons of water every year. Now, IB is a flag and worthwhile leader in China's green financing sector.

The bank has also taken first-mover advantage in the carbon finance market represented by carbon emission trading. As early as in 2007, the bank tested the water for the carbon trading market, and developed a host of carbon finance products, including carbon agency, carbon trading guarantee and carbon asset-pledged credit related to the CDM for the international carbon trading market. It has successively completed the first international carbon asset-pledged credit business, the first carbon quota-pledged loan business and the first carbon quota repurchase business in China. At the same time, the bank has innovatively extended carbon finance services to personal customers and dedicated itself to building a leading carbon finance ecosystem in China.

c) Product and service information[18]

Taking its information and channel advantage, the bank has spared no effort to promote carbon trading, established extensive cooperation with carbon traders and carbon exchanges

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[16] Data source: http://energy.people.com.cn/n1/2016/1205/c71661-28926608.html
[17] Data source: https://www.cib.com.cn/cn/aboutCIB/investor/profile/index.html
[18] Data source: https://www.cib.com.cn/cn/minipage/financial/Financial_A1a.html

and delivered integrated services to customers participating in carbon trading at every link.

- **Carbon agency**

Carbon agency is an integrated financial service, meaning that the bank provides seller resources and buyer resources for both parties to the carbon trading under the CDM specified by the Kyoto Protocol, matches the carbon transaction, delivers due diligence and surveys for the credit standing of the buyer.

- Carbon asset assessment and development consultation

IB helps the customer (carbon seller) design the CDM project development plan, provides comprehensive CDM training for the customer, strengthens the customer's ability to perform CDM monitoring and implementation and helps the customer for declaration and examination to the NDRC and the United Nations. Also, it assesses carbon assets of the customer with the carbon asset assessment tool based on the output forecast and risk discount model it has developed in house, and designs carbon asset management and other service plans to help the customer maximize its interests.

- **Carbon asset-pledged credit**

The carbon asset-pledged credit is a credit business IB provided for the customer with the pledge of future carbon assets of the customer derived from the CDM project, and applies to Chinese projects registered with the CDM Board. According to the CDM rules, the carbon asset income mismatches the funding demand of the project owner, namely, the income usually lags behind by 2-3 years. To solve this problem, IB has developed in house a carbon asset assessment tool to mobilize future carbon asset of the enterprise and vigorously support project construction and operation. Also, the tool has helped the enterprise increase the operation and management efficiency of the CDM project and further assured the output of emission reduction.

- **Carbon delivery guarantee**

During the settlement of a CDM project, despite the delivery of CER is exposed to many uncertain factors, which will directly affect the intent of the carbon buyer to pay the advance and the CER price of the carbon seller. Therefore, the IB as a third party, accepts the request of the carbon seller (CDM project owner), issues a written guarantee to the carbon buyer to assure the carbon seller can fulfill the carbon emission purchasing agreement signed by both parties to the CDM transaction, and deliver the CER (certified emission reduction) equivalent to the advance paid by the carbon buyer. With the performance bond for CER delivery provided for the seller, the bank helps the seller obtain the advance in certain amount, thereby assuring smooth implementation of the project, strengthening the seller's bargaining power and helping the seller get a high CER price. At the same time, it can strengthen the trading confidence of the carbon buyer.

- **Settlement of voluntary emission reduction transaction**

The settlement of voluntary emission reduction transaction means the bank provides the fund custody and transaction settlement service for voluntary carbon emission transaction, and has

blazed the trail for a commercial bank to provide the financial settlement service for a voluntary emission reduction project.

- **Construction and research of domestic carbon trading platform**

The bank cooperates with exchanges and governments in the carbon trading pilot regions and aims to ensure stable and effective operation of the market. From the perspective of a financial institution, the bank has participated in the work to research and define relevant rules. On this basis, it has developed supporting carbon finance products and services with moderate foresight and rhythm, and helped the governments and exchanges to jointly build the carbon emission trading market.

iii. Achievement

In April 2011, the IB successfully launched the carbon asset-pledged credit business in Fuzhou. A private hydropower enterprise in Fujian successfully applied for the first financing support of RMB 1.08 million from the bank, and secured the loan with the expected carbon sales income from its small hydropower project.

The small hydropower CDM project was successfully registered under the United Nations (UN) in June 2010 and expected to reduce the emission by 43,000 tons. It has signed an emission reduction purchasing agreement (ERPA) with a Swedish carbon asset company and the trading price is USD 10.3/ton. The bank learned from the exchange with the customer that January to May is the low water period, and the power generation of the company declines, which reduces the income of the company. For one thing, the carbon emission reduction was not issued yet and the company didn't obtain the carbon sales income. For another, the company needed money to repair the hydropower station, thereby suffering a tight cash flow.

The launch of the carbon asset credit business in due course has effectively solved the aforesaid problem. To satisfy the true demand of the customer, the bank has designed a credit plan in an amount of RMB 1.08 million secured with the accounts receivable (carbon sales income) of the hydropower project for the project owner, and will continuously optimize the credit plan, depending on the actual issued emission reduction and operating status of the project. At the same time, the bank has helped the owner optimize the emission reduction agreement and control the risk with its advantages in professional capacity, law, finance and negotiation. During the legal review of the aforesaid ERPA, the bank also gave its professional opinions on the unsound contents of the articles. The buyer and the seller have revised the ERPA based on the opinion to assure effective performance of the ERPA and avoid a potential legal dispute.

iv. Revelation

The launch of the unified carbon market will create a growth space for carbon asset management companies. After the launch of the carbon market, the upstream and downstream of the industrial chain will pay more attention to carbon emission. Major stakeholders are the environmental protection industry and the energy industry, including upstream energy provider along the industrial chain, the midstream energy consumer and the downstream service provider, and carbon asset management companies offering the carbon asset service

(verification, development and other services) will first benefit.

Carbon asset management will be of great significance. For the state, carbon asset management will activate the carbon market, more reasonably allocate resources, and play a positive role in effectively promoting carbon emission reduction, refining the environmental policy and improving the carbon trading market. For the enterprise, carbon asset management can increase its utilization efficiency of carbon assets, promote energy saving and emission reduction, and obtain an economic interest from reasonable control and management of carbon assets.

2.2 Analysis of cases implemented by asset management institutions

Asset management has become the fastest-growing sector in the financial industry, and this sector mainly delivers asset planning, mutual fund, asset management plan, trust service, international financing planning, global private banking, integrated investment brokerage service and prime investment brokerage service to customers. The asset management officer may be an advisor or a special account management expert on behalf of the investor, and to deliver the service, the officer will usually perform strict financial analysis, asset and stock selection, and plan implementation as well as regular supervision and reporting of investment activities. Major sectors of the industry include private fund, investment trust company, pension, private customer asset and other institutional investors.

Table 6 Summary of Asset Management Products and Services

Product	**Important product solution and result/potential**	**Financial institution**	**Region**
Fiscal Green Funds	The bank buys shares of the Dutch green fund or the fund so that the customer will enjoy an income tax preference, thereby obtaining a lower interest rate of the investment. In reward, the bank will extend loans to environmental protection projects meeting five conditions at a lower cost.	Banks of the Netherlands	Europe
Fund	The ecological performance stock fund of Swiss Bank (Luxembourg) is the world's largest "green" fund. 80% of the assets will flow to ecological and social leaders, and 20% of the assets will flow to the "ecological innovator". The future energy stock fund of Swiss Bank (Luxembourg) mainly invests in the clean energy market related to four clean energy sectors.	Swiss Bank	Europe
Cat Bond Fund	The Leu Prima Cat Bond Fund is the first public catastrophe bond fund, and covers natural disasters (or climate adaptation) related to climate in part. It is an instrument that hedges the climate risk that is almost	Credit Suisse	Europe

	not insurable in the traditional insurance market.		
Private equity fund	The bank makes a private equity investment in wind energy, solar energy, biofuel and other sectors through the sustainable development plan for alternative investment.	Citigroup	US
	KKR has initiated the first forward-looking ESG project – the green investment portfolio project (GPP) – together with the environmental protection fund (EDF) to assess major business activities of the enterprise accepting the private equity investment from KKR.	KKR Group	US
	The target enterprise accepting the investment must receive the compliance due diligence and the training on risk response strategy. Senior operation advisors and board members train the target enterprise, instruct companies under the flag of the company to improve their transparency, build a better governance architecture and manage ESG risks.	Carlyle Group	US
Trust	The trust provides financing support for enterprises developing green and energy saving projects, and provides diversified financial instruments and financial services, including asset securitization, to satisfy the medium and long-term financing demand of green and energy saving projects for R&D and design. Also, the trust develops the green supply chain finance in an innovative manner, and guides social capital to flow and aggregate in the areas of low energy consumption, low emission, low pollution and high efficiency.	AVIC Trust	China

2.2.1 Green equity investment fund case—Green Living Equity Investment Fund

i. Case analysis

a) Background

Since the introduction of the concept of green building in the 1990s, the Chinese government has successively promulgated several guidelines, guidelines and regulations and vigorously promoted the development of building energy conservation and green buildings, which has become an objective requirement for implementing the member economy energy production and consumption revolution strategy. During the 12th "Five-Year Plan" period, China's

building energy conservation and green building business made a significant progress. The energy conservation standards steadily increased, the implementation ratio reached 100%, and the energy conservation building area increased 7 billion square meters cumulatively. There were 4,071 projects labeled green building logos in the economy, with a construction area of exceeding 470 million square meters.[19]

Although the total building energy consumption in China has continued to slow down since 2012, the development of building energy conservation and green buildings still faces many difficulties and problems. There still are problems needing to be resolved, such as low requirements of building energy conservation standards, about 60% of non-energy-saving buildings in existing urban buildings, too small amount of green buildings and still unsound mechanisms for market allocation of resources. In addition, the World Bank's investigation and research found 70% of potential is in building energy conservation for China to achieve the goal of energy conservation and emission reduction by 2030. Therefore, continuing to promote the development of building energy conservation and green building industry has important practical and far-reaching strategic significance for building an energy-saving and low-carbon, green and ecological, intensive and efficient building energy system through promoting the supply-side structural reform in the construction of housing in urban and rural areas and achieving green development.

b) Entity[20]

Green Living Equity Investment Fund is China's first equity investment fund for the green building industry ecosystem. The fund applies the “industrial chain finance” mode to the green real estate industry, takes green building industry standards as the core and foundation and the value chain as the link, identifies the “green science and technology settlements” area in the real estate segment market, pioneers the “PE + incubation” mode, focuses on green real estate demonstration projects and industrial chain innovation projects, truly realizes the combination of industry and finance and incubation of light assets based on the Internet + green real estate’s upstream and downstream industrial chains and financial institutions, forms a benign industrial ecosystem that supports the recycled and optimized development of project development and industry promotion and leads important changes in the green science and technology real estate field.

The Fund has successfully covered listed companies in real estate and its upstream and downstream industries, Modern Land [HK.01107], Glodon [SZ.002410] and Honggao Creative [SZ.002504], managing assets of RMB 6 billion. It focuses on investment in green real estate and PE/VC investment in the upstream and downstream industries of the industrial chain, exploits opportunity-based and relational investment opportunities based on strategic mutual trust and business fit of market partners, realizes asset management of the green building industry, and achieves making investments with controllable risks and high returns.

[19] Data source: http://www.mohurd.gov.cn/wjfb/201703/W020170314100832.pdf
[20] Data source: http://www.lvmintou.com/

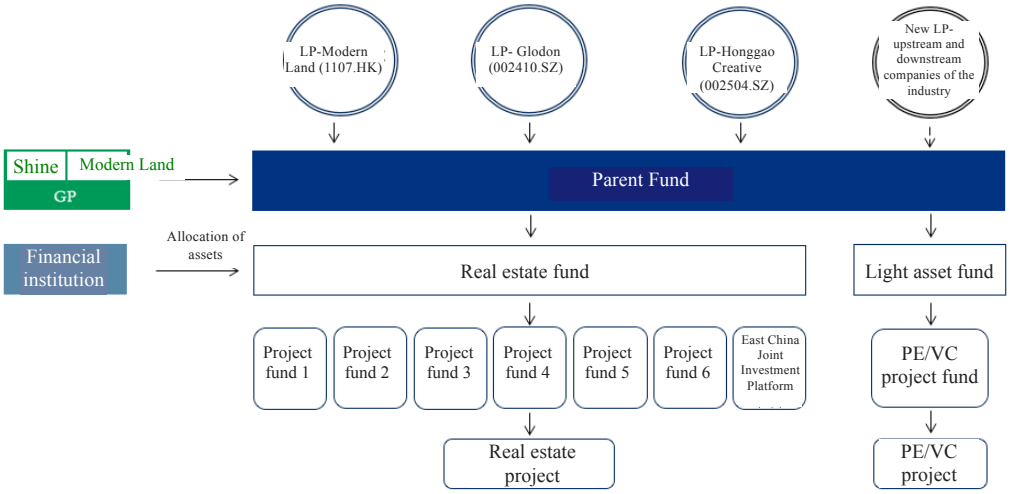

Figure 8 Structure of Green Living Equity Investment Fund (from: GLF)

c) Product and service information

Green Living Equity Investment Fund is positioned in the alternative investment and asset management business of the green real estate industry in the future development direction of the green building industry. The fund attracts upstream and downstream industries of green buildings to participate in fund investment by constructing a green building industry alliance platform, enlarges the financial power of capital invested by real estate developers and upstream and downstream companies through three levers, solve capital problems, and assists real estate companies to transform from heavy assets to light assets. At the same time, the fund provides industrial partners with sources of high-quality projects and allows them to more likely participate in green building projects, gain main business revenue and explore more business opportunities in addition to letting them enjoy investment income brought by the fund.

In addition, the fund-pioneered "PE + incubation" mode, in addition to investing in outstanding green real estate projects, invests and incubates green real estate innovation and entrepreneurship projects with huge market potential. The innovation and entrepreneurship projects can not only incubate and obtain traffic from other real estate projects invested by the fund, but also increase the construction efficiency and reduce costs of real estate projects, thereby realizing an excellent industry ecology of mutual promotion and common development of real estate projects and innovative projects.

Table 7 Basic Information of Green Living Equity Investment Fund

Fund name	Green Living Equity Investment Fund I
Management scale	RMB 6 billion
Fund nature	Equity investment fund
Fund period	3+2 years
Fund GP	Jiaxing Green Living Equity Investment Fund Management Co., Ltd.

Fund LP	Modern Land [HK.01107], Glodon [SZ.002410] and Honggao Creative [SZ.002504],
Income distribution	Distribute according to capital contributions to the fund.
Fund management fee	GP collects annual fund management fees of 1.5% of paid-in capital.
Investment orientation	Green real estate projects and PE/VC projects of the green industry
Withdrawal method	Withdraw in a way of settlement of received payments of projects, transfer of fund shares and listing of GP parent fund

• Green building and real estate investment

After more than two decades of development and accumulation, China's real estate development has already bidden farewell to extensive growth. The policy requirement that "houses are used to live, not used for speculation" also makes housing companies have to pay attention to the real needs of consumers if wanting to get a place in today's market competition. When people's good life seeks to return to the living function itself, the concept of health, green, and sustainability has gradually become the orientation of customer needs.

After more than two years of successful operation and practice, the fund has formed a real estate equity investment fund with unique value and focuses on opportunistic and business-promoted investment opportunities. It has completed investment in 4 projects in Suzhou, 2 projects in Hefei, 2 projects in Hubei, 1 project in Hebei, 1 project in Zhejiang's Jiaxing, 1 project in Xi'an, and two light asset projects 51 VR and 1st Habitat and formed high-quality property-based asset packages, achieving risk control and high profitability.

Green Living Equity Investment Fund applies the "industrial chain finance" mode to the green real estate industry, solves restrictions such as higher cost and financial leverage of green construction companies and traditional financing difficulties with green building industry standards as the core and foundation, and assists real estate companies to transform from heavy assets to light assets. At the same time, with the help of industry sponsors' leading experience and technology in the green building industry and combining with project partners' leading-edge scientific and technological results on operation in science and technology, health and smart industries, the fund provides clean energy and builds a health system of the entire life cycle for residential and commercial buildings, etc.

• PE/VC investment in green buildings

The Fund focuses on the "green science and technology settlements" area in the real estate market, pioneers the "PE + incubation" mode, invests and incubates green real estate-related innovation and entrepreneurship projects with huge market potential, forms a benign industrial ecosystem that supports the recycled and optimized development of project development and industry promotion and leads important changes in the green science and technology real estate field. On the one hand, fund investors can participate in a wide range of projects, and innovation and entrepreneurship projects invested by the fund can be incubated and obtain traffic in other real estate projects invested by the fund. On the other hand,

high-quality industrial innovation technologies play a positive role in improving the construction efficiency, reducing construction costs and optimizing management of real estate projects, etc. so as to achieve excellent industry ecology for real estate projects and innovative projects to serve as platforms and traffic for each other, mutually promote and jointly develop. Since its inception, Green Living Equity Investment Fund has brought together top experts from the nation's real estate, financial and green building industries to participate in investment decision-making, judged project feasibility from all angles, established a perfect "investment, fundraising, management and withdrawal" system in investment practice and gradually refined and improved the compliance and risk control system.

Table 8 Risk Control Method of Green Living Equity Investment Fund

Decision-making power of major issues	The fund, as a shareholder of the project company, has decision-making power for major issues such as investment and financing of the project company.
Right to know and supervise projects	The fund selects a professional project supervision team to regularly supervise projects, regularly review capital budget and engineering progress of projects, etc.
Strict control of development costs	The operator agrees the project development cost must not exceed 5% of the corresponding construction cost limit agreed with the fund, and the excess part should be borne by the operator.
Regular information disclosure	• Update quarterly report of the fund within 15 working days every quarter and publicize it to all fund investors • Issue annual reports of the fund within 3 months after each year and publicize it to all fund investors
Asset valuation	The fund commissions a third-party assessment agency to access the existing target assets. The fund in principle commissions the third-party assessment agency to access assets, form an asset assessment report and publicize it to all fund investors on an annual basis.
Post-investment evaluation and analysis	• Before and after comparison and analysis method: array and compare predictive value of evaluation before investment with that at a certain time after project investment, intuitively reflecting superiority and inferiority between project expectation and actual situation and providing data support for post-investment evaluation. • Logical framework method: A method for comprehensive analysis of evaluation conclusions after project investment is used to analyze and evaluate the relationship between target levels of projects.
Regulatory system	• Financial audit system (cash operation standard, expense operation standard, accounting operation standard, tax management operation standard, and information disclosure operation standard)

	• Risk management system • Fund-raising and investment management and withdrawal system (operation standard for investors to join, project equity investment operation standard, investment exit operation standard, and entrusted asset management operation standard) • Seal management system

ii. Achievement

Green Living Equity Investment Fund has invested in 11 green real estate projects nationwide, with an average annual internal rate of return (IRR) of exceeding 35%. The fund focuses on providing institutional investors with opportunities for project equity cooperation, building an investment platform for the green real estate financial investment industrial chain, and deepening the division of upstream and downstream labors in the real estate financial field. Up to now, the fund has completed equity cooperation with several financial institutions, including Cinda Investment, and bursts out strength to mixed investment of real estate equity and creditor's rights through the formation of a joint management investment platform, which is used to play the fund's advantages in industry and project investment as well in docking with financial institutions in capital, thus promoting real estate and finance to complement with each other and deepen cooperation.

Most of real estate projects invested by the Fund use energy-saving measures such as external shading systems and LED lights to achieve energy saving and emission reduction effects. At the same time, they make comprehensive and coordinated use of permeable ground, multi-layer greening, rainwater collection systems, etc., optimize site runoff and reduce the heat island effect to create a comfortable environment with constant temperature, constant humidity and constant oxygen.

In PE/VC investment in green buildings, the fund completed a total investment of USD 3.5 million to 51VR. 51VR was established in 2014, its team members are from the domestic leading VR/game science and technology, real estate, Internet, and financial companies, and its current estimated value is USD 140 million and floating profits are nearly 2 times higher.

Since the phase 1 of the project was launched in January 2015, 51VR has marched into more than 40 first- and second-tier cities such as Beijing, Shanghai, Guangzhou and Shenzhen and four major cities in North America, established four VR research and development centers in Beijing, Silicon Valley, Shanghai, and Chengdu for more than 100,000 users. Currently, 51VR has greatly improved/reduced the operating efficiency/transaction cost of the entire industry chain from VR viewing of houses to crowd funding for buying houses with the VR+ finance method has become the instigator of real estate transformation in the new era and a pioneer of industrial chain innovation.

iii. Revelation

Specialized teams and investment services will help overcoming the market and customers' financing barriers and can produce higher leverage effects. At the same time, it is very

important to carry out targeted technical support, market development, clarify financing conditions and develop coordinated financial products at the beginning of fund establishment.

In terms of fund structure, a parent fund can be chosen to be established according to fund sources and specific strategic positioning. This will have certain flexibility and operation convenience in terms of impacting driving power, participation of various types of capital, and fund management.

In the design of green fund products, it is necessary to fully consider the circumstances and needs of different borrowers, including equity financing, preferred shares, mezzanine investment, entrusted loans, risk guarantees, technical support, green bonds, asset securitization and other financial products.

2.2.2 Green equity investment fund case—US-China Green Fund

i. Case analysis

a) Background

Climate change, clean energy and environmental protection are of the biggest challenges faced by the entire world. China and US as the largest economies, the largest energy consumers and the largest greenhouse gas emitters in the world, have delivered a major impact on public health of both countries and global environment.

Understanding that the most effective way to solve these issues is cooperation, both countries signed US -China Framework for the Ten-Year Cooperation on Energy and Environment ("Ten-year Cooperation") during the fourth US -China strategic economic dialog (SED) in 2008, which symbolizes the official launch of the important bilateral cooperation mechanism derived from the SED to jointly meet challenges from sustainable environmental development, climate change and energy security.

In September 2009, 24 American enterprises proposed and established a non-profit government-enterprise partnership platform - US -China Energy Cooperation Program (ECP), which is intended to promote bilateral cooperation in energy and environmental areas, serve as a bridge connecting governments and enterprises, assist commercial cooperation between both parties and promote sustainable development. During a visit to China in November 2009, US President Obama acknowledged the establishment and mission of the ECP. Afterwards, China and America signed the memorandum of understanding on US -China Energy Cooperation Program (ECP) between the State Energy Administration and the Ministry of Commerce of China and US Department of Energy, US Department of Commerce and the United States Trade and Development Agency. This signifies the formal launch of the ECP has obtained the official support from the supreme governments of China and America.

b) Case entity[21]

On the basis of bilateral cooperation in the green area, the political and business circles of China and America jointly advocated the launch of a pure market-oriented green guiding fund— US-China Green Fund.

[21] Data source: http://www.uschinagreenfund.com/

Through cross-border innovation and cooperation, the fund aims to realize an organic combination of America's products and technologies with China's market size and quick commercialization capacity, and promote a green and sustainable development of China. The fund integrates top-ranking innovative green technologies and solutions of China and America and applies them to consumption, service, real estate, energy, medical and other sectors to reduce resource consumption and environmental protection, promote a green development of different industries, and become a benchmark for US-China green equity investment and a commercial actor of bilateral green cooperation.

The fund takes pride in an investment management team with international investment experience, keen eyesight into the local market and industrial expertise, and observes the investment and operation mode of international top-ranking private equity funds. It sets up an investment committee and adopts operation by the professional market-oriented management team. Based on these points, US-China Green Fund has forged a powerful capacity to seek high-quality projects, capacity for investment judgment and capacity for value-added service after investment. Combining investment, consulting and management, the fund participates in strategic investment of the funded enterprise in depth, helps it introduce international advanced management practice, and strengthen the internal management system. Also, the fund actively helps the management team to conduct industrial integration through listing, private offering, merger, acquisition and other means to quickly improve the value of the company.

At the same time, the fund owns extensive strategic resources of America. It has gradually established a liaison mechanism with US Department of Energy, US Environmental Protection Agency, US Department of Commerce and other government agencies, reserved a number of China-America cooperation projects and jointly promote strategic cooperation in green area. Meanwhile, the fund conducts industry research together with influential think tanks of America and share research results with them. By means of the technical institute under the flag, the fund integrates the most excellent green technologies and products of China and America, provides integrated green solutions for invested enterprises and projects to lift the green development level of different industries, promote cross-border cooperation between the business circles of China and America, and forge a US-China green investment and ecological alliance.

c) Product and service information

Adhering to the long-term value investment concept for a long term, the US-China Green Fund has deeply involved itself in smart city, green building, clean energy, medical service and industrial park. Meanwhile, it has made equity investments to forge green benchmarks in these segments and promote a green and sustainable development of China's new economy.

- **Green smart city**

Our city is getting smarter and smarter, inspired by the access of Internet-of-things sensors and development of the mobile Internet technology. The construction of a smart city will create vast economic benefits for the society. Also, it can evidently reduce the greenhouse gas emission and improve the ecological benefit.

The fund provides advanced green technologies and energy saving services to accelerate the construction of green smart cities and green beautiful villages. It mainly watches the opportunity to invest in green, smart, and healthy home, green smart parking, green upgrade of consumption, beautiful village and other areas during the construction of smart cities. The fund employs innovative business models and technical advances (electric vehicle – charging terminal) to reduce the pollutant emission from mobility and lead green mobility. It provides technical services to strengthen green development of the logistic supply chain and improve the service quality in e-commerce and O2O areas. At the same time, it focuses on production and service of green sustainable consumer goods covering clothing, food, residence and transportation.

- **Green building**

In the context of urbanization, the member economy's residential and commercial estate market has gradually stepped into the oversupply time, particularly in first-tier cities. Existing real estate can realize secondary positioning and value discovery through business transformation, change of business format and renovation. New enterprises, such as professional operation and service platforms in apartment, office and commercial sectors, will emerge with new technologies and new models in the transaction, operation, service and other core value chain links of real estate.

The US-China Green Fund seeks commercial estate target assets consistent with the "urban upgrade and green development" theme, reshapes the value chain of asset management through asset acquisition, secondary positioning, design, reconstruction, tendering, operation and disposal. Also, it applies the latest technologies, including energy saving, environmental protection and assembled building, to build green building benchmarks. The application of the Internet technology and new management modes can realize transaction, operation and service along the entire real estate chain, and compared to traditional modes, the new mode can greatly increase the human efficiency and resource efficiency and realize green development.

- **Clean energy**

In the clean energy area, the US-China Green Fund seeks to reduce the heavy-pollution energies represented by coal, increase the weight of natural gas, solar energy, wind energy and other clean energies in China's energy structure, and explore segments in value. Meanwhile, it hunts for relevant opportunity to invest in emerging saving and emission reduction equipment and services in the industrial energy saving, emission reduction and grid upgrade areas, and seeks relevant opportunity to invest in environmental treatment technologies and services related to atmospheric treatment, sewage treatment and soil repair.

- **Medicare & health**

The quickly ageing population, high private expenditure and emerging commercial insurance drive the growth of key therapeutic areas and the consumer demand for medical services (gynaecology and obstetrics, paediatrics and medical beauty). US-China Green Fund mainly watches private medical service and consumer health goods, and forges a differential brand and channel capacity through the combination and application of green technologies. Also, the

fund provides a green medical system with higher-quality service positioning and duplicability, and pays attention to building integration platforms and industrial integration in the greater therapeutic area. Taking such measures as energy saving reconstruction and modern technical treatment of pollutants, the fund builds contemporary green hospitals characterized in energy saving and environmental protection, and balances green and environmental protection with return on investment. The fund also provides energy saving and environmental protection technologies and services to promote a high-quality, sustainable and green development of the supply chain for production and logistics of medical products, and create good economic and social benefits.

- **Industrial park**

US-China Green Fund mainly eyes merger and acquisition opportunities emerging during de-capacity, integrates green technologies and provides advanced assembly technologies for energy saving, environmental protection, energy conversion, solid waste treatment and other areas to help traditional enterprises realize clean production and green upgrade, resolve excessive capacity, increase industrial concentration, and realize structural adjustment, transformation, upgrade and sustainable development of traditional industries, thereby effectively utilizing existing assets and resources in the industry and optimizing the efficient allocation. Besides, the fund also can integrate its own resources to help land resources discharged during industrial restructuring to realize the green and energy-saving building objective. At the same time, it can make a synergy effect with green building projects (such as assembled building) financed by the fund.

ii. Achievement

Ever since the initial investment in January 2017, US-China Green Fund has successively made a number of green investments in green smart city, green building, clean energy, medical service and industrial park, and unified economic benefit, environmental benefit and social benefit.

Table 9 Some Investment Projects of US-China Green Fund

Green smart city	Aipark.com	Aipark.com deploys the four-generation smart parking technology to manage the urban parking system (including roadside and parking lot) to mitigate traffic congestion and reduce greenhouse gas emission. It has successfully landed in Shijiazhuang City, the capital of Hebei Province. Now, it is taking a pilot in Beijing and Shanghai, and building a parking system in Zhangjiakou City.
	Huitongda	Huitongda combines modern online and offline commercial modes and helps rural store owners start business. It delivers upgraded services to villages under 15,000 towns, and offers sales and after-sales service for distributed solar energy product, agricultural electric pickup truck and upgraded agricultural products to make greener and more sustainable products and services benefit rural

		areas and improve the life standard of local communities.
Green building	East Low Carbon	East Low Carbon is the most successful and experienced service provider in energy saving of buildings in China. its business scope covers high-end five-star hotels, three-level hospitals, government buildings, urban complexes, industrial clean workshops and other real estate sectors. The company takes the lead in the energy saving of high-end hotel sector. East Low Carbon cooperates with all international five-star hotel management groups doing business in China in more than 20 cities. These projects have widely applied advanced technologies, facilities and equipment form America and realized an energy saving ratio above 20%.
	Hosjoy.com	Hosjoy.com, a professional service provider for comfortable smart home, bears the mission to satisfy the consumption upgrade demand of families. It focuses on promoting continuous environment of a comfortable environment at home, and dedicates itself to bringing green to the family life. Its five major products include refrigerating/heating system, fresh air system, water purification system, smart system and new energy system, which cover products related to comfortable temperature, fresh air, healthy purified water and smart equipment at home. It provides users with integrated solutions for a comfortable environment through systematic solution, product portfolio, construction management and other one-stop services.
	New Start	New Start is a fast-growing service provider related to apartment/dormitory leasing, and provides rooms for blue-collar workers in the urban service industry. After receiving the investment from US-China Green Fund, the company has introduced greener products and services, including renewable energy supply, building energy saving management, intelligent system (such as energy-saving water meter) and more comfortable, healthier life standard.
Clean energy	Capital Heat	Capital Heat, cosponsored by US-China Green Fund together with Beijing Capital and Hony Capital, is committed to growing into an excellent heat platform nationwide. With steam or hot water as water supply media, the company supplies heat to residents and enterprises in specific area through the heat supply pipeline. Now, the company has a heat supply area of 8.50 million square meters, and this figure is expected to hit 100 million square meters.
Medicare	UIB	UIB is a professional institution that focuses on high-end hospital

& health		investment and management, and mainly delivers international high-end medial and care services to women, pregnant women and children. It has created the unique CMSE quality control system for mother and baby care, and opened the green channel with many third-class hospitals in Shanghai. It has hired a third-party professional institution to perform regular testing on indoor area, rehabilitation facilities and supplies, which has laid a good foundation for establishing industrial standards.
Industrial park	Siyuanhe Iron & Steel Industry Structure Adjustment Fund	Sized at RMB40-80 billion, the fund is jointly sponsored by US -China Green Fund, Baowu Group, China Merchants Group and WL. It has participated in the restructuring of Chongqing Iron & Steel Co., Ltd. The fund will focus on green capacity upgrade during the restructuring.

iii. Revelation

At present, green investment and financing remain at the traditional mode dependent on the government subsidy, which has poor commercial sustainability and thus gets stuck in a vicious circle of weak enthusiasm of private capital. Introducing the bottom-up commercial development pattern, US-China Green Fund has set an example for the traditional incentive mode dependent on the subsidy mechanism.

As to commercialization, the fund stresses the investment strategy of risk reduction and prudential return. First, when selecting a segment, it focuses on segments with a long-term derive and a big enough market size; Second, mature and proved commercial patterns is a must to ensure explicit profitability; Third, the most excellent team in the industry will be considered as the partner.

When marching towards the emerging green energy industry, energy saving and environmental protection industry, a financial institution can cooperate with leading enterprises, listed enterprises, state-owned enterprises and other large customers to fuse its brand and resource advantages in the capital market with professional advantages of these industry leaders in respective industry. By doing this, it can offset its disadvantage in short entrance to relevant industry and inadequate experience, increase the efficiency to fuse finance and industry, benefit both parties and earn an income while propelling the economy to evolve towards green and low-carbon development.

2.2.3 Green trust case—AVIC Trust

i. Market summary of green trust

ii. Case analysis

a) Background

Despite annual growth, China’s green trust industry still embodies a vast growth space. At the

end of 2016, trust companies recorded 284 existing green trust projects totaling RMB 102.19 billion, representing a stable year-on-year growth over 248 and RMB 46.8 billion in 2013, according to the CSR Report of China Trust Industry. However, the green trust took only 0.5%o of the overall size of the trust industry, up to RMB20 trillion, and embodies an enormous development space. [22]

For the green industry, the trust system features unique resource integration and flexibility of transaction arrangement. Trust companies can employ diverse financial instruments like loan, equity investment, bond and asset securitization, and provide trust products and services for green industry and green philanthropy through public-private partnership trust fund, tradable green equity financing and philanthropic trust.

At the same time, green trust still faces many challenges and difficulties on the way to develop. Energy saving, environmental protection, new energy, environmental treatment and other green industrial sectors are relatively strange to trust companies, which still need to improve their understanding of these industries. Meanwhile, there are no top-level design and policy framework for the development of green trust. The Guiding Opinions on Establishing Green Financing System published by seven ministries/commissions doesn't specially discuss green trust. Thus, green trust, as a new thing, lacks explicit legal provisions, encouraging measures and supervisory standards.

b) Entity

AVIC Trust is the first that has systematically announced the green trust concept among 68 peers in China. It has first applied green concept and green action to trust business and corporate governance and become a vanguard in the transformation towards green trust. AVIC Trust provides diversified financial instruments and financial services, including asset securitization, to satisfy the medium and long-term financing demand of green and energy saving project for research, development and design. It has successively established long-term strategic partnership with several powerful energy-saving and environmental protection enterprises at home and abroad, and guided private capital to flow and assemble in the areas of low energy consumption, low emission, low pollution and high efficiency.

With continuous green investment and financing activities, AVIC Trust provides professional financial services for green industries. Also, it seeks to cooperate with industry leader of energy saving and environmental protection sectors, and forge a "green industry + financial ecosystem". So far, AVIC Trust has reached a consensus with more than 20 excellent enterprises with advanced technologies in the green industry, including China Energy Conservation and Environmental Protection Group and General Electric. It has successively launched six green funds including US-China Green Fund, and carried out green trust practices with rich forms and evident effects. Until October 2017, the trust assets under management of AVIC Trust have flowed to the green sectors, including natural gas, photovoltaic power generation, other new energies, lithium-ion battery, coal to power and other clean energy sectors, and the assets totaled RMB 10 billion.

c) Product and service information

[22] Data source: http://www.xtxh.net/xtxh/responsibilityrecord/index.htm

AVIC Trust has cooperated with Anhui Shengyun Machinery Co., Ltd. (Shengyun), adopted the industrial fund mode to invest in the upstream and downstream of solid waste incineration, and jointly launched a collective trust plan for the co-branded solid waste industry fund. With the fund operation and equity investment mode for the green industry, AVIC Trust has actively integrated resources in the green industry, delivered professional financial services to Shengyun and further exerted its advantage from long-term implementation of the green trust strategy.

Shengyun is an integrated listed company that specializes in production and manufacturing of incinerator equipment, overall installation and construction of garbage incineration power station, and subsequent operation of the power station. It incurs an overall big investment to obtain relevant qualification and realize power generation and grid connection of the power station during the project, and the project usually involves an investment payback period of 8 years. This has extended the confirmable income cycle of the company in actual operation. Meanwhile, Shengyun holds confirmed orders and signed BOT agreements on garbage incineration power station projects under construction. Based on the aforesaid factors, the trust plan was launched in 2017 and intended to raise no more than RMB 2 billion. The trust plan will invest in the industrial fund sponsored by a professional fund management company, accept the transfer of high-quality target asset after selection. The first phase of the fund will involve a total amount of RMB 308 million which be mainly used to pay for the transfer of equities in the power stations.

The trust plan mainly participates in industrial funds established by professional investment management institutions, takes over equities of high-quality target companies exclusively owned or controlled by Shengyun. It has set corresponding caps and floors for operating indicators and performance indicators of the power stations based on actual conditions and historical data during the operation to ensure risk control during post-investment management. Both parties cooperate mainly to take equities of project vehicles through the industrial fund and bolster the cash flow of the listed company. At the same time, both parties will optimize financial statements of the listed company and closely combine industry and finance. This reflects AVIC Trust seeks sustainable develop as the ultimate objective in actual business operation and designs professional and flexible transaction structures for customers.

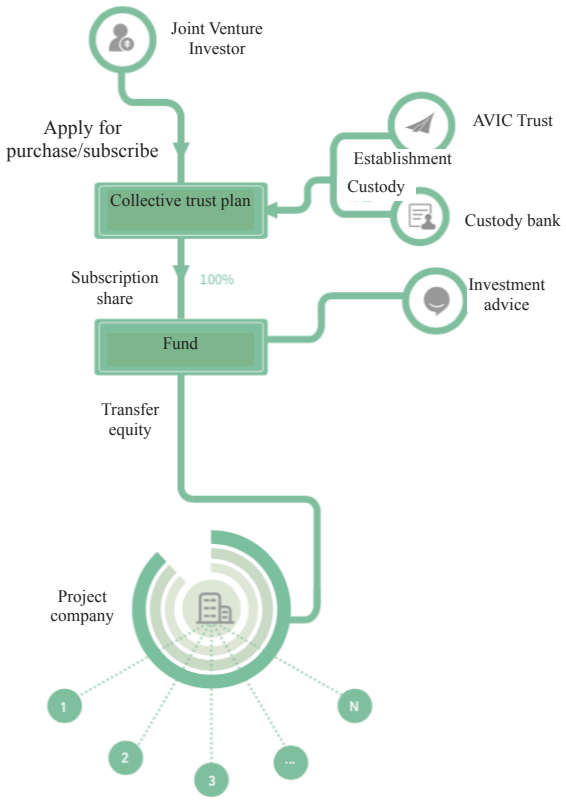

Figure 9 Transaction Structure of AVIC Trust-Shengyun Trust Plan (from: AVIC Trust)

Through the industrial fund, the trust plan takes over equities in the high-quality target companies, injects these assets into the listed company after the power stations generate a stable cash flow to optimize the financial statements and corporate governance of the listed company while providing a financing support for the projects.

AVIC Trust has cooperated with enterprises, funds and third-party research institutes in green industries to invest in physical projects and attempted to measure the social benefits of these projects with carbon emission reduction and other quantitative indicators while assuring the project is economically feasible. Besides, AVIC Trust has attempted to establish an information sharing-based asset management ecosystem so that customers won through contingent channels will trust AVIC Trust, rely on AVIC Trust and belong its long-term partners.

ii. Achievement

- **Deeper understanding of green industry and more professional utilization of financial instruments**

Benefiting from the long-term continuous learning, AVIC Trust has broken down the operating indicators for garbage incineration power stations, and reasonably set caps and floors based on historical performance indicators market environment and profit forecast to

assure the investment quality of target projects. The experience gained from long-term operation in green industries constitutes the precondition and foundation for the application of more professional financial instruments and integrated services.

- **It has exerted the brand effect of green trust and effectively utilized resources in the green industry**

During the development of green trust, AVIC Trust has worked together with China Energy Conservation and Environmental Protection Group, China Tian Ying Incorporation, General Electric (GE) and other industry leaders to carry forward a cluster of green investment and financing projects with the demonstrative effect, and built a good green brand in the green industry. Based on the long-term strategic cooperation, AVIC Trust has actively borrowed the experience and resources of China Energy Conservation and Environmental Protection Group, established friendly cooperation with Shengyun, and discussed the fusion between financial capital and environmental protection technologies in green industries. With professional capacity and good brand, AVIC Trust has promoted further development of environmental protection enterprises, increased their fund utilization efficiency, thereby realizing the appreciation of both funds and capital and making a synergy effect between industry and finance.

During the cooperation, AVIC Trust has actively introduced banks and other financial institutions to connect the fund side and the asset side, delivered green financing products that create values to social investors, forged a value chain of wealth management covering private equity, investment banking, asset management and wealth management, and reinforced competitive strengths.

iii. Revelation

After years of attempt, the participation of trust companies in green and environmental protection industries is advancing in depth. These companies not only provide medium and short-term financing support, but also conduct active management and deliver integrated financial services through investment-loan linkage, fund and other financial instruments.

- **Strategic cooperation with green industry leaders**

In January 2017, AVIC Trust signed a cooperation agreement with CECEP Capital Holdings. Both parties will jointly initiate CECEP Huayu (Zhenjiang) Green Industry M&A Investment Fund (Limited Partnership). They will exert respective advantages, enter into extensive and deep cooperation in green financing and other related areas, and collaborate to carry forward result transformation and industrial integration in the energy saving and environmental protection sector. Also, they will jointly carry forward financial cooperation based on the industrial chain, forge an energy saving and environmental protection capital alliance at the central enterprise grade integrating industrial M&A, restructuring, equity investment, supply chain finance, equipment leasing and other functions, and propel the development of China's energy saving and environmental protection industry cluster. China Energy Saving and Environmental Protection Group is the most powerful and largest industry group focusing on technological services in the energy saving and environmental protection sector. The strategic cooperation with China Energy Saving and Environmental Protection Group aims to forge a

central enterprise-grade green ecology alliance, rely on respective advantages in green financing and green industry and make full use of the size and resource advantages of both central enterprises to inject a fresh drive into the development of the energy saving and environmental protection industry, and provide a new impetus for the construction of the value chain of green ecosystem.

In November 2017, AVIC Trust signed a comprehensive cooperation framework agreement with Shenwu Environmental Protection Co., Ltd. Both parties will give play to respective advantages, enter into extensive and deep cooperation in energy saving, environmental protection, green financing and other related areas, work together to promote result transformation, industrial integration and financial cooperation based on the industrial chain, forge an industry-capital alliance in the environmental protection sector, and drive the development of China's energy saving and environmental protection cluster. Shenwu has developed multiple revolutionary energy saving, low carbon and environmental protection technologies up to the international leading level. In particular, it has realized industrialization of the projects adopting the anoxybiotic pyrolysis of solid wastes like urban domestic garbage and biomass straws in Hubei, Jiangxi and other regions. Also, Shenwu has attacked the carbon emission market for a long time. As the shareholder of the Hubei Carbon Exchange, it has established a carbon asset management company with the central enterprise Sinosteel Engineering & Technology Co., Ltd. The cooperation between Shenwu and AVIC Trust will further help Shenwu promote industrialization of its energy saving and environmental protection technologies nationwide, particularly in Jiangxi, with the force of capital. It will be a good start for the long-term mutual cooperation between both parties and carry a heavy weight to propel the development of China's energy saving and environmental protection industry.

- **Public-private partnership industrial fund trust**

In 2015, AVIC Trust launched the "Green Jiangxi Revitalization PPP Industrial Investment Fund" together with banks, government vehicles and other institutions, in a move to support municipal infrastructure construction, expressway building, government PPP projects, shanty town renovation projects, tourism and cultural projects and other projects in Jiangxi Province. Also, it has jointly sponsored "Green Jiangxi Revitalization PPP Industrial Investment Fund" with other financial institutions. Now, it has completed company registration for the fund and announced formal establishment of the fund with a total size of RMB 10 billion. So far, the fund has invested more than RMB 6 billion in infrastructure construction, affordable housing project and other emerging urbanization projects in cities with districts in Jiangxi Province.

In September 2017, AVIC Trust attended the Green Financial Development Conference in Jiangxi's Ganjiang New Area and signed a cooperation agreement with Ganjiang New Area Administrative Committee. The agreement stipulates both parties will cooperate in depth in the green industry guidance fund level, plan to set up a green industry guidance fund to invest in high-end smart manufacturing, new materials, bio-pharmaceuticals, new energy, modern textile, electronic information and other green industries, and expand in-depth cooperation in other industry investment areas on basis of this.

- **Charitable Trust**

In September 2017, AVIC Trust and China Environmental Protection Foundation (CEPF) initiated China's first charitable trust based on the theme of green ecology, "AVIC Trust • Green Ecological Charity Trust". The charitable trust focuses on supporting the development of green ecological undertakings and the carry-out of related activities, covering a wide range of activities such as green ecological protection, education, training, and exchange. Its initial scale is of RMB 500,000 and aims to drive more charitable funds and project resources to participate with this as a starting point. This charitable trust has profound implications for the introduction of social resources into the green ecological field. CEPF, as a charity organization of business management under the Ministry of Environmental Protection, has strong social credibility and professional competence, promotes the implementation of ecological protection in the form of trusts, is able to ensure the effective implementation and healthy development of projects, forms a demonstration effect nationwide and fulfils the social responsibility of innovative integration of green ecological protection and philanthropy. AVIC Trust has "innovative" genes, seeks innovation in green trusts and charitable trusts, gives full play to the dual advantages of specialized financial services and specialized management of charity projects, truly realizes the purpose of charitable trusts of green ecological protection and development, practices member economy’s strategy of green development and builds a green sustainable development ecosystem based on a multi-party consensus.

2.3 Analysis of green financial implementation cases with insurance companies as the main body

2.3.1 Green insurance case—Chubb’s green insurance business

i. Overview of green insurance market

The insurance sector is usually divided into two main categories: life insurance and general (non-life) insurance. "Green" insurance belongs to the latter and usually contains two product areas: a) Differentiating insurance premiums based on environmental-related characteristics; and b) Insurance products tailored specifically to clean technologies and emission reduction activities. Its essence is to use insurance as a tool for sustainable development to deal with some issues related to the environment, including climate change and environmental pollution.

Table 10 List of Green Insurance Business Products and Services

Product	Important product plans and results/potentials	Financial institutions	Region
Auto insurance	Hybrid and fuel-efficient cars enjoy a 10% discount. Banks also can choose to reduce the annual emissions of vehicles (for example, through climate care companies, the cooperative Financial Services Group shall reduce emissions by 20%.)	Financial Services Group, Aviva Plc	Europe and North America

	Recovery insurance When a car is damaged and maintenance is required, the customer shall enjoy a 20% discount in car insurance for recycled parts.	Credit Suisse AG	Europe
Building / housing insurance	Green building replacement and renovation insurance The product covers a particular type of "green" risk associated with the sustainable construction industry.	California Firemans Fund Insurance Company	US
	"Climate-neutral" house insurance policy The first type of housing insurance product reduces greenhouse gas emissions according to customers' use.	Environmental Transport Association of the UK	Europe
Commercial insurance	Environmental damage insurance	Rabobank from the Netherlands	Europe
Carbon insurance	Emissions trading or capital futures	Swiss Reinsurance	Europe
	Credit guarantee for carbon emission	AIG, MMC	Europe

After more than 25 years of mature development, the global green insurance industry is entering an era of change. As many new entrants enter the market each year, companies that underwrite the green insurance business are transforming and innovating to maintain growth and market competitiveness. Wells Fargo estimates premium income in the green insurance market exceeds USD 2 billion and maintains a double-digit growth in 2017, exceeding the annual growth rate of the general property insurance market.

Environmental pollution liability insurance, as an important type of insurance in the green insurance system, is an insurance based on the liability for compensation that should be borne by a company according to law for damage caused by its pollution accidents to a third party. Environmental pollution liability insurance is an important product for the insurance industry to participate in environmental governance. From the experience of European countries and the United States, as an effective risk management method, environmental pollution liability insurance not only shares the liability for compensation for environmental pollution and governance, but also helps to strengthen environmental risk management and prevent problems before they occur.

According to Axco's data[23], from 2008 to 2012, the average annual net premium income of

[23] AXCO is a major independent supplier in the global insurance market information circle (http://axcoinfo.com).

environmental liability insurance in the United States was stable at about USD 660 million and the average annual net claim loss was about USD 420 million, which shows the profitability of environmental liability insurance is basically stable. According to Munich Re's estimation, in 2013, the environmental liability insurance of the United States and Canada accounted for 81% of the global market share, about 16% in the European market and about 2% and 1%[24] in the Asia-Pacific and Latin American markets. As of 2015, the active players in the environmental liability insurance market include 15 international large insurance companies including Chubb, Allied World, and AIG.

AIG's latest claim status report analyzed more than 100 cases of claims for environmental pollution liability insurance in 2016. It found claims for environmental damage have become more frequent, the affected industries are more than ever before, and remedial costs are still rising steadily. In 2016, 45% of environmental damage liability claims were caused by environmental damage or pollution caused by third-party activities. In terms of industry, the claim cases involved 30 industries including transportation, communications, electricity, gas and health services (55%) and finance, insurance and real estate. In terms of professional fields, 22% of claims cases involved wastewater treatment, 19% of cases involved fuel/oil management, and pure environmental (non-pollution) damage accounted for 13%[25].

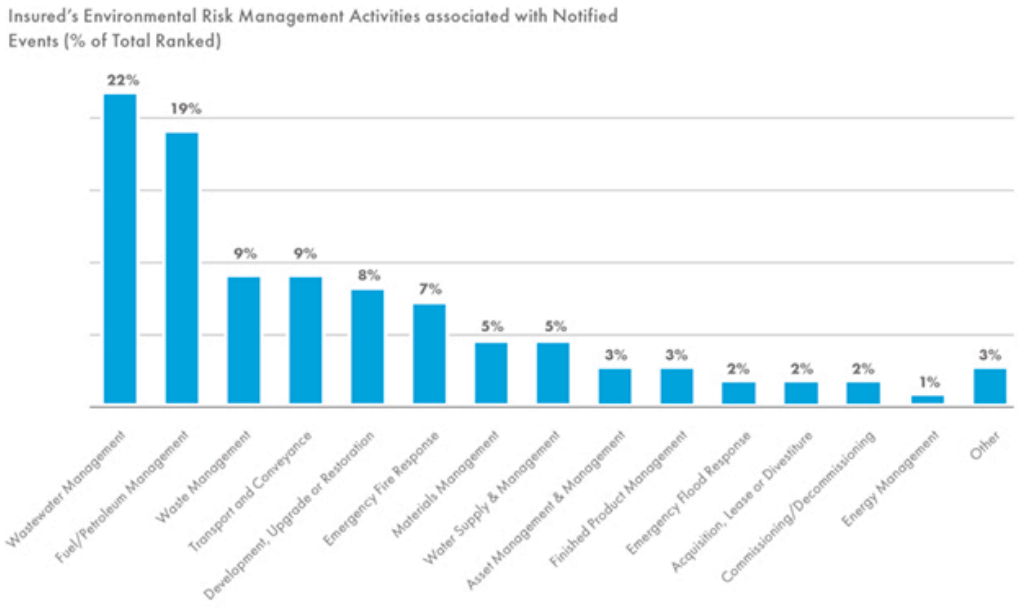

Figure 10 Statistics of Fields Involved by Environmental Liability Insurance Claims

ii. Case analysis

a) Background

Strict environmental legislation is the precondition and foundation for the development of environmental liability insurance. The development of environmental liability insurance the United States and Europe has commonness mainly because the strict regulations and

[24] Data source: Munich Re, insights into environmental liability insurance in an international context, 2014
[25] https://www.chubb.com/us-en/business-insurance/premises-pollution-liability-ppl-policy.aspx

operating rules of the laws on environmental responsibility and strict legal and legal mechanisms make enterprises face environmental liability risks that are difficult to bear independently, while the continuous improvement of related laws and the expansion of scope of environmental responsibility has boosted the demand for environmental liability insurance by enterprises, thus promoting the development of environmental liability insurance.

Since the 1970s, US Congress has passed a series of legislation that aimed at preventing environmental problems and managing environmental pollution. Among them, the most important laws include the Resource Conservation and Recovery Act (RCRA) promulgated in 1976 and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (also called Superfund) promulgated in 1980. RCRA gave US Environmental Protection Agency (EPA) the authority to manufacture, transport, treat, store, and dispose of toxic waste and proposed a framework for the management of non-hazardous solid waste. Europe's environmental responsibility legislation followed practical experience and gradually evolved into current source control from afterwards governance and compensation. In January 2002, the European Commission submitted a draft legal framework for environmental responsibility. After repeated discussions, the EU Environmental Responsibility Directive was established and came into effect on April 21, 2004, becoming the basic legal framework for the EU's environmental responsibility system. Until 2010, the European Union member states have successively revised their environmental protection laws with this as a standard, making it become the legal basis for the development of environmental liability insurance systems in various countries.

The above laws imposed high environmental protection, prevention, and financial requirements on enterprises that have environmental responsibility for contaminated sites and required enterprises to adopt prescribed pollution prevention measures and assume responsibility for the management of environmental pollution caused in the past, making enterprises be faced with huge expenditures. Therefore, with the promotion of corporate needs, environmental liability insurance has become one of the ways for enterprises to seek environmental liability risk protection.

b) Entity

Chubb is one of the world’s largest and most advanced underwriters of environmental responsibility and pollution risk, with environmental risk units in North America, Europe, Asia, and Latin America. The company is committed to providing marketable solutions for a variety of issues related to environment and climate through the development of insurance products and risk management services. The related products and services are divided into three major categories: environment pollution liability insurance, renewable energy insurance, and a number of “green” initiatives, covering virtually all aspects of global environmental risk protection.

Chubb's environmental risk business unit continuously launched a variety of products to meet the needs of the world. The following will cover green insurance-related products and services provided by Chubb Insurance in the United States.

- **Energy and marine insurance**

In many cases, the use of energy and marine insurance products and services can help reducing greenhouse gas emissions directly or indirectly. For example, Chubb's renewable energy construction insurance, energy and marine insurance and other plans combine the expertise of the company's various industry sectors to promote the development of clean and efficient alternative energy.

- **Environmental liability insurance**

With the development of environmental laws and regulations and the improvement of people's awareness, the demand for environmental responsibility protection is also increasing. Chubb's product innovation paradigms include global premises pollution liability insurance (PPL) and contractor pollution liability insurance (CPL), facing US multinational companies doing business in US and overseas. CPL and PPL combines safeguards with technical support to help contractors reduce their environmental risk exposure. In addition, Chubb's hazardous materials/waste transport product line provides protection and claims services for hazardous materials and hazardous waste transporters. CPL and hazardous material transport insurance have won the "Risk Innovation Award" from Risk & Insurance magazine.

Another innovative product is the Chubb ALERT project of Chubb's environmental risk unit. This program can facilitate accident response service providers to arrive on the spot at the first time and monitor clean-up expenses in real time. Practice shows that this program can not only reduce environmental damage, but also reduce claims costs up to 20%-25%. Chubb's environmental risk unit won an award in the commercial insurance innovation selection relying on the Chubb ALERT project.

- **Renewable energy project**

The renewable energy field is another major product area of Chubb, which particularly agrees with the increase in the attention of the international community to climate changes. People's desire for clean and efficient alternative energy enabled various renewable energy projects to continue to emerge around the world.

These projects are in various forms: biomass/biofuels, biogas, waste to energy, fuel cells, and solar, wind and water power. Chubb Insurance seeks to address the risks involved in two major phases of a typical renewable energy project, project construction and operation. Construction risks include commencement delay until public or employer liability insurance, while operational risks include business interruption, site pollution, etc.

- **Green project**

Chubb Insurance develops various risk transfer and risk management services to respond innovatively to additional risks associated with implementing green projects. Chubb's separate insurance type, green property insurance, provides protection for industrial and commercial enterprises that want to rebuild under "greener" standards in the event of loss of existing buildings. This includes energy-efficient appliances, electronic equipment, heating and cooling systems, internal drainage systems and lighting installation; low VOC paints, primers, solvents, topcoats and adhesives; low-emission carpets and floors; timbers certified by Forest Stewardship Council (FSC). In addition, customers who have purchased "preventive

measures" protection can receive certain discounts. If policyholders take some mitigation measures, they will receive a certain number of subsidies. All these insurance products will encourage Chubb's customers to take action to help reducing greenhouse gas emissions.

- **Consultation service**

Chubb's customers also have access to a full range of traditional environmental risk consultation services, including industrial hygiene assessment, controlled and hazardous materials management and rescue supervision, environmental due diligence on real estate and financial markets, and consultation on green building certification system Leadership in Energy and Environmental Design (LEED) and regulatory compliance. In addition, the company also customizes compliance training courses and services of Occupational Safety and Health Administration (OSHA) for its customers. The courses cover treatment of asbestos, lead paints and microorganisms and prevention of water intrusion.

Chubb shall dispatch certified compliance personnel to customer sites as the case may be to enhance customers' environment and safety team building to meet its health, safety and environment (HSE) goals.

- **Other guarantees**

The guarantees such as property catastrophe insurance, crop insurance, and business interruption insurance account for a large proportion in Chubb's business. The company continues to invest in these businesses and develop a variety of solutions to help clients manage natural risks posed by climate changes. Today, Chubb is the leading crop insurance company in the United States and conducts business through its subsidiary Rain and Hail Insurance Service. Chubb's agribusiness sector serves the manufacturing, processing, and distribution of agricultural products. In addition, the company's global weather insurance helps customers protect unpredictable weather conditions and climate changes and protect their assets around the world from damage or loss due to adverse weather conditions.

c) Product and service information[26]

Premises Pollution Liability (PPL) is an elastic combination of protection for business losses due to sudden, unexpected or progressive pollutions provided by Chubb for owners, managers and operators in different premises. It is also an important part of Chubb Insurance's green insurance system. The specific products and service information of PPL are as follows:

- **Insurance coverage**

Underwrite remedial costs required by government agencies for pollution at or from the covered locations (remedial costs for first party and third party);

Underwrite personal injuries, property damage, and remedial costs of third parties caused by pollution at or from the covered locations;

Underwrite personal injuries, property damage, and remedial costs of third parties caused by pollution during the transportation of waste or commodities;

[26] Data source: http://sustainability.brt.org/assets/pdfs/Chubb.2017Sustainability.Final.pdf

Underwrite legal defense fees paid for claims within the scope of insurance policy coverage;

Underwrite sudden and accidental pollution as well as progressive pollution;

Underwrite damage to natural resources, fines and emergency response costs;

Pollution based on widespread definition includes medical appliances, infectious medical waste, infectious diseases and pathological waste illegally discarded;

The claims arising from the following reasons can be underwritten by the endorsement method, including underground storage tanks, business interruption of first party, and transportation.

- **Insurance income**

Chubb's stable financial position (AA by S&P and A++ by A.M. Best);

Tailor insurance for complex risk situations faced by mergers and acquisitions, multinational corporations, etc.;

Freely provide an Environmental Incident Alert^{SM} to help customers find and dispatch qualified incident response contractors, monitor cleanup costs, and mitigate potential liability related to environmental release;

Experienced underwriting experts and proprietary claims experts;

Provide a wide range of risk control services (including environmental risk control experts from ESIS) through a first-class engineering consultant network;

A think-tank capable of solving problems in implementation of complex domestic and global environmental laws and regulations and policies;

Maintain a valuable long-term relationship with Chubb Insurance

- **Minimum/maximum limit**

Minimum self-insured amount: USD 10,000 (United States)

Minimum premium: USD 10,000 (United States)

The total/sub quota for claims amounts to USD 50 million to the maximum, including legal litigation defense costs, and the claim sub-quota can be applied to the scope and category of certain commercial businesses.

- **Risk control service**

Chubb provides a wide range of bundled and unbundled environmental engineering and risk minimization services for environmental risk insurants, including:

Evaluate selection of existing waste management regulations/disposition points;

Evaluate existing mould, asbestos and lead management plans;

Evaluate existing underground tank management plans;

Evaluate spill prevention, control, and countermeasure (SPCC) plans;

Simulated regulatory audit on point source pollutants discharged into surface water, air pollutants and solid waste pollution (aim to meet the National Pollutant Discharge Elimination System (NPDES) and the Resource Conservation and Recovery Act (RCRA);

Training on (mildew awareness, underground tank plan management, 24 HAZWOPER for hazardous waste operations, etc.);

Training for tank operators.

iii. Achievement

Chubb Insurance's environment program has been in place for more than ten years. During this period, Chubb Insurance has become a leader in the development of market-oriented insurance products and risk management services in the field of responding to and solving issues related to environment and climate. Chubb Insurance also has made a positive progress in reducing greenhouse gas emissions in its own operating process, charitable grants, sponsorship and support to volunteer services and other environmental initiatives.

In 2016, Chubb Insurance undertook environmental risk insurance policies in more than 35 countries, providing insurance services for more than one-third of the world's top 100 clean technology companies. At the same time, Chubb Insurance also provided green building consulting services and property insurance for companies, making post-disaster reconstruction to be able to achieve higher green standards.

In the continuous development of insurance business that focuses on environmental risks, Chubb Insurance strived to reduce carbon footprints in its own operation. From 2006 to 2012 (before acquisition of The Chubb Corporation), Chubb Insurance's each employee's greenhouse gas emissions reduced by 27%. In 2014, Chubb Insurance set a new target of reducing greenhouse gas emissions per employee by 10% on basis of 2012 by 2020. By 2015, Chubb Insurance achieved a target of 5.3% reduction in per capita greenhouse gas emissions. In 2016, Chubb Insurance received A-level results in the climate change project ranking of CDP (Carbon Disclosure Project).

In addition, Chubb Insurance also actively participates in charity and international cooperation and strives to promote the development of global green insurance. Chubb Charitable Foundation's grants help protecting habitats and biodiversity, promote effective management of resources and provide financial support for the development of "green companies" around the world.[27]

iv. Revelation

a) Strict laws and regulations lay the foundation for the development of environmental liability insurance.

From the development history of environmental liability insurance in developed countries, we can see the ceaselessly stricter legal requirements in the United States make environmental

[27] Data source: http://sustainability.brt.org/assets/pdfs/Chubb.2017Sustainability.Final.pdf

liability risks faced by companies continue to rise, companies are difficult to independently assume the responsibility for compensation caused by environmental accidents, and their demand for seeking to spread risks has promoted the development of environmental responsibility insurance. Similarly, the EU Environmental Liability Directive has become an important cornerstone for the development of European countries' environmental liability insurance market. After EU countries make laws based on this, environmental liability insurance has entered a stage of rapid development. Taking France as an example, domestic legislation based on the "EU Environmental Responsibility Directive" has increased the liability faced by companies by nearly 40 times, which has greatly stimulated companies' demand for insurance protection and thus promoted the development of environmental liability insurance.

b) The insurance mechanism with mandatory characteristics plays an extremely important role in the development of environmental liability insurance.

In the United States, the laws require companies in certain industries must adopt financial protection methods to meet the capital requirements for protecting the environment, natural resources and ecology. Environmental liability insurance has become an important choice for enterprises and thus environmental liability insurance has been rapidly developed. Although German companies generally adopt a voluntary approach to insure environmental liability insurance, the principle of root-cause prevention requires a company cannot obtain an operating license only after it meets the regulatory assessment of its environmental governance capabilities. This mechanism allows companies to intensify their anti-risk capabilities by insuring environmental liability insurance, indirectly promoting the development of environmental liability insurance in Germany.

c) The positive role of insurance associations or related institutions outside regulatory agencies in the development of environmental liability insurance

German Insurance Association and German Federation of Industry have played an important role in promoting the development of the insurance industry and are the most representative developed markets. German Insurance Association represents the interests of the German insurance industry, provides services and consumer information for member companies, reflects the industry's perspectives and needs to the federal financial supervisory authority BaFin and makes insurance companies maximize its risk protection role based on the insurance industry's risk management advantages. In the context of legal norms, after a long period of negotiations and discussions, German Association of Liability Insurance Companies, German Federation of Industrial Associations and German Insurance Protection Association agreed on details of environmental liability insurance, such as pollution damage clauses, underwriting equipment, insurance coverage, and environmental responsibility before and after event, making limited underwriting on damages in operation and becoming the basic terms of environmental liability insurance still used in Germany today. German Insurance Association provides all standardized contracts for environmental liability insurance in Germany currently, playing an active role in the development of the environmental liability insurance system. Since environmental liability insurance contracts are more complex than general liability insurance contracts and there are few historical experience data in the

industry, the insurance industry association, the industrial association and other industry associations strengthen cooperation, having more professional advantages and cost advantages for building specific environmental liability insurance contracts.

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