

The Environmental Impacts of Issuing Green Bondson Clean Projects: China's Green Bonds Market as a Model

الآثار البيئية لإصدار السندات الخضراء على المشاريع النظيفة: سوق السندات الخضراء في
الصين نموذجا

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Abstract

This study aims to determine the effect of green bonds in promoting sustainable development by preserving the environment and financing clean projects, where green bonds are becoming a powerful tool for mobilizing the global bond market to meet the demand for green investment. In order to achieve the objectives of this research, we studied the Chinese experience which is considered a pioneer in the field of issuing and trading of green bonds. The study shows that the green bonds are one of the best finance resources for investors to start new sustainable projects which has a positive impact on global economy, and the volume of Chinese green bonds issued overseas has grown rapidly in recent years (2012-2019).

Keywords: Green bonds, Sustainable projects, Green bond market, China.

ملخص

تهدف هذه الدراسة إلى تحديد أثر السندات الخضراء في تعزيز التنمية المستدامة من خلال الحفاظ على البيئة وتمويل المشاريع النظيفة. ولتحقيق أهداف هذا البحث قمنا بدراسة التجربة الصينية التي تعتبر رائدة في مجال إصدار وتداول السندات الخضراء. تظهر الدراسة أن السندات الخضراء من أفضل مصادر التمويل للمستثمرين لبدء مشاريع مستدامة جديدة كما أن لها تأثير إيجابي على الاقتصاد العالمي، وقد نما حجم السندات الخضراء الصينية بشكل سريع في السنوات الأخيرة.

الكلمات المفتاحية: السندات الخضراء،

الأسواق المالية الخضراء، الصين.

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1. Introduction

The Green bonds leading on the top of topic research and became one of the commonly discussed in the world. As innovative financial instruments, green bonds provide a historic opportunity to direct private finance towards low-carbon investments. The last few years, China, the USA and France led the country rankings once again by the total amount of labeled green bonds.

In this context, we will study China because it was the largest source of labeled green bonds, 2019 was marked by new developments in China's profile of issuer types. The most noticeable is the strong growth in the total volume of green bonds issued by Non-Financial Corporates that have increased by 54% year-on-year.

At present China has adopted market-based means, such as green finance, as important means of improving the environment and strives to create a green credit policy system to support the development of green economy, circular economy and low-carbon economy. We have also seen the first municipal green bond from China which reflects Chinese local governments' ambitions to address climate change and local environmental issues. Activating the trend towards a green finance requires sources for the investment in the various fields of green economy, which include green bonds, renewable energy, sustainable transport, green architecture, and clean production.

This study aims to examine the effect of green bonds as a modern mechanism for financing green projects in China. Hence, the following problem can be posed: **What is the impact of issuing green bonds on environmentally investment projects?**

In order to understand the aspects of our topic, it was divided into three consecutive chapters as follows:

2. Theoretical aspect of sustainable finance and green bonds

The introduction and development of green finance environmental

issues become a major problem in the sustainable development of humanity around the world; different fields have been devoted to improving the environment through various ways (Jingyan Fu, 2020, p. 47). The financial sector as the main driving force of economic development, also has attempted to contribute in its own way. The transition to the sustainable global economy needs financial sources for investments that provide environmental benefits. Thus, the idea of "Green Finance" has recently been widespread at the global level (Tomasz Bielinski, 2018, p. 14).

2.1. Green bonds definition

Green bonds are an important development because they are a financial innovation designed to facilitate sustainable investing for institutional investors such a pension funds, insurance companies, mutual funds, and sovereign wealth funds (Aaron & Björn, 2020, p. 03). The following is the most important definition of green bonds:

- According to the "Green Bond Principles (GBP)" green bonds are any type of bond instrument where the proceeds will be exclusively applied to finance or refinance new or existing eligible green projects" (ICMA Paris Representative Office, June 2018, p. 03). In order for a bond to be labeled and accepted as "Green", it is therefore required to specify how the proceeds of a bond will be used (Kahlenborn & Walter (adelphi), 2017, p. 06).

- Green bonds are fixed-income securities, both taxable and tax exempt, that raise capital for use in projects or activities with specific climate or environmental sustainability purposes. These bonds are structured the same way as standard bonds, with the same characteristics as standard bonds in terms of seniority, rating, execution process, and pricing, but with proceeds dedicated to climate or environmental projects. The bonds carry the same rating as an issuer's other debt and are often structured under the issuer's medium-term notes (International Finance Corporation, 2020, p. 11).

- Green bonds are theme bonds with environmental goals as the

specific theme of such bonds. They are also known as Climate Bonds or Green Infrastructure Bonds in that they are targeted at climate change mitigation projects or environmentally friendly infrastructural projects and proceeds of the bond are 'ring-fenced' for financing climate change or renewable energy and other environmental projects. The main objective of green bonds is achieving a triple bottom line of economic, environmental and societal benefits as the bonds satisfy the needs of issuers, bondholders and the environment (Kila, pp. 03-04).

2.2. Green bonds types

Different types of green bonds exist in the market. It is understood that certain green projects may have social co-benefits, and that the classification of a use of proceeds bond as a green projects. It is important to note that green bonds should not be considered fungible with bonds that are not aligned with the four core components of the GBP (ICMA Paris Representative Office, June 2018, p. 03).

There are currently four types of green bonds (additional types may emerge as the market develops and these will be incorporated in annual GBP updates):

- **Social bonds:** The use of proceeds from social bonds is directed toward projects that aim to achieve positive social outcomes especially, but not exclusively, for a target population. ICMA's Social Bond Principles have four components analogous to the GBP: use of proceeds, process for project evaluation and selection, management of proceeds, and reporting (IFC, 2019, p. 11).

- **Transition bonds:** Transition bonds are new products that aim to finance the transition to a low-carbon economy. ICMA has formed a working group to examine the lack of issuance in the green bond market by carbon-intensive corporates and will consider providing guidance for issuance.

- **Sustainability bonds:** Sustainability bonds are debt instruments whose proceeds will finance or refinance a combination of green and social

projects. The Sustainability Bond Guidelines established by ICMA are aligned with the four core components of both Green Bond Principles and Social Bond Principles (IFC, 2019, p. 11).

- **Sustainability-linked bonds:** Sustainability-linked bonds (SLBs) are non-earmarked bonds whose financing cost may be increased in the event of failure to achieve a sustainable performance objective. ICMA has established a working group on sustainability/KPI-linked bonds to establish the main characteristics of SLBs and potentially to propose the creation of Sustainability-linked Bond Principles (IFC, 2019, p. 11).

2.3. Green Bond Principles

The Green Bond Principles (GBP) developed by the International Capital Markets Association (ICMA). The GBP recommends that issuers monitor and report the use of proceeds and environmental impacts on an ongoing basis. It also recommends that issuers receive external review and publish results. However, the GBP are voluntary and thus issuers are responsible for incorporating these standards into their own green bond frameworks. Any issuer may self-label their bonds as green, citing adherence to the GBP. (Donovan, June, Neil, Ying, & Mathias, June 2020, p. 06). The GBP have four core components:

- **Use of Proceeds:** The cornerstone of a green bond is the utilization of the Proceeds of the bond for green projects, which should be appropriately described in the legal documentation for the security. All designated Green Projects should provide clear environmental benefits, which will be assessed and, where feasible, quantified by the issuer.

- **Process for Project Evaluation and Selection:** The issuer of a Green Bond should clearly communicate to investor, the environmental sustainability objectives; the process by which the issuer determines how the projects fit within the eligible Green Projects categories identified above; the related eligibility criteria, including, if applicable, exclusion

criteria or any other process applied to identify and manage potentially material environmental and social risks associated with the projects (ICMA Paris Representative Office, June 2018, p. 04).

- **Management of Proceeds:** The net proceeds of the green bond, or an amount equal to these net proceeds, should be credited to a sub account, moved to a sub-portfolio or otherwise tracked by the issuer in an appropriate manner, and attested to by the issuer in a formal internal process linked to the issuer's lending and investment operations for green projects.

- **Reporting:** Issuers should make, and keep, readily available up to date information on the use of proceeds to be renewed annually until full allocation, and on a timely basis in case of material developments. The annual report should include a list of the projects to which green bond proceeds have been allocated, as well as a brief description of the projects and the amounts allocated, and their expected impact (ICMA Paris Representative Office, June 2018, p. 05).

2.4. Eligible Projects

The following list of project categories, while indicative, captures the most commonly used types of projects supported by or expected to be supported by the Green Bond market (ICMA Paris Representative Office, June 2018, p. 03).

Eligible projects include the following sectors: (International Finance Corporation, 2019, p. 02)

- **Energy efficiency:** investments in equipment, systems and services which result in a reduced use of energy per unit of product or service generated.

- **Renewable energy:** investments in equipment and systems which

enable the use of energy from solar, wind, hydro, biomass, geothermal, tidal and other renewable.

- **Green buildings:** which meet regional, national or internationally

recognized standard or certifications (ICMA Paris Representative Office, June 2018, p. 04)

- **Clean transportation:** (such as electric, hybrid, public, rail, non-

motorized, multi-modal transportation, infrastructure for clean energy vehicles and reduction of harmful emissions)

Other: pollution prevention and control, cleaner technology production, environmentally sustainable management of living natural resources and land use, sustainable water and wastewater management, climate change adaptation (Internanional Finance Corporation, 2019, p. 02).

3. A case study of greening the bond markets in China

Green bonds are an increasingly attractive mechanism for both private and public sector organizations to raise capital for projects, assets or other activities that benefit the economy, environment and society. The global green bond market is growing rapidly. Before 2007, green bonds did not exist, but fast forward to 2014 and the value of green bonds stood at over \$37 billion dollars. The volume of Chinese green bonds issued overseas has grown rapidly (Climate Bonds Initiative and China Central Depository & Clearing Research Centre, 2019, p. 03).

3.1. China Green Bond Market

China, the largest emitter of greenhouse gas (GHG), is one of the leading players in the global green bond market. The development of the Chinese Green Bond market is an important part of China's ambitions to transition towards sustainability, a shift that needs an additional US\$6.4 – 19.4 trillion in investment. China's domestic green bond market has more than tripled from US\$29 billion in 2016 to US\$98bn by April 2019,

representing 30% annual growth rate in issuance. Including offshore issuances, China issued US\$55.5 billion of green bonds in 2019, with US\$31.3 billion of that aligned with international definitions of green, reflecting 12% of the global green bond issuance, 2nd only behind the US (Udetanshu, 2020, p. 03).

3.2. China's Green Bond Market Development

The green bonds issued by Chinese firms grew rapidly in 2016, from almost zero to 238 billion Yuan, accounting for 39% of the global issuance. The Agricultural Bank of China in London issued the first green bonds in China at the end of 2015. In December 2015, the People's Bank of China published the announcement of green financial bonds in the inter-bank bond market, China's current largest bond market. A few weeks later, the China Development and Reform Commission also announced guidelines for green corporate bond issuance. Since then, China's green bond market has grown rapidly, mainly due to the green bonds from large issuers such as Shanghai Pudong Development Bank, Industrial Bank, and Bank of Communications. As the sizes of the issues have grown, so have the variety of green bonds, which have included green asset-backed bonds (ABS) and Bank of China's green guaranteed bonds. By the end of November 2018, more than 500 billion US dollars of global green bonds had been issued, and China had become one of the largest distribution sources in the global green bond market. Industrial Bank has played an important role in the domestic green bond market. Industrial Bank landed its first green financial bond in 2016, in November 2018, it successfully completed the issuance of green financial bonds in both domestic and overseas markets. The stock of green financial bonds exceeded 110 billion yuan, making it the commercial financial institution with the largest balance of green financial bonds issued at that time (Jingyan Fu, 2020, p. 50).

3.2.1. Recent trends in the green bond market

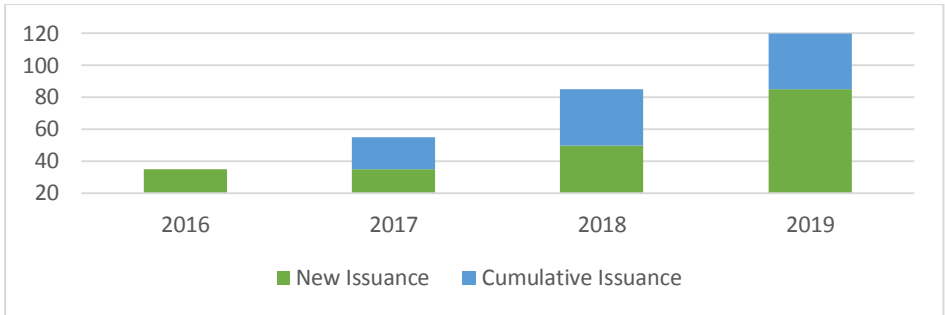
Green bonds provide an opportunity for long-term and sustainable infrastructure financing. Previously carried out by multilateral development

banks (MDBs), namely the World Bank and the European Investment Bank, green bond issuance has promptly spread to other traditional investors, such as institutional investors, commercial banks, municipalities, and some of the world's largest companies. Investments in this new and growing segment of fixed-income markets have increased more than ten-fold over the past five years and is expected to reach USD 1 trillion by 2020, as the demand for green bonds continues to rise. The launching of the Green Bond Principles (GBPs) in 2014, which now involve a consortium of more than 200 financial and non-financial institutions, has only strengthened the emergence of green bonds. According to Climate Bonds Initiative's database,³ the total number of green bonds issued has increased from one in 2007 to more than 2000 issued green bonds in 2017, a spectacular annual growth of more than 13% during the same period. In 2017, the United States, China, and France accounted for 56% of global green bond issuance (Banga, 2019, p. 19).

3.2.2. The growth of China's green bonds market

Globally, the green bond market outperformed expectations in 2019, with record issuance of 240\$ billion. The nascent market for sustainability bonds doubled in size, with issuance of over 40\$ billion in 2019. Emerging market green bond issuances rose 21 percent to \$52 billion, bringing the amount outstanding to 168\$ billion. Including developed and emerging markets, issuance of green bonds constituted marginally over 3 percent of total global bonds issued last year (IFC, 2019, p. 12).

Fig. 1. Cumulative issuance in China's domestic green bond market (unit: USD Billion)



Source: Donovan, June, Neil, Ying, & Mathias, 2020, p. 08.

China's domestic green bond market has nearly quadrupled in size from USD 29bn in 2016 to USD 120bn by the end of 2019. Including offshore issuances, China's green bond market is currently the second largest in the world, representing 12% of the global issuances with USD 34.83 billion issued in 2019 (Figure 1). While this reflects impressive growth, the green bond market remains a small fraction of China's overall bond market; with nearly USD 13 trillion outstanding.¹² This indicates huge potential for future growth. The size of green loan portfolios held by China's largest banks also indicates huge potential demand for green bonds in China, surpassing RMB 10 trillion (USD 1.4 trillion) in 2019 and accounting for 10% of China's total loan balance (Donovan, June, Neil, Ying, & Mathias, The State and Effectiveness of the Green Bond Market in China, June 2020, p. 08).

3.3. The type of bonds and issuers in China

The issuers in the Chinese bond market are mainly state-owned enterprises. Among these, central state-owned enterprises have the highest amount of bond issuance, accounting for more than half of the total, while local state-owned enterprises account for 30%. Although the issuers in China's green debt market have become increasingly diversified, state-owned enterprises still occupy an absolute leading position, while private enterprises and wholly owned enterprises still have room for potential development space (Jingyan Fu, 2020, p. 50).

3.3.1. The issuers of China's green bond market

The following is the presentation of the most important of type's issuer in 2019:

- Non-Financial Corporate: 2019 has been marked by new developments in China's profile of issuer types. The most noticeable is the strong growth in the total volume of green bonds issued by Non-Financial Corporates that have increased by 54% year-on-year, representing 37% of the total volume of issuance in 2019. China Three Gorges was the largest Non-Financial Corporate issuer in 2019, with six bonds totaling USD 5.1bn. Non-Financial Corporates thus became the largest issuer type in 2019 (Climate Bonds Initiative and China Central Depository & Clearing Research Centre, 2019, p. 04).

- Financial Corporate volumes slightly increased despite the slight increase in volume, the share of Financial Corporates dropped from 48% in 2018 to just under 37% in 2019 given the increase in Non-Financial Corporate.

- Financial Leasing companies' entrance in the green bond market financial leasing companies, as a subcategory of Financial Corporate issuers, accelerated their issuance in 2019. Nine financial leasing companies brought 14 deals to the market over the year, issuing a total of USD1.7bn, which is more than double the volume in 2018 (Climate Bonds Initiative and China Central Depository & Clearing Research Centre, 2019, p. 04).

3.3.2. Types of bonds in China's green bond market

Chinese regulators recognize four types of bonds:

- **Financial bonds:** bonds issued by financial institutions, including three policy banks and commercial banks, and traded on the interbank market. Proceeds from these issuances are channeled into other uses through bank lending.

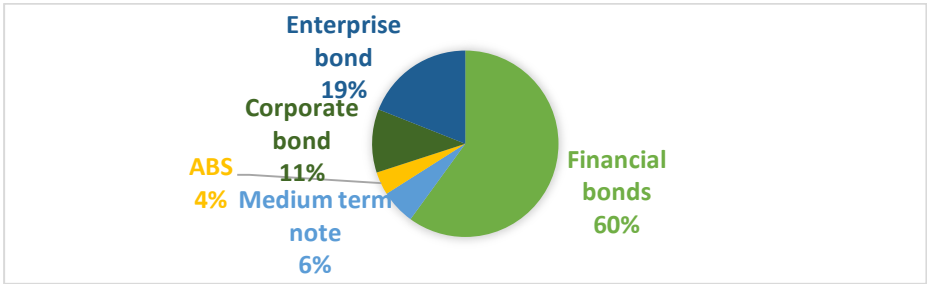
- **Corporate bonds:** bonds issued by state-owned enterprises and private companies on the Shanghai or Shenzhen Stock Exchanges.

- **Enterprise bonds:** bonds issued primarily by state-owned enterprises, traded on the interbank bond market, Shanghai or Shenzhen Stock Exchanges.

- **Non-financial Corporate Debt Instruments:** shorter-term notes issued by non-financial corporate entities. Medium-term notes account for the largest share, with mostly 3-5 years maturity and issued on the interbank market (Donovan, June, Neil, Ying, & Mathias, The State and Effectiveness

of the Green Bond Market in China, June 2020, p. 11).

Fig. 2. Green bonds by bond type, 2010-19



Source: Udetanshu, Gaia stigliani, 2020, p. 13.

The green bond market in China is composed of different types of bonds, but financial bonds dominate the mix with almost (60%) of the issuance. The rest of the issuance is comprised of enterprise bonds (19%), corporate bonds (11%), medium term notes (6%) and asset-based securities (ABS – 4%). In terms of issuer sector, financial institutions, utilities and industrials dominate (Figure 2). The Chinese green bond market currently represents 2% of the overall bond market, in the country, based on issuances between 2010 and 2019 (Udetanshu, 2020, p. 13).

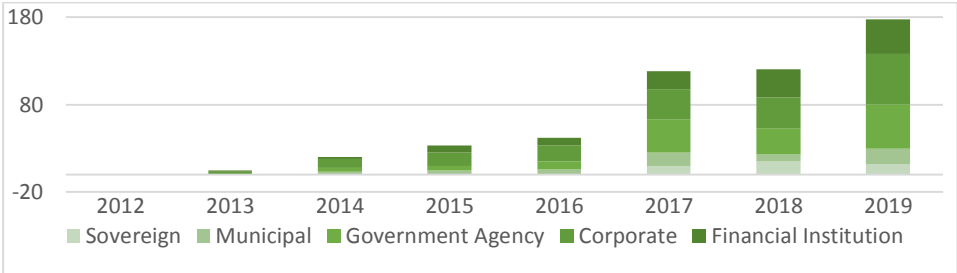
3.4. Trends in emerging market green bond issuance

The Chinese green bond market accelerated from US\$29 billion in 2016 to US\$55.5 billion in 2019. In the first four months of 2020, China has issued a total of US\$2.6 billion of green bonds(Udetanshu, 2020, p. 13).To understand the productivity of green bonds in China, we did a review of the Chinese bond market, with a focus on sectors that dominate in the issuance of green bonds. We then looked at Emerging Market green bond issuance by currency, by size, by tenor and also by use of proceeds.

- **Issuing sectors:** Financial institutions remain the largest issuing sector in emerging markets, making up 59 percent of cumulative green bond issuance by volume. (Figure 3). Looking at the volume of new issues during 2019, financial institutions accounted for (47%), followed by nonfinancial corporates (35%), sovereigns (12%), government agencies (5%), and municipalities (0.1%). Power and utility companies account for the largest

share of issuance among nonfinancial corporates (56%), followed by construction and real estate (16%), transportation (13%), and manufacturing (10%) (IFC, 2019, p. 16).

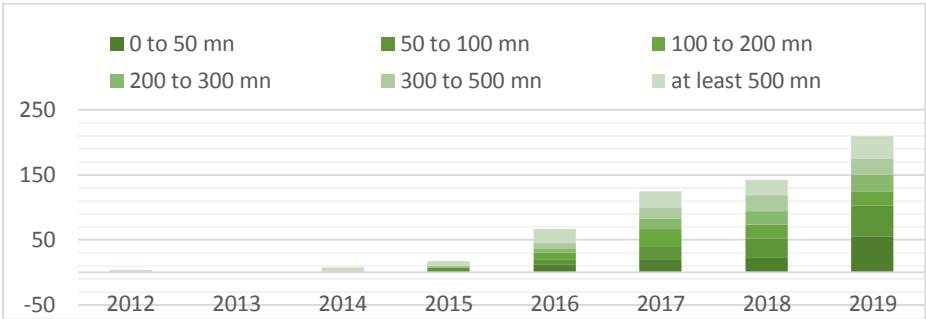
Fig. 3. Developed Market Green Bond Issuance by Sector (\$ billion)



Source: International Finance Corporation (IFC), 2019, p16.

- **Issue size:** Benchmark-sized bonds of at least \$300 million numbered more than 60 in 2019 (of which 32 were \$500 million or more a 25 percent increase). The bulk of new issues are still smaller than benchmark size (Figure 4), with the range of issuance size from \$1.5 million to \$2.9 billion in 2019. For these markets to mature, benchmark-sized issues will be key to attracting substantial investment flows.

Fig. 4. EM Green Bond Issuance Size (number of bonds)

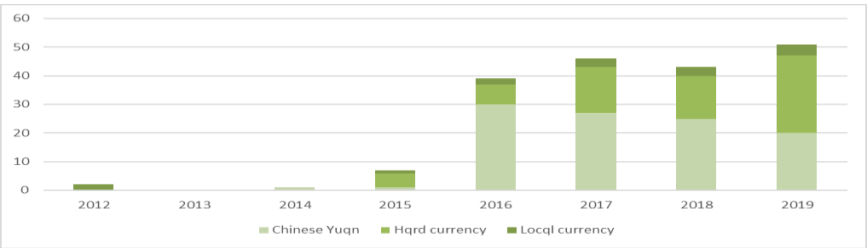


Source: International Finance Corporation (IFC),2019, p16.

- **Currency:** Prior to 2019, a majority of emerging market issuance was in Chinese yuan (by Chinese issuers). This past year saw a shift toward hard currencies and local currencies in other markets. The Chinese green bond market remains driven by domestic demand, but a shift last year to

more offshore issuance and a corresponding shift to hard currency issuance by Chinese green bond issuers points to increased focus on tapping into foreign investor appetite for emerging market green bonds (Figure 5). Investor appetite for local currency risk remained strong, all the same, with new issues in Brazilian real, Thai baht, and South African rand accounting for over half of green bond issuance denominated in local-currency outside China (IFC, 2019, p. 17).

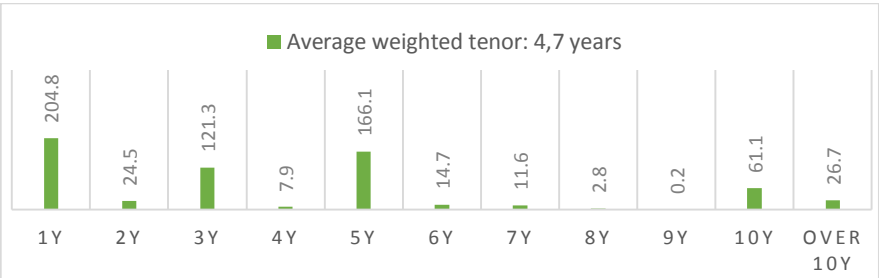
Fig. 5. EM Green Bond Issuance, by Currency



Source: International Finance Corporation (IFC), 2019, p17.

- **Tenor:** The majority of emerging market green bonds are medium-term instruments, with 60percent having a tenor of either three years or five years. About 10 percent of issuances are longer term, having terms over 10 years, including a few perpetual bonds. Across emerging market regions, cross-border issuance by financial institutions points to the strong potential for new green bond issuers to come to the market (Figure 6). As 45 percent of the cross-border bonds covered by this analysis is either a three-year or five-year bullet bond (International Finance Corporation, 2018, p23).

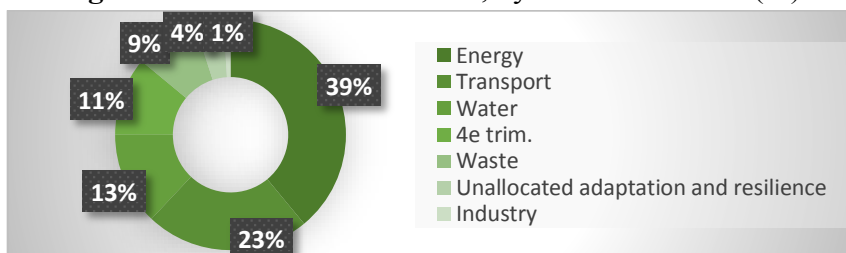
Fig. 6. Tenor of FI Cross-Border Bonds, 2014-2018 (\$billion)



Source: International Finance Corporation (IFC), 2018, p23.

- **Use of proceeds:** Most green bonds specify the allocation of use of proceeds for projects that address environmental concerns (IFC, 2019, p. 17). Renewable Energy & Energy Efficiency and Clean Transportation made up the largest portion in the Green Bond eligible projects portfolio (Figure 7). They comprise approximately (66%) of all Green Bond commitments (THE WORLD BANK, 2019, pp. 10-11).

Fig. 7. EM Green Bond Issuance, by Use of Proceeds (%)



Source: International Finance Corporation (IFC), 2019, p17.

4. The impact of green bonds on environmental protection

Financial instruments are crucial means for applying green finance in real life. The global green bonds experienced an explosive growth. Green bonds combine both "bonds" and "green" features. First and foremost, green bonds own basic function and characteristics of ordinary bonds. For issuers, capital cost of issuing bond is low and interest is pre-tax charge; bond investment risk is relatively low and investors' demand for yield is low thus reducing the cost of capital. Also, the bonds can raise a larger scale of funds whose terms are relatively long, so bonds are very suitable for those investment projects of large-scale infrastructure construction which demands huge capital and returns investment for a longer period.

In addition, the financing subjects are diversified, including government, financial institutions and enterprises, etc. For investors, compared with bank deposits, bonds tend to provide higher profitability, liquidity and stability meeting the diversification of investors. At the same time, the bonds markets make investors easier to enter and exit, adjust the investment portfolio, thus having higher flexibility in liquidity management (Yao Wang & Qiang, 2016, p. 314).

4.1. Environmental impacts

To understand the environmental impacts of the green bond market in China, we reviewed 157 issuances with publicly-available environmental impact reporting, out of a total 311 green bonds. The aggregate impacts reported by these issuers are listed in (Table 1) below: (Donovan, June, Neil, Ying, & Mathias, The State and Effectiveness of the Green Bond Market in China, June 2020, p. 17)

Table 1. Aggregate environmental impact reported by Chinese green bond issuers (Onshore)

Sector	Metric	Impact	Unit
Climate	Annual CO2 reduction	52.6	Million tons
	Annual reduction of fossil fuel use	20.2	Million tons standard coal equivalent
Energy	Installed capacity	11,197	MW
	Annual energy production	80, 903, 228	MWh
Pollution Prevention	Annual SO ₂ emissions abatement	1,413	Thousand tons
	Annual particulate matter abatement	54,653	Tons
Resource Conservation	Annual water treatment	128,068	Thousand tons
	Annual water use reduction/conservation	250,990	Thousand tons
Clean Transport	Annual ridership	19.3	Million persons
	Length of rail/subway line	3,022	Km

	constructed		
Waste Management	Annual waste processed	1, 280,680	Thousand tons

Source: Donovan, E., June, C., Neil, C., Ying, C., & Mathias, Lund Larsen, 2020, 17.

In general, there is high uncertainty around some of these figures as they are based on issuers’ own reporting and only a portion have been subject to external review. While the PBoC offers standard environmental impact metrics for reporting, a standard methodology for calculating metrics does not exist. The China green bond market has been delivering significant environmental benefits; however, environmental reporting could be improved. Environmental impact data aggregated from post-issuance reporting shows important impacts, including 52.6 million tons of CO2 avoided annually, and the deployment of more than 11 GW of clean energy. A significant share of green bond investment has been directed into clean transport including the construction of public rail and subways. Annual ridership for projects financed with green bonds is estimated at 19.3 million. Environmental reporting and verification could be improved of the 157 bond issuances with environmental impact reporting, external verification documents were available for around half of those issuances. While environmental reporting was readily available for financial bonds, corporate and enterprise bonds had low levels of environmental impact reporting, as well as low levels of ex-post verification. Most issuers did not disclose methodologies for calculating impact and did not specify whether calculations were based on a pro- rata basis (Donovan, June, Neil, Ying, & Mathias, The State and Effectiveness of the Green Bond Market in China, June 2020, p. 17).

4.2. Investment direction of raised funds in China’s green bond market:

According to Climate Bond Initiative’s definition, the raised funds must be spent on renewable energy and sustainable green projects. Green bonds can hedge investment risk brought by environment and climate change. Some green bonds raise money to the project with national or local government subsidies and the government in the future may also launch

preferential policies related to green bonds, such as lower investment threshold, more favorable tax, etc. In addition ,green bonds have stricter disclosure requirements than regular bonds, so that investors can invest with a low risk, both meeting the social sense of responsibility and can obtaining benefits. And in 2013, the green bond market entered the stage of rapid development. Among the key characters that the green bonds market performs are scale increase and the issuer varieties. Distribution scope is expanding from Europe to all over the world especially developing countries(Yao Wang & Qiang, 2016, p. 314).

Renewable energy has the greatest potential for fundraising. As non-financial companies, CGN International and China Energy Conservation Wind Power Co. Ltd. both have invested in green bond to fund wind farm projects. Since the beginning of China's green bond market in early 2016, low-carbon transportation has been ranked in the top three areas for fundraising. Qualified assets have included subway and bus infrastructure. Since the beginning of 2018, the proportion of green bond funds in the water sector has continued to increase, from 7% in the first quarter to 18% in the third quarter. The uses for raised funds in the water sector have been diverse, from wastewater treatment to rainwater harvesting and distribution. As the number of extreme rainfall events has increased, we have observed increasing frequency of urban flooding. Therefore, we should encourage the rational design and management of stormy water drainage systems and infrastructure to ensure the climate adaptability of urban infrastructure (Jingyan Fu, 2020, p. 53).

5. Conclusion

Through what has been addressed in the previous themes of the research topic: The impact of issuing green bonds on sustainable environmental projects with the study of China's green bonds market, a series of results can be listed, most notably the following:

- Greening the financial sector is an integral and inherent part of greening our economies, while the assessment and inclusion of climate risks in financial decisions is becoming more widespread, financial institutions in emerging markets would be well advised to

pay serious attention to them in order to avoid the need for costly amends in future.

- The Chinese green bond market grew from almost zero to the second largest in the world in just a few years, accounting for 13% of the global issuance in 2019 (34 USD bn).
- Green bond has been developed progressively as a financial instrument in various capital markets and it has become the world's second largest issuer of green bonds.
- Green bonds provide as innovative financial instruments, an opportunity to direct private finance towards low-carbon investments. In addition to that the green finance is an innovative financial pattern aimed at the environmental protection and the accomplishment of sustainable utilization of resources. If the market mechanism of green finance is rational, green finance can guide the flow of funds and achieve effective management of environmental risk and optimal allocation of environmental resources and social resources. That's why the construction of environmental protection should consider setting up the mechanism of efficient green finance system coordinating the relationship between the ecology and finance.
- We can promote the use of renewable energy to achieve environmental protection through active financial tools, as green bonds are used exclusively to finance or meet the requirements of green projects in China.
- Issuers can use green bond financing to fund new and existing green projects, invest in specific green projects, issue green loans, or simply invest in general green funds. All identified green project categories should provide clear environmental benefits that can be described, quantified, and assessed if feasible.
- Most funded projects are in clean energy (39%), clean transportation (23%), and they made up the largest portion in the Green Bond eligible projects portfolio. They comprise approximately 66% of all Green Bond commitments.
- Through new and extensive primary data collection by CPI and the

International Institute of Green Finance (IIGF), we account for more than USD 120 billion of cumulative issuance. Cumulative impacts of these green bonds, as reported by issuers, are a reduction of more than a 52.6 million tons of CO₂e and at least 11.2 GW of installed clean energy capacity added. However, overall impacts are difficult to determine due to large data gaps resulting from a complex regulatory framework with inconsistent guidelines.

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