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The State and Effectiveness of the Green Bond Market in China

Donovan Escalante

June Choi

Neil Chin

Ying Cui, IIGF

Mathias Lund Larsen, IIGF

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A CPI Report

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Contact	June Choi	june.choi@cpiclimatefinance.org
	Donovan Escalante	donovan.escalante@cpiclimatefinance.org

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Executive Summary

The Chinese green bond market has rapidly expanded demonstrating impressive ambition and demand for green financing in China. More analysis is needed, however, to understand what exactly is being funded, how these activities are contributing to climate mitigation and adaptation and whether Chinese policies are leading issuers to invest in more green projects. This is especially important in light of the fact that green bonds and other green finance instruments in China must scale substantially. For China to meet its commitment to the Paris Agreement, it must mobilize an estimated RMB 3-4 trillion (roughly USD450-600 billion) in green investment per year.¹

This report provides a comprehensive review of the Chinese green bond market. The analysis is based on an extensive primary data collection effort to track bond issuances, their use of proceeds and their environmental and climate impacts, including new data that has never been published before. It also explores the development of the market from an economic and regulatory perspective and provides recommendations on how policymakers can support the market to continue its growth.

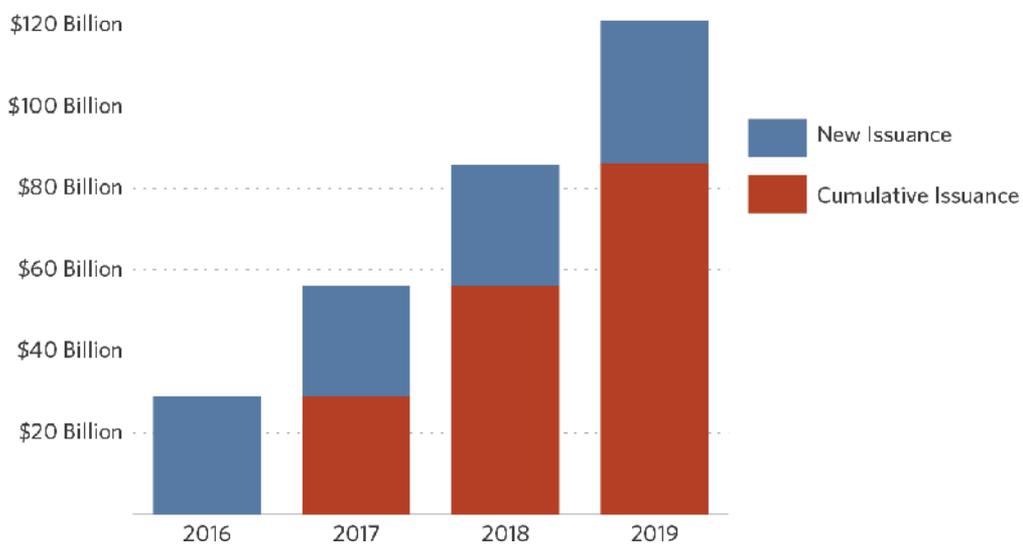
Investment Trends

Our analysis comprehensively shows the Chinese domestic labeled green bond market has grown to nearly USD 120 billion, quadrupling in size over four years and making it the second largest in the world.

Through new and extensive primary data collection, we account for USD 120 billion cumulative green bond issuance in China from 2016 to 2019.³

Of the nearly USD100 billion green bonds issued in China from 2016 to April 2019, clean transportation and clean energy received the largest share of proceeds with USD 17 billion and USD 16 billion respectively. Within the clean energy sector, hydropower accounted for the largest share at USD 7 billion. China Three Gorges Corporation was a leading issuer of green bonds for hydropower, with around USD 1.9 billion going towards the construction of several large-scale hydropower stations with capacities of at least 10 GW each. Within clean transportation, urban rail transit contributed the

Figure ES1: Cumulative Issuance in China's domestic green bond market (Unit: Billion USD)²

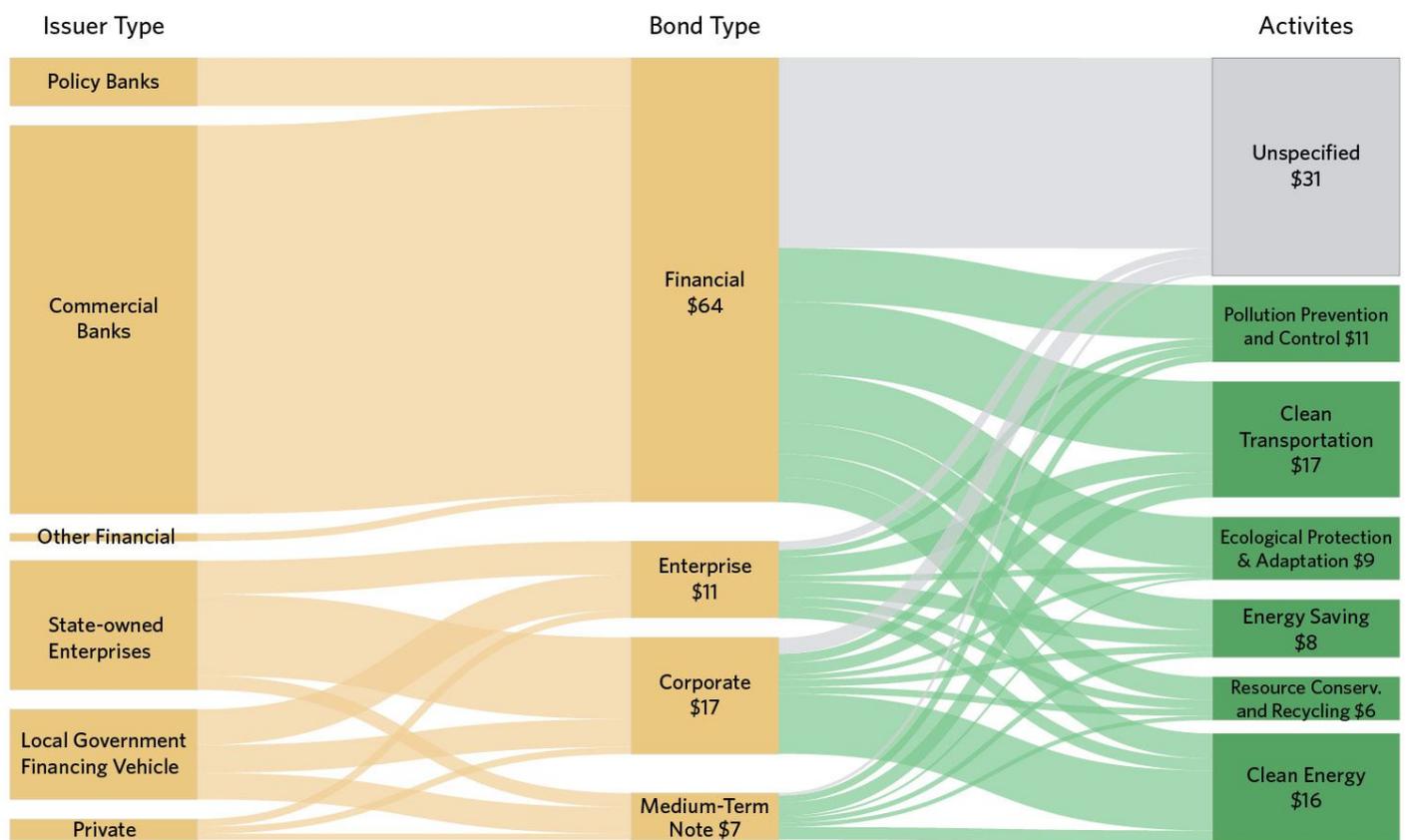


1 Estimate for 2015-2020 period; Yao Wang (2018)

2 Since only labeled green bonds have committed to upholding green standards, this figure represents the labeled green bond market only. Note: "labeled" green bonds here is in reference to those that issue in alignment with China's green bond project catalogue. ABS issuance is not included in the figure

3 Excluding ABS issuance.

Figure ES2: Allocation of proceeds, from issuers to allocation sector (2016- April 2019)



*Note: Mid-term Notes are the most common non-corporate financial debt instrument. Only mid-term notes are analyzed here.

largest share at USD 5.7 billion. According to The Green Bond Endorsed Project Catalogue (2015 Edition), green bonds can be issued for projects with marked environmental benefits, and are categorized into 6 categories (Level-1 Category) and 31 sub-categories (Level-2 Category). Three of these sub-categories allow coal-related activities, including efficiency-related improvements for coal-fired power generation, building facilities for coal washing and processing, as well as resource utilization related to coal mining and washing processes. This is a contentious issue with international green bond investors.

Almost a third of total proceeds, USD 31 billion, were unspecified or pending allocation. Bonds issued primarily by banks make up the largest share of unspecified bonds; largely because financial institutions are intermediaries and provide capital to end-users who may not have been identified or may not have allocated the funds prior to issuance.

In terms of the share of funds that went to new or existing projects, 28%, or USD 19 billion, were used to finance new projects, and 10% went towards refinancing debt or to existing projects. The remaining 51%, most

of which are financial bonds, lacked project-level details and the breakdown between new projects and refinancing remains unknown.

Issuer and investor characteristics

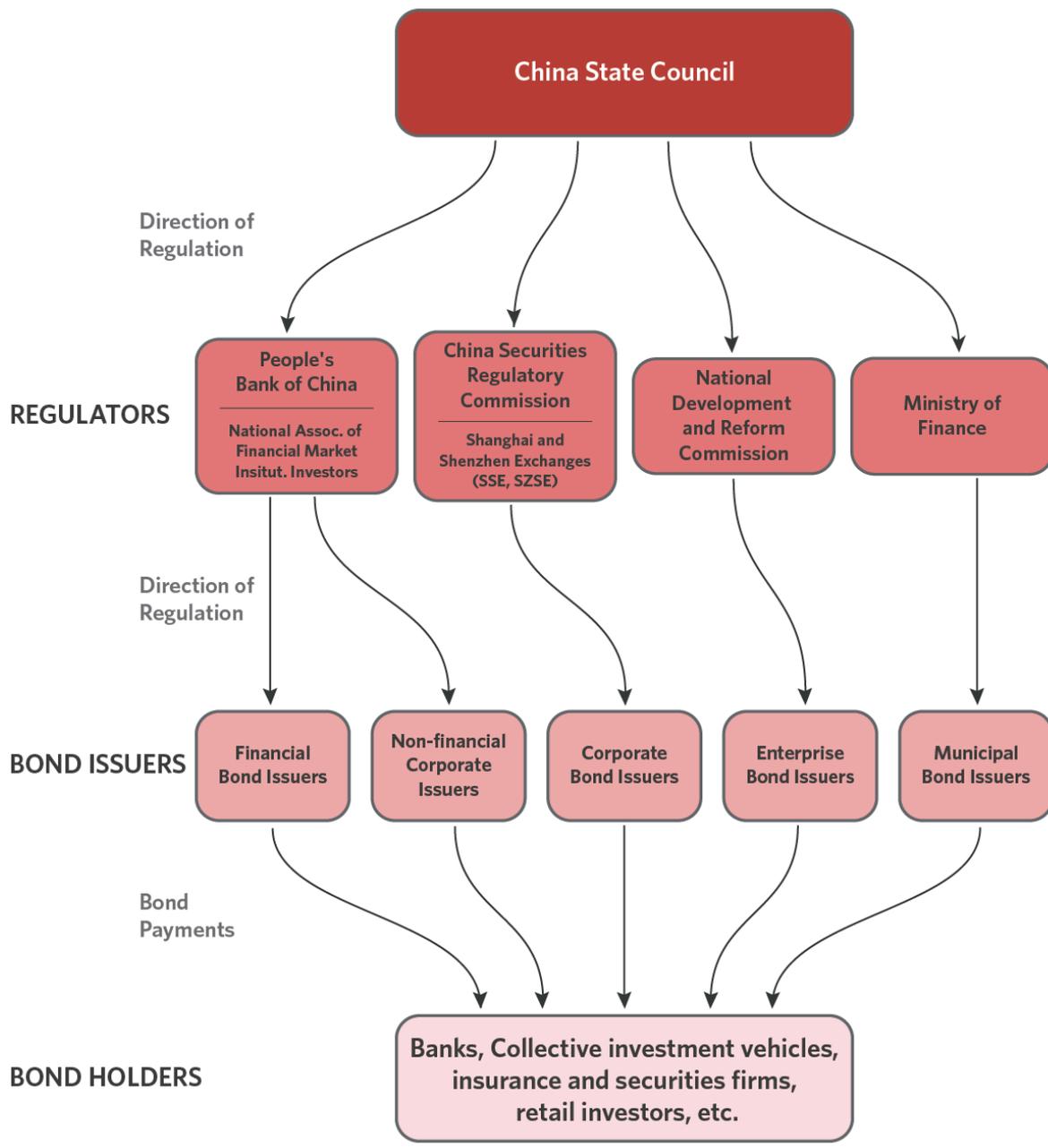
Most green bond issuers in China have been large entities with strong credit ratings that have broad access to bond markets.

In general, participation in the green bond market in China is limited in its diversity. Most issuers are large entities with strong credit ratings. Nearly all investors are domestic.

The benefit of green bond issuance remains mainly reputational in nature and if there is a financial impact, it remains small considering the added costs and restrictions associated with green bonds.

FUNCTIONING OF THE MARKET

China's green bond market has multiple regulatory authorities providing oversight over different parts of the market as illustrated below. Each regulator provides its own guidelines for green bond issuance and regulates different types of bonds. The resulting segmentation poses several consequences for the market such as inconsistent standards and different expectations for reporting which can decrease efficiency and increase cost.



Green bonds in China have almost entirely been held by domestic investors, partly because foreign participation in the domestic Chinese bond market is relatively low compared to other similar bond markets, at around 1.6% of the total value of bonds outstanding.⁴ Recently, programs such as Bond Connect have allowed international investors to increase foreign holdings in onshore markets. Specifically for green bonds, there are foreign investor concerns regarding eligible activities, in particular coal-related projects.⁵

Credit ratings for green bonds are highly skewed towards the upper end of the spectrum, just like they are in the wider Chinese bond market. Most bond types are required to obtain a minimum rating of A- in order to be listed and some firms must obtain additional guarantees depending on their balance sheet.⁶ Comparing the overall bond market between the US and China shows that in China most issuances are AAA- rated with a very high skew towards the top end while in the US, most are BBB+ and follow a normal statistical distribution. This potentially implies an inefficient allocation of capital as many investment-grade participants are effectively locked out of credit markets. 78% of green bonds in China have an AAA rating.

Impact & Additionality

We reviewed reporting from 114 issuances that have publicly-available reporting of environmental impacts out of 233 issuances prior to September 2018.

Proceeds from green bonds in China are largely going to environmentally-relevant projects that likely wouldn't have occurred without the market, though there is a lack of publicly-available reporting.

The cumulative impacts of these green bonds as reported by issuers are 52.6 million tons of CO₂e reduced and 11.2 GW of installed clean energy capacity.

4 IMF, 2019

5 Bloomberg, 2019

6 Enterprise bonds, corporate bonds, medium-term notes, and commercial paper require minimum ratings of AA or A-, and in some cases AAA. IMF (2019)

7 PBoC Green Bond catalogue (2015)

A significant share of green bond investment has been directed to clean transport including more than 3000 km of rail/subway line constructed.

In terms of additionality, we used the number of entrants to the green bond market as a proxy and found that the overall number of green-related issuances drastically increased following the central bank's launch of the green bond endorsed project catalogue in December 2015.⁷ More than 160 new issuers have entered the market since 2016, and these new entrants have increased the total amount of bond financing for green projects in China, highlighting its additionality. Proceeds from these bond issuances have gone to environmentally relevant projects within the sectors allowed under domestic regulations and some have reported substantial environmental impacts.

Recommendations

The Chinese green bond market is in a clear upward trajectory expected to continue in the years ahead. However, there are opportunities for policymakers and investors to increase the rate of growth, broaden both the issuer and investor base, and increase the effectiveness of the market. Some of these opportunities include:

Continue growing the market through clear guidelines and incentives

The market segmentation created by different authorities and regulatory frameworks impacts the efficiency of the market, creates unnecessary burdens on issuers, and decreases transparency. Authorities can work to address market segmentation by seeking approaches to consolidate requirements and clarify guidelines.

Authorities can also strengthen regulations on use-of proceeds in a manner consistent with China's priorities. Current regulations are mostly high-level principles and lack specific guidance or mandatory requirements. Specific procedures must be provided to enhance clarity in the market. They may be backed by appropriate enforcement mechanisms, such as fines for issuers failing to meet reporting requirements.

Finally, the development of the market can continue to be supported through sensible financial incentives. Provincial-level incentives have been effective in increasing issuance, but care must be taken these are fiscally responsible.

Diversify the issuer and investor base

Easing credit rules may help increase the participation of entities that have less access to credit but are still creditworthy as current regulations favor large issuances with AA or AAA ratings. Non-financial private companies are also underrepresented in the market and could play a larger role.

To meet the needs of smaller projects and borrowers, authorities and issuers can work to develop the green asset-backed securities (ABS) market. The transaction costs of bond issuances favor large issuances that do not meet the needs of many types of projects. Using ABS, smaller projects can be aggregated and transaction costs reduced. Another strong opportunity is to increase linkages between green loans and green bonds as green loans can meet the needs of small projects. Outstanding green loans reached RMB 9.23 trillion (USD1.37 trillion) by March 2019, accounting for 9.9% of the total outstanding loans.⁸ There is a strong opportunity for financial intermediaries to raise more capital for green loans by issuing green bonds. Specific measures could include raising awareness amongst banks, developing purpose-built institutions like green banks, and developing tailored regulations and incentives to enable greater participation by banks.

Increasing alignment with international standards can draw more international investors. Clean coal is not allowed under international standards and allocations to working capital should be limited to less than 5%.

Strengthen the monitoring, reporting and verification system

A robust MRV system will help enforce transparency and boost credibility in the green bond market. Our analysis faced limitations due to the lack of project-level data on green bonds that was either difficult to find or incomplete. For bonds issued by financial institutions, which account for the majority of the market by market value, we find that project-level details on the final allocation of proceeds are not always disclosed, remaining at the category-level in most cases. Other project-level details, such as whether proceeds were

used for a new or existing project, were not always available. The limited disclosure on the latter point, however, is not unique to the Chinese market.

Specific measures that regulators can take include establishing a centralized depository of green bond financial and environmental data. A major challenge to understanding the green bond market in China is the difficulty in gathering the data for reporting. A centralized depository could be set up by an independent entity that would hold all relevant data and make it accessible to third parties in a free and transparent manner. Another measure is to introduce a standardized framework for environmental impact reporting that provides common methodologies and metrics for issuers to track and report on the impact of their green bonds. This will allow market to better understand and communicate the benefits of green bonds and draw environmentally-conscious investors.

⁸ PBoC, quoted in China Daily (2019)

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1. Introduction

China has made great strides towards greening its financial system in recent years. There is a broad shift towards sustainable investment supported by a high level of political buy-in. This is most notably demonstrated by the State Council's commitment to construct an "Ecological Civilization," a concept first introduced in 2007 and increasingly emphasized in China's subsequent Five-Year Plans.⁹ Under this framework, various 'greening' strategies and principles have been adopted by Ministries and other governmental bodies.

The development of the Chinese green bond market is an important part of this ambition. A green bond is a financial instrument whose proceeds are earmarked for projects with environmental and climate objectives. Supported by various directives, China's green bond market grew from almost zero to the second largest in the world in just a few years. In 2019 it accounted for 13% of the global issuance (USD34.8bn).¹⁰ The growth of green bond issuance in China is also one of the highest in the world, averaging 30% growth annually. The key player in driving this growth have been the central bank (People's Bank of China), which officially launched the green bonds market in China through publishing guidelines and using Green Bond Endorsed Project Catalogue in 2015 as standard for green projects, supported by regulatory guidance from the National Development and Reform Commission (NDRC) and the China Securities Regulatory Commission (CSRC).

Given the rapid growth of the market, as well as expectations for future growth, there is a need to understand the market's effectiveness. This report is part one of a four-part series on Green Finance in China and the green bond market. It assesses the Chinese green bond market with the objective of understanding how the market is mobilizing investment in green assets

and activities. This can inform how green bonds are contributing to a green transition in China and how investments align with China's policy priorities and global mitigation and adaptation needs.

The report starts with a review of current investment trends, drawing on various data sources including the International Institute of Green Finance (IIGF) green bond database, Climate Bonds Initiative (CBI), Wind Financial Terminal, China Central Depository and Clearing (CCDC), Bloomberg New Energy Finance (BNEF), and the Shanghai and Shenzhen Stock Exchanges. All publicly available green bond reporting and verification documents were examined to supplement the green bond database and identify specific investment trends in the allocation of bond proceeds which have not been published before (See Methodology in Annex). The bulk of our research efforts consisted of tracking project-level details and verifying the specific use of bond proceeds wherever possible. Data was collected and is current as of April 2019.

Then, the report provides an overview of the state and functioning of the market, covering the regulatory framework, investor base, and the role of local governments in driving the green bond market. Finally, to understand whether green bonds are increasing flows towards green assets, it examines how green bond flows have been contributing to environmental impact and whether market participants are changing behavior to engage in green projects that would not have been funded in the absence of green bonds – in other words, its additionality. Ultimately, we hope that our assessment can help investors and policy makers understand the state of the market and provide a vision for how it can grow and achieve a central role in the transition of China's economy towards green growth.

9 See also "Opinions of the CPC Central Committee and the State Council on Accelerating the Construction of Ecological Civilization"《中共中央国务院关于加快推进生态文明建设的意见》

10 CBI (2020). 2019 Green Bond Market Summary; IIGF green bond issuance data for China. CBI's China issuance data is lower as it excludes green bonds that do not meet international definitions.

2. Investment trends

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 2019.¹¹

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.¹³

2.1 Financial flows

An overview of the financial flows within the Chinese green bond market from 2016 through April 2019 is presented in Figure 2. It depicts, from left to right, the categories of issuers, the types of bonds issued according to the regulatory classification in China and the ultimate use of proceeds reflecting the six categories identified by the People Bank of China’s green bond catalogue, which are further divided into 31 sub-categories. In our review, we found that almost a

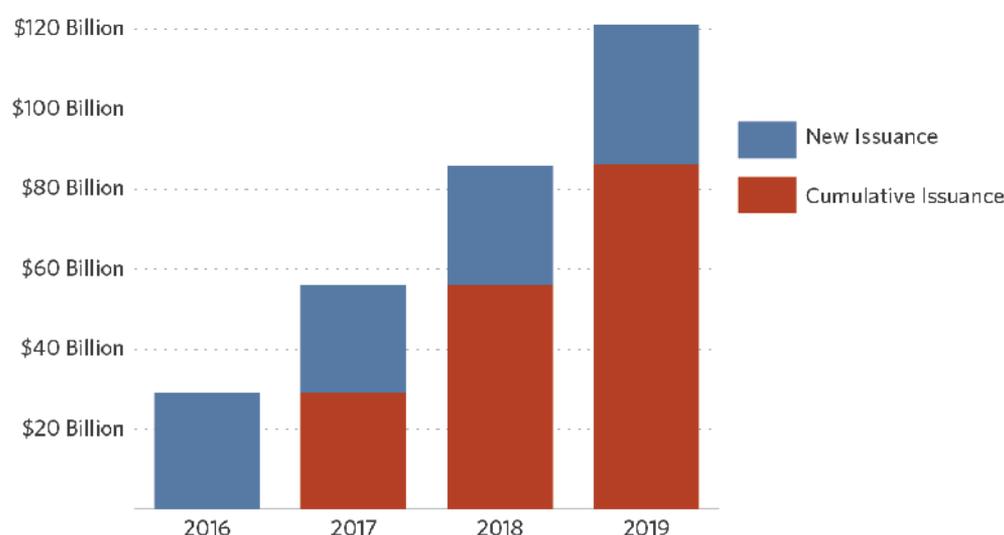
third of proceeds were unspecified or pending allocation (USD 31 billion). Among the specified proceeds (in green), clean transportation (USD 17 billion) and energy (USD 16 billion) capture the largest share followed by pollution prevention and control (USD 11 billion).

At the sub-category level, the largest share of proceeds went to hydropower (USD 7 billion), followed by facilities construction for pollution prevention and control (USD 6.4 billion), urban rail transit (USD 5.7 billion) and solar (USD 3.7 billion).

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Within the hydropower sector, China Three Gorges Corporation accounted for the largest share of issuance, with financing from bonds issued over three years (as much as USD 1.9 billion) going towards construction of the 10,200 MW Wudongde Hydropower station. Other hydropower projects listed in the China Three Gorges’ green bond frameworks were large-scale as well, including the Baihetan Hydropower Station (15,200 MW), Xiluodu Hydropower station (13,860 MW) and Xiangjiaba station (6448 MW).

Figure 1: Cumulative Issuance in China’s domestic green bond market (Unit: USD Billion)¹⁵



11 CBI (2020). 2019 Green Bond Market Summary; IIGF green bond issuance data for China. CBI’s China issuance data is lower as it excludes green bonds that do not meet international definitions.

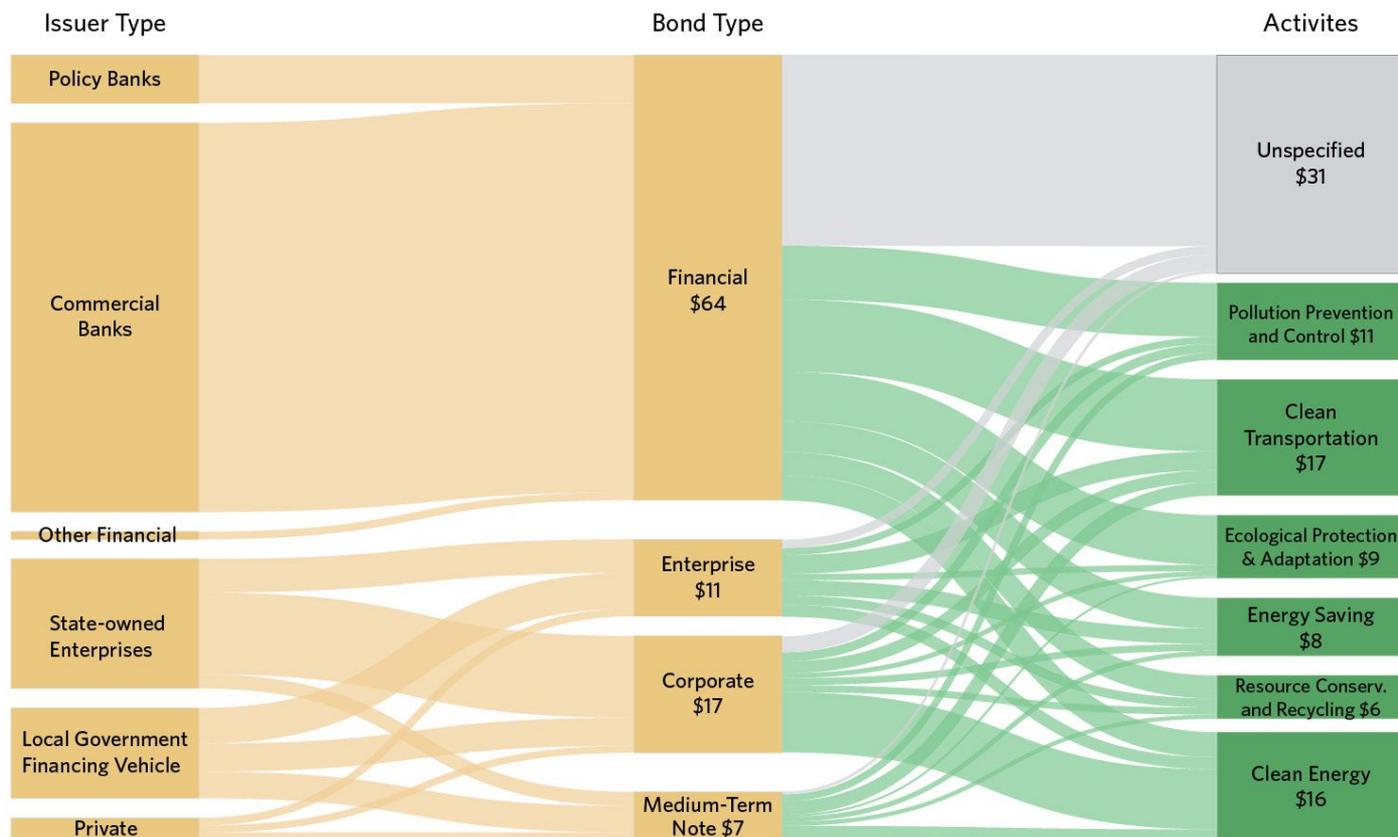
12 S&P (2019). <https://www.spglobal.com/en/research-insights/articles/credit-trends-demystifying-china-s-domestic-debt-market>

13 CBIRC (2019)

14 Since only labeled green bonds have committed to upholding green standards, this section provides an analysis of the labeled green bond market only.

15 See Annex for the full detailed list of eligible project categories

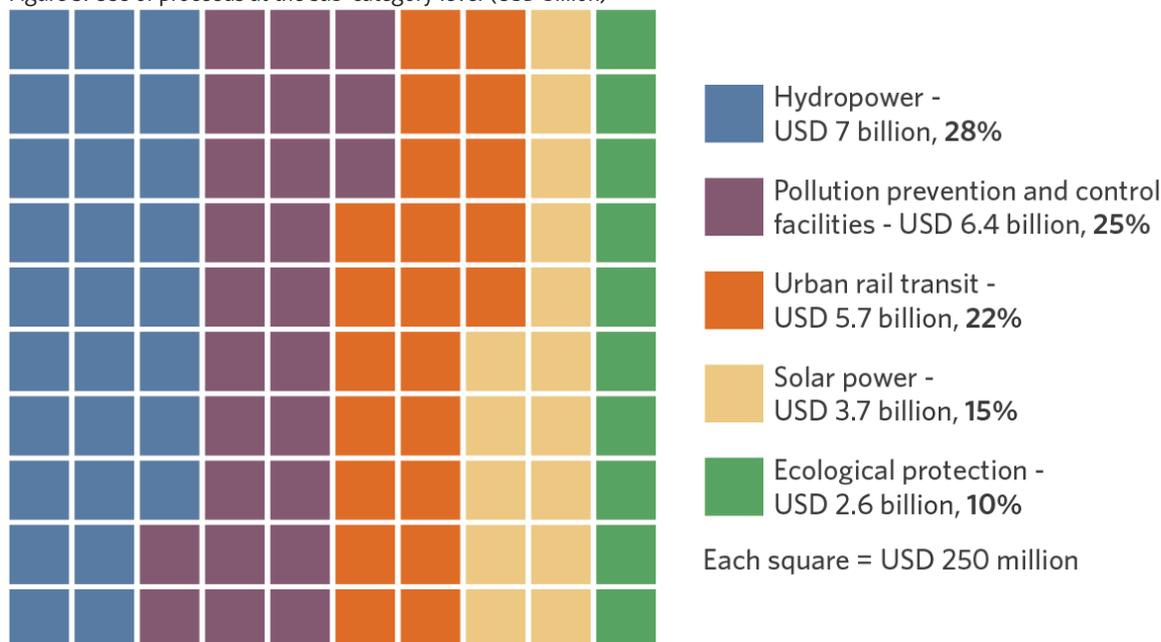
Figure 2: Allocation of proceeds, from issuers to allocation sector (2016- April 2019)



Coal-related activities are featured in three different categories of the catalogue. “Clean utilization of coal” is endorsed in the Pollution Prevention and Control category to which USD 380 million was allocated by five

issuers.¹⁶ This category allows funds to be used for the construction and operation of facilities for coal washing and processing, as well as the adoption of technologies for pollution treatment of coal, such as coal gasification.

Figure 3: Use of proceeds at the sub-category level (USD billion)



16 Leshan City Commercial Bank, Bank of Communications, Shanxi Jincheng Anthracite Mining Group, Pingdingshan Tianan Coal Mining Co., Ltd., Shanxi Jin Hua Yumei coal chemical Industry

The standard for this category is set by the Action Plan of Clean Utilization of Coal (2015-2020) and Opinions on Regulating Coal Fuel Demonstration Work.

Coal-related activities are also included in the catalogue’s Energy Saving category and Resource Conservation category. Coal-fired generation units are eligible for green bond proceeds as long as it utilizes ultra-supercritical or supercritical Combined Heat and Power (CHP) generator units that are no less than 300MW capacity. Coal mining and washing is eligible for green bond proceeds if they’re related to improving resource efficiency and utilization of tailings.

2.2 Project-level use of proceeds

Within the share of green bonds that specify use of proceeds, 28% was reported as going to new projects and 10% towards debt refinancing or for existing projects. 51% was not specified, largely due to financial bond issuers not disclosing information at this level of detail or because final allocation is pending.

Because a large portion of bonds were issued by banks that had not yet fully allocated proceeds after issuance, this information was missing for many of the bonds at the time of analysis. On the whole, however, post-issuance reporting often lacks project-level details.

This lack of disclosure is not unique to Chinese issuers. Expanding reporting to the project level is an important step for increasing transparency.

Eleven percent of proceeds went to replenishing working capital for the issuers. Working capital means that proceeds may be used for various short-term operating expenses of the issuer. However, working capital proceeds could potentially finance the issuer’s other non-green business lines.¹⁷ Even for “pure-play” green bond issuers (companies whose revenue is primarily derived from green business activities), the consensus internationally has been to move towards reducing the share of working capital allocations for green bonds.¹⁸

The major share of working capital allocations in the Chinese green bond market is partly due to the result of regulation for enterprise and corporate issuers, which allows up to 50% and 30% of bond proceeds to be dedicated to replenishing working capital, respectively. While not all enterprise issuers allocated the maximum permitted amount of 50% to working capital, every enterprise bond issuance had some funds dedicated to working capital, averaging around USD 95 million per issuance, or around 47% of the average size of issuance. Out of 54 unique enterprise bond issuances, 25 issuances allocated the maximum allowed 50% to

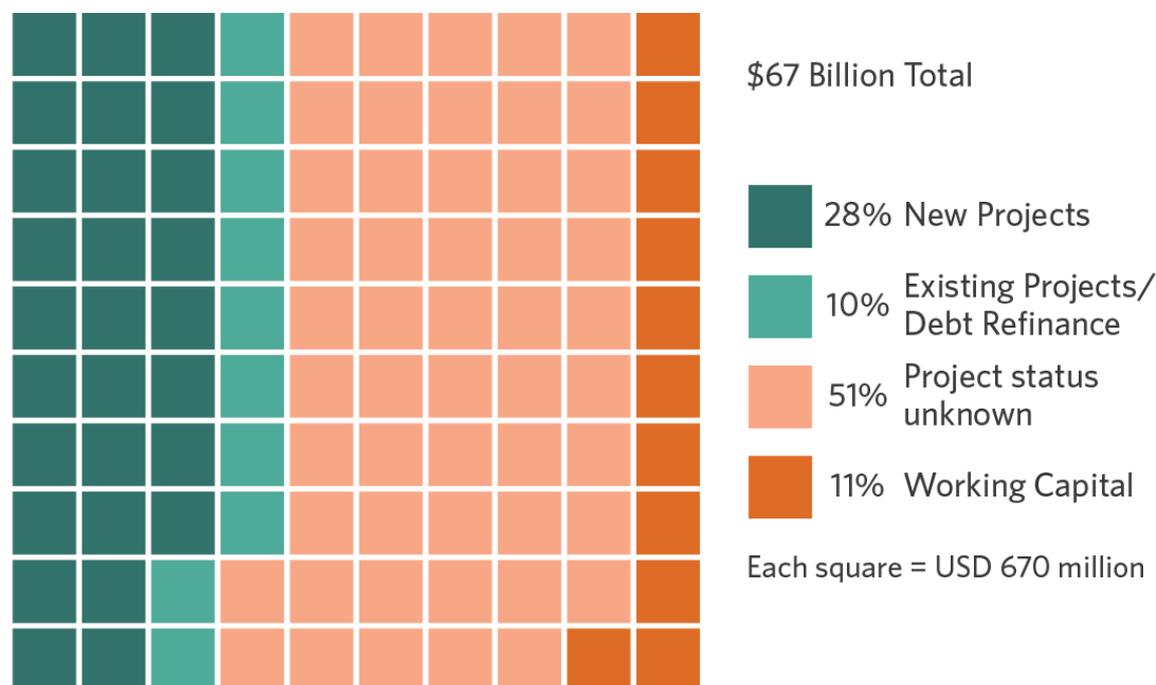


Figure 4: Proceeds analysis demonstrates lack of information for 51% of project investments and shows at least 28% is allocated to new projects.

17 CBI (2019) China Green Bond Market Newsletter Q1 2019

18 MSCI (2019) Bloomberg Barclays MSCI Green Bond Index Consultation

working capital. Working capital allowances provide flexibility to issuers to allocate proceeds later but also diminish transparency and potentially quality.

2.3 Types of Bonds and Issuers

Chinese regulators recognize four types of bonds:

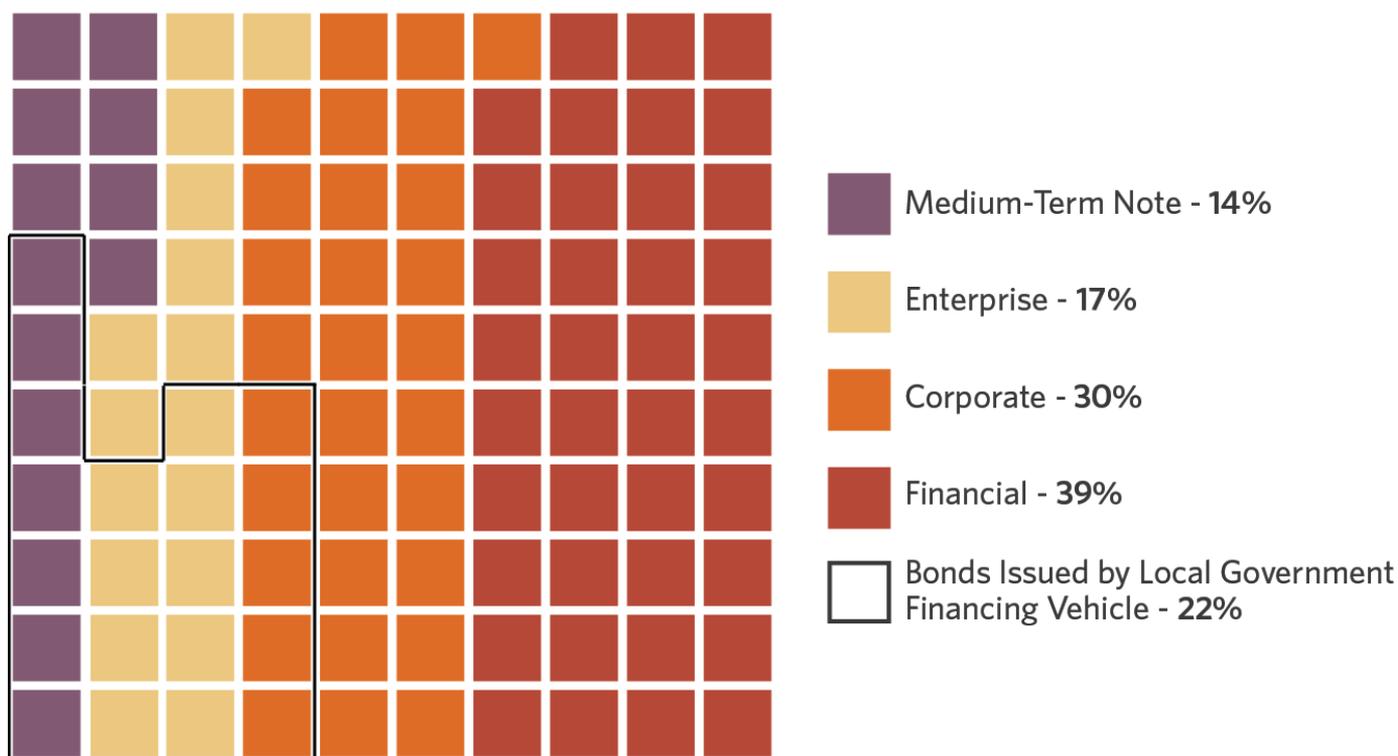
- **Financial bonds** – bonds issued by financial institutions, including three policy banks¹⁹ and commercial banks, and traded on the interbank market. Proceeds from these issuances are channeled into other uses through bank lending.
- **Corporate bonds** – bonds issued by state-owned enterprises and 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.

Figure 5 demonstrates how the size of issuance varies by bond type—for instance, financial bonds are 39% of the market by issuance count from 2016 to April 2019, but account for 65% of the market in terms of total issuance amount. In contrast, corporate bonds account for 30% of bond issuances, but only capture 17% in terms of issuance amount. The average size of financial bonds is USD 530 million, compared to USD 180 million for corporate bonds, USD 200 million for enterprise bonds, and USD 150 million for medium-term notes.

Most financial bonds are issued by commercial banks (87%) followed by the three Chinese policy banks (11%): the China Development Bank, the Agricultural Development Bank and the Export-Import Bank of China.

Corporate bonds account for 17% of the market. They contributed mostly to the clean energy sector (USD 8.6b), with a majority of proceeds going to hydropower. The remaining allocation of corporate bonds was relatively even across the green categories, with 4% of proceeds unspecified, while 13% of proceeds were allocated to working capital (USD 2bn).²⁰

Figure 5: Distribution of bond types, by issuance count



19 Export-Import Bank of China, China Development Bank, Agricultural Development Bank of China

20 Corporate bonds also account for the highest share of private placement bonds, which is a relatively simpler form of issuance that does not require regulatory approval to be listed in the exchange. A total of USD 6 billion in the green bond market has been issued as private placement, of which corporate bonds account for 73%.

Enterprise bonds account for 11% of the market, with most proceeds going to urban rail transit and industrial energy saving technologies. The State Grid Corporation accounted for the majority of projects related to energy saving among enterprise bond issuers. Not surprisingly, enterprise bonds contributed nearly half the amount of total proceeds dedicated to working capital across all bond types. As noted above, this is mainly the result of NDRC's regulation allowing up to half of proceeds to go to working capital. All enterprise bond issuers have dedicated some portion of their funds for this purpose, while not all used the maximum permitted amount. Out of 54 unique enterprise bond issuances, 25 issuances had 50% of proceeds going to working capital.

Medium-term notes are 3 to 5-year maturity bonds issued by a variety of issuers encompassing state-owned enterprises, non-financial corporates, and LGFVs. They represent 7% of the market. In contrast

to enterprise bonds, medium-term notes report a high share of proceeds as going towards debt refinancing for green projects (31%), while only 3% is dedicated to working capital related to green projects.

Local Government Financing Vehicles (LGFVs) are an issuer type unique to the Chinese market. As they have been a source of increasing local government debt, LGFVs are now highly regulated and no longer allowed to raise funds on behalf of the government. LGFVs have issued bonds across three different bond types, accounting for 11% of the market by issuance amount and 22% by issuance count (Figure 5). The average size of LGFV-issued bonds are USD 65 million. Leading LGFV issuers are Wuhan Metro Group, Beijing Enterprises Water Group, and Chengdu Rail Transit Group.

Table 1: Top issuers and categories by bond type

	Financial Bonds (\$64b)		Corporate Bonds (\$17b)		Enterprise Bonds (\$11b)		Medium-Term Notes (\$7b)	
Top Categories	Waste Treatment	\$3.9b	Hydropower generation	\$5.4b	Urban Rail transit	\$0.94b	Wind power generation	\$0.9b
	Urban Rail Transit	\$3.3b	Urban Rail Transit	\$0.87b	Industrial Energy Saving	\$0.77b	Waste Treatment	\$0.56b
Top Issuers	Industrial Bank	\$15.9b	China Three Gorges Corp	\$6b	State Grid Corporation	\$1.4b	Wuhan Metro Group	\$0.79b
	Bank of Communications	\$7.2b	Beijing Infrastructure Investment Co., Ltd.	\$0.87b	Wuhan Metro Group	\$1b	Chengdu Rail Transit	\$0.72b
	Shanghai Pudong Development Bank	\$7.2b	CECEP Group	\$0.72b	China Longyuan Power Group	\$0.87b	China Three Gorges	\$0.72b

3. The State and Functioning of the Market

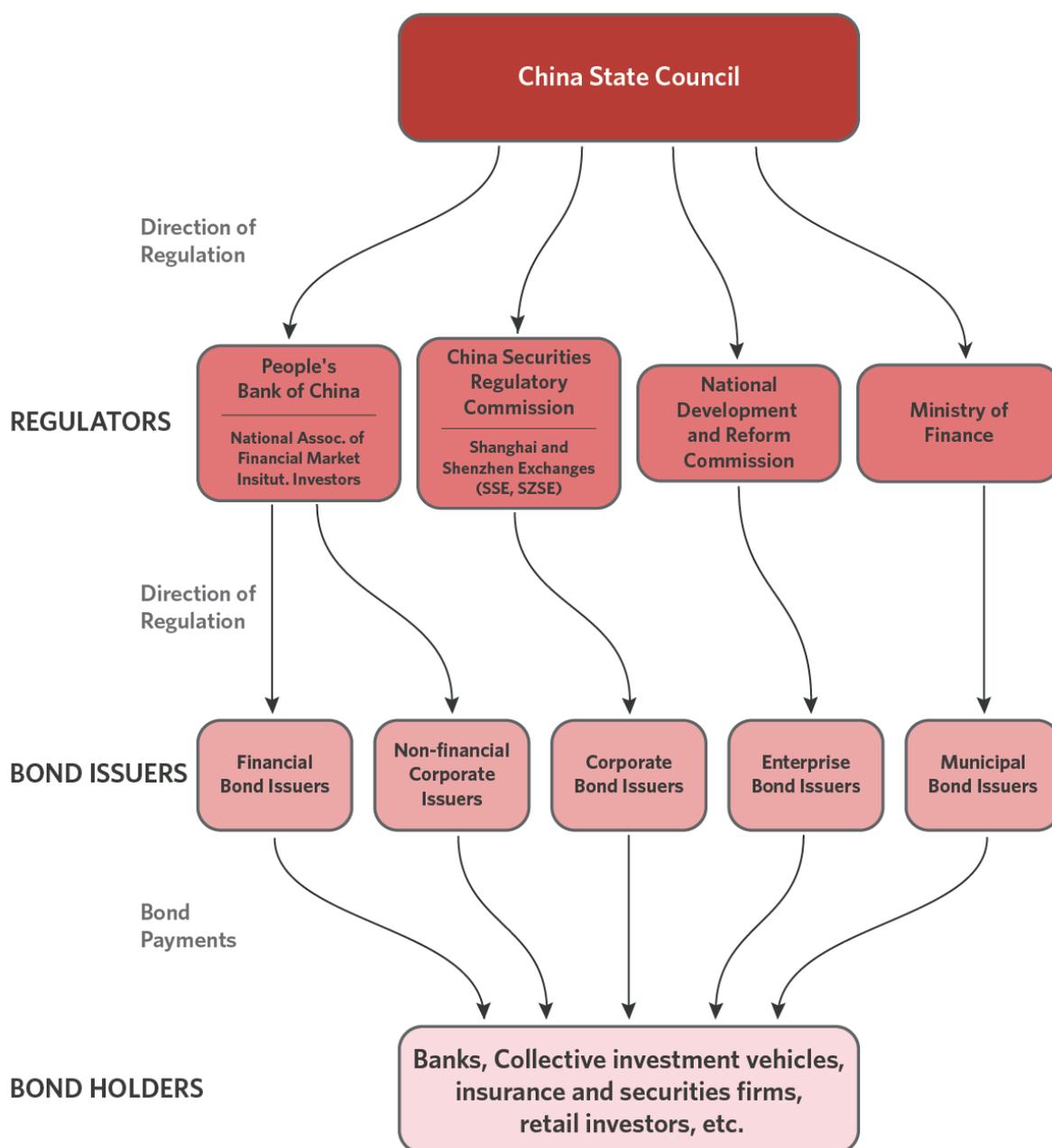
3.1 Regulatory framework

The key regulatory authorities of China’s green bond market include the People’s Bank of China (PBoC), the National Development and Reform Commission (NDRC), China Securities Regulatory Commission (CSRC), and Ministry of Finance (MoF),²¹ all of which are accountable to China’s State Council. Additional guidance is provided by semi-regulatory organizations, the National Association of Financial Market Institutional Investors (NAFMII), an industry

association under the PBoC, and the Shanghai and Shenzhen Stock Exchanges, which are overseen by the CSRC.

China’s green bond market has multiple regulatory authorities providing oversight over different parts of the market. This is partly a reflection of how the financial system has historically developed in China, which was marked by regulatory competition among authorities.²² The resulting segmentation poses several

Figure 6: Map of China’s green bond regulators and market participants



21 MoF is the regulator of municipal bonds but has not published any regulations for green municipal bonds.

22 IMF (2019)

consequences for the market, such as inconsistent standards depending on the type of issuer and different expectations for mandatory reporting.

Regulatory oversight is distributed amongst authorities according to the bond type. Each regulator provides its own guidelines for green bond issuance. Table 2 below illustrates how the green bond market is regulated by different entities depending on the type of issuer.²³ The two largest bond categories, financial bonds and corporate bonds, are regulated by the PBoC and CSRC, respectively. The third largest category of bonds, enterprise bonds, are regulated by the NDRC.

There are financial and non-financial incentives for green bond issuance in China. Financial incentives are predominantly applied at the local and municipal level. Non-financial incentives are primarily reputational benefits which are very important in China.

Labeling 'green' is important because it means that issuers voluntarily agree to comply with the green bond regulations, which includes the transparent management of bond proceeds earmarked for green projects, obtaining third party verification, as well as reporting on environmental impacts. While unlabeled green bonds have funded green projects in the past, growing investor demand for green financial products and China's high-level push for greening the financial system has prompted more and more issuers to label their green bonds. Along with increasing investor demand, there have been increasing regulations to improve transparency and investor confidence in the green bond market.

Table 2: Regulatory authority by bond type

Bond Type	Regulatory Authority					Related Green Bond Policy(s)
	PBoC	NDRC	NAFMII	CSRC, Stock Exchanges	Ministry of Finance	
Financial bonds <i>Issued by financial institutions, including the three policy banks and commercial banks, traded on the interbank market.</i>	✓					PBOC Announcement No.39 (2015); Notice on Strengthening the Supervision and Administration of the Continuation Period of Green Financial Bonds (2018)
Corporate bonds Bonds issued on the Shanghai or Shenzhen Stock Exchanges.				✓		Guidelines for Supporting Green Bond Development (2017); Notice on GB Pilot Program (2016)
Non-financial corporate debt instruments Bonds issued by non-financial corporates, including medium term notes and short-term commercial paper .	✓		✓			Guidance on Debt Financing Instruments Issuance from Non-financial Corporates (2017)
Enterprise bonds Bonds primarily issued by state-owned enterprises, traded on the interbank market, Shanghai or Shenzhen Stock Exchanges		✓				NDRC Green Bond Guidelines (2015), NDRC 2019 Green Industry Guiding Catalogue
Municipal bonds Bonds issued by local governments and municipalities.					✓	No official policy

23 See annex for full comparison of guidelines

Table 3: Comparison of the PBoC Green Bond Catalogue and NDRC Green Industry Guiding Catalogue

PBoC Green Bond Endorsed Project Catalogue	NDRC Green Industry Guiding Catalogue 2019
<ol style="list-style-type: none"> 1. Energy Saving 2. Pollution Prevention and Control 3. Resource Conservation and Recycling 4. Clean Transportation 5. Clean Energy 6. Ecological Protection and Climate Change Adaptation 	<ol style="list-style-type: none"> 1. Energy Saving and environmental protection industry 2. Cleaner production industry 3. Clean energy industry 4. Eco-environmental industry 5. Green upgrading of infrastructure 6. Green services

HOW CHINESE GREEN BOND TAXONOMIES’ GREEN DEFINITIONS DIFFER WITH INTERNATIONAL STANDARDS

China’s green bond regulations do not fully align with various international standards. The main difference is that China allows clean coal and efficient utilization of fossil fuels for green bond financing. Both PBoC by using the Green Finance Committee (GFC)’s taxonomy and NDRC consider clean coal and efficient utilization of fossil fuels to be valid uses of proceeds, which is inconsistent with most of the different international standards for green bond projects, such as the EU’s proposed green bond standard, the Climate Bond Standard, or the ASEAN standard.

However, the reverse case also exists such as NDRC’s 2019 Green Industry Guiding Catalogue, upon which the forthcoming updated green bond taxonomy will be based, excludes passenger-rail - which is included in most international standards. In addition, while nuclear power is excluded from PBoC’s standard, it is included in NDRC’s and EIB’s standard, while most other international standards don’t include it. Further research and efforts to improve compatibility between China and the EU have taken place over the last years, for instance through the white paper jointly by the EIB and GFC.

Amounts allowed to be allocated for working capital are another barrier. Working capital allocations for Chinese green bonds can exceed the 5% threshold in international guidelines. Most of the non-alignment is attributable to enterprise bonds, which are allowed to allocate up to 50% of proceeds to working capital or debt repayment, while corporate bonds are allowed up to 30%. Despite these deviations from international standards in green bond regulations, China remains the largest source of internationally-aligned green bonds.

24

24 EIB & GFC (2018). Phase II: The Need for a Common Language in Green Finance

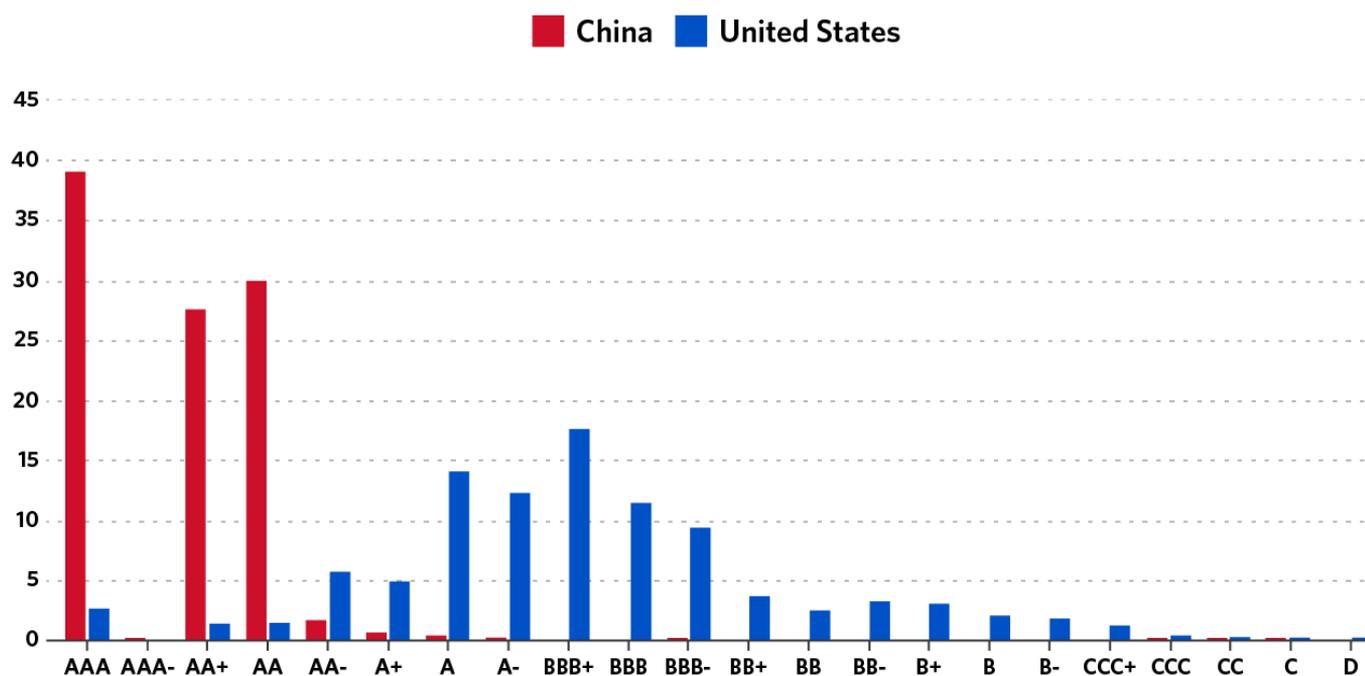
3.2 Issuer and investor characteristics

Most issuers in China are large entities with strong credit ratings that have broad access to credit markets. Stringent issuance requirements have also led to a skewed distribution towards the upper end of credit ratings in the overall bond market (See Figure 7).

obtained for 78% of the market (Figure 7). In contrast, less than 6% of bonds in the United States obtain a rating of AA and above.

Bonds are almost entirely held by domestic investors among which collective investment vehicles account for about 60%, followed by banks and securities firms.²⁶

Figure 7: Credit Bond Ratings Distribution: China and the United States, 2017 (percent)



Due to a difference in ratings systems and rating organizations in China and internationally, a similar bond would tend to get a higher credit rating in China than it would get elsewhere. This potentially implies an inefficient allocation of capital as a large number of participants are effectively locked out and weakens the case that green bonds in China significantly increase access to credit. Most bonds, excluding private placement bonds, are required to obtain a minimum rating of at least A- or AA, and in some cases AAA, in order to be listed. Firms with a high leverage ratio are required to obtain external guarantees in addition to meeting the minimum rating requirement. For instance, all enterprise bond issuers with leverage ratios higher than 75% must obtain external guarantees, unless they are an AAA or AA+ issuer.²⁵ As a result of these requirements, more than 96% of green bonds have been obtaining ratings of AA and above, with AAA ratings

Foreign investor participation in Chinese bond markets remains small at around 1.6% of the total value of bonds outstanding,²⁷ however experts expect that this share will increase in the coming years through the new Bond Connect Scheme, which grants overseas investors greater access to the Chinese mainland’s interbank bond market. Other positive trends include the inclusion of RMB-denominated bonds in global indices, such as the phased inclusion of Chinese sovereign and policy bank bonds into Bloomberg Barclays Global Aggregate Index starting April 2019.²⁸ China has also been implementing a series of policies opening its financial market to foreign firms, including the lifting of foreign-ownership limits in its financial sector one year ahead of schedule,²⁹ allowing foreign companies to rate and lead underwriting for a greater range of bond types, and scrapping quotas for foreign investment in local stock and bond markets.

25 Zhang Longmei and WU Yuchen. Credit Bonds. “The Future of China’s Bond Market.” IMF (2019)

26 IMF (2019) The Future of China’s Bond market.

27 IMF, 2019

28 Bloomberg (2019) <https://www.bloomberg.com/news/articles/2019-03-28/global-debut-for-china-s-13-trillion-debt-gives-pboc-new-ally>

29 SCMP (2019) <https://www.scmp.com/news/china/money-wealth/article/3019463/china-open-finance-sector-more-foreign-investment-2020-one>

4. Impacts and additionality

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,³⁰ out of a total 311 green bonds. The aggregate impacts reported by these issuers are listed in Table 4 below. 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. The lack of standardized methodology for monitoring and reporting environmental impact makes it difficult for comparability and accurate estimation.

Table 4: Aggregate environmental impacts reported by Chinese green bond issuers (Onshore)

Sector	Metric	Impact	Unit
Climate	Annual CO ₂ 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 constructed	3,022	Km
Waste Mangement	Annual waste processed	1,280,680	Thousand tons

³⁰ All available reporting including green bond frameworks, pre-issuance, post-issuance, third party verification documents

4.2 Contribution to China’s energy transition

While the green bond market has potential to impact the green energy transition, as of now, it has shown a relatively small impact compared with other financing methods.

A number of energy-related companies have participated in the green bond market. This includes the subsidiaries of all top five power producers in China³¹ as well as the “new energy” subsidiaries of other large energy companies. The participation of the top five energy producers is critical, as they collectively represent 26% of China’s total coal capacity.³² Issuance from the subsidiaries of these top five energy companies by April 2019 represented 3% of the total green bond market (USD 3b), with half the proceeds going to wind power (USD 1.4b), followed by hydro (USD 273m) and solar (USD 23m). The rest of proceeds went to working capital (USD 0.8b).

Accounting for all energy-related green bond issuers, collective issuance represented around 22% of the total green bond market (USD 21.7b).³³ Hydro accounts for a significant portion of the proceeds, mostly contributed by China Three Gorges Corporation. Meanwhile, solar has been lagging in green bonds proceeds allocation.

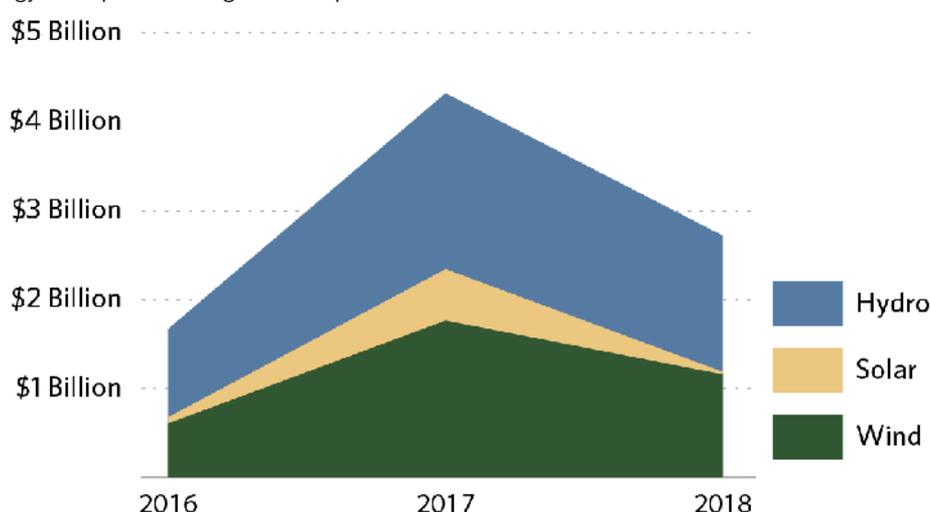
While green bond figures are sizable, it is still much smaller than the green loan market in China. Since the release of the Green Credit policy in 2007, Chinese banks have amassed considerable green loans in their

portfolio. Outstanding green loans reached RMB 9.23 trillion (USD1.37 trillion) by March 2019, accounting for 9.9% of the total outstanding loans.³⁴ Specifically, outstanding loans for clean energy projects stood at RMB 2.28 trillion, marking a growth of 1.7% from the beginning of the year.³⁵

Still, it is early days for the green bond market, and more impacts may be to come. The green bond market is relatively young, which means not enough green bonds have matured and provided full reporting on the allocation of proceeds. Most green bonds in China are short-term (i.e. maturities of less than five years) however, which means that the first batch of green bond issuances should be soon providing reporting on their full allocations (Figure 10). However, even with this reporting, it may be difficult to assess the impacts of green bonds in particular in the context of the central government’s nation-wide push for greening the financial system in its 13th Five Year Plan and its comprehensive Guidelines for Establishing the Green Financial System jointly issued by seven ministries in 2016.

Overall, while the bond market’s scale of contribution to an energy transition remains relatively negligible, the participation of top energy producers in the market, especially those with coal-dominant energy portfolios, could be a positive sign indicating potential for change in the near future.

Figure 8: Renewable energy mix represented in green bond proceeds (USD Billions)



31 China Datang, Huaneng, Huadian, China Energy Investment Corporation, and the State Power Investment Corp

32 Data from BNEF

33 Green bond issuers who are also power plant owners, according to BNEF power plant database

34 PBoC, quoted in China Daily (2019)

35 ibid

Overall, while the bond market’s scale of contribution to an energy transition remains relatively negligible, the participation of top energy producers in the market, especially those with coal-dominant energy portfolios, could be a positive sign indicating potential for change in the near future.

4.3 Additionality

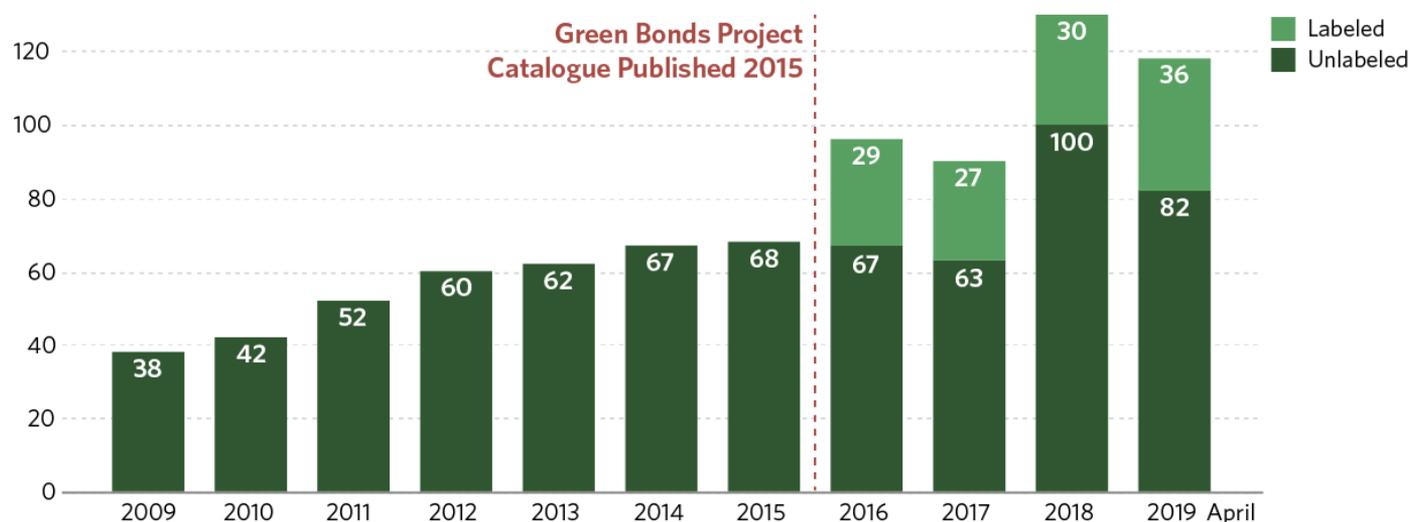
An activity is “additional” if it is unlikely to have happened under a business-as-usual scenario. Green bonds will only help address China’s environmental and energy transition goals if they shift investment towards technologies and activities that would not have happened otherwise and contribute positively to these objectives. To understand the effectiveness of the green bond market, it is essential to understand its additionality.

As the green bond market is relatively young, it is not possible to make a conclusive assessment but preliminary trends can be observed. We used the number of issuances and issuers in the market as a proxy indicator to understand whether the development of the green bond market has led to financing activity above a baseline scenario. Green projects have been financed in China through the bond market well-before the concept of green bonds existed. To take a baseline, we looked at all bond issuances since 2009³⁶ and categorized bonds whose use of proceeds would qualify as green under the project catalogue but were otherwise unlabelled as green bonds.

We find that the overall number of green-related issuances drastically increased following the publication of regulatory guidance and the green bond endorsed project catalogue in December 2015 and 2016. These include new entrants to the market who have not previously undertaken green projects through bonds.³⁸ Since the publication of the green bond guidelines and the project catalogue in 2015 and 2016, 181 unique issuers have participated in the green bond market. Among these, 21 were repeat issuers that had previously issued bonds for financing green projects, while 160 were new issuers. These new entrants accounted for 84% of all labelled green bonds issued (USD 82.6bn) since 2016.

Some of the new green bond issuers have been newly established state-owned enterprises (e.g. China Energy Conservation and Environmental Protection Group), and some have been large energy companies that are starting to undertake efficiency and renewable energy projects through newly established subsidiaries. Another difference between the unlabelled and labelled market was due to the entry of green financial bonds— however the extent of their previous participation in green projects through unlabelled bonds remains unknown.³⁹ Their entry in the labelled green bond market indicates that banks have actively started the process of identifying eligible green projects in their portfolio, as well as seeking new green opportunities for investment.

Figure 9 Annual Issuance of unlabelled bonds (green portion only) vs labeled green bonds (USD Billions)³⁷



36 Financial bonds are excluded in the IIGF database of unlabelled bonds.

37 The Green Bond market was created in China in December 2015 through the publication of PBOC Announcement No.39 (2015) and the attached Project Catalogue

38 Only the green portion of unlabelled green bonds are represented in the figure (68% of the total issuance amount; USD 580 billion out of USD 850 billion).

39 Financial bonds are excluded in the IIGF database of unlabelled bonds.

5. Conclusion and Recommendations

This report showed how the market has developed and where and how finance has flowed from the proceeds of green bonds. It also presented data on environmental and climate impacts of these issuances. The key findings are summarized below.

Where is finance flowing?

- Most funded projects are in clean transportation (17%), clean energy (16%), pollution prevention (11%), and energy saving (11%). However, a large share of the bond issuances had not been allocated or did not specify the use of proceeds (31%).
- Among the specified proceeds, at least 28% of proceeds from green bonds were used to build new projects, 11% were used for working capital and 10% were used for existing projects or to refinance debt. The remaining proceeds (51%) did not provide specific project-level details, highlighting some of the significant limitations in data availability.

How is the market functioning?

- 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 (USD34bn). The growth of issuance in China is also one of highest, averaging 30% annual growth.
- Although the Chinese green bond market has achieved very rapid growth, the market is still in its infancy, making up less than 1% of the total bond market in China.
- A majority of green bonds have very high credit ratings (78% are rated AAA), reflecting the high credit rating requirements for bond issuances in China. We can draw two potential conclusions from this: 1. Due to rating differences between China and elsewhere, bonds get higher ratings in China than they would internationally; and/or 2. There may be a potentially large share of issuers who have not been able to enter the green bond market due to the high rating requirements.

- International investors have not engaged meaningfully in the Chinese green bond market. Key reasons include differing expectations and understanding of the allowed use of proceeds, as well as China having a large closed capital account which limits capital flows in and out of the country. However, foreign investor participation is expected to rise in the coming years through the new Bond Connect Scheme that allows overseas investors from Hong Kong to trade in the China bond market through mutual access arrangements and the inclusion of RMB-denominated bonds in global indices.

Who are the key players and how are they incentivized?

- Bond issuance by financial institutions including commercial and policy banks dominates the green bond market. These make up 65% of all issuances and are known as “financial bonds”. Financial institutions are intermediaries who raise capital using financial bonds and then lend to projects and other beneficiaries. This arrangement is in line with the functioning of the financial system but decreases transparency as the ultimate use of proceeds by intermediaries is often not readily available.
- State-owned enterprises and corporates make up the remainder of the market (32%). Participation by private non-bank issuers is negligible (3%).
- Issuance by local government financing vehicles (LGFV), an issuer type unique to China, makes up 11% of the market. These proceeds are used primarily for urban infrastructure projects. LGFVs are now highly regulated, as they have been identified as a source of growing debt which has exploded to \$4.5-\$6 trillion in recent years. Several LGFVs received negative rating actions from S&P in 2018.⁴⁰
- There are financial and non-financial incentives for green bond issuance in China. Financial incentives are predominantly applied at the local and municipal level. Non-financial incentives are primarily reputational benefits which are very important in China.

40 S&P (2018)

Are investors changing their behavior? Is there additionality in the market?

- We plan to explore the question of additionality in more detail in a future report. However, in this report we carried out a preliminary assessment using the number of issuances and issuers in the market as a proxy.
- Green projects have been financed in China through the bond market well-before the concept of Green Bonds existed. To take a baseline, we looked at all bond issuances since 2009⁴¹ and categorized bonds whose use of proceeds would qualify as “green” under the project catalog but are otherwise “unlabeled” as green bonds.
- The overall number of green-related issuances drastically increased since the publication of green bond guidelines and the project catalogue in 2015 and 2016. 181 unique issuers have participated in the market. Among these, 21 were repeat issuers that had previously issued bonds for financing green projects, while 160 were new issuers that had not previously engaged in green projects through green bonds.

Recommendations

The Chinese green bond market is in a clear upward trajectory expected to continue in the years ahead. However, there are opportunities for policymakers and investors to increase the rate of growth, broaden both the issuer and investor base, and increase the effectiveness of the market. Some of these opportunities include:

Continue growing the market through clear guidelines and incentives

The market segmentation created by different authorities and regulatory frameworks impacts the efficiency of the market, creates unnecessary burdens on issuers, decreases transparency and increases perceived risks. Authorities can work to address market segmentation by seeking approaches to consolidate requirements and clarify guidelines.

Authorities can also strengthen regulations on use-of proceeds in a manner consistent with China’s priorities. Current regulations are mostly high-level principles and lack specific guidance or mandatory requirements. Specific procedures must be provided to enhance clarity

⁴¹ Financial bonds are excluded in the IIGF database for unlabeled bonds.

⁴² PBoC, quoted in China Daily (2019)

in the market. They should be backed by appropriate enforcement mechanisms, such as fines for issuers failing to meet reporting requirements.

Finally, the development of the market can continue to be supported through sensible financial incentives. Provincial-level incentives have been effective in increasing issuance but care must be taken these are fiscally responsible.

Diversify the issuer and investor base

Easing credit rules may help increase the participation of entities with less access to credit but are still creditworthy as current regulations favor large entities with AA or AAA ratings. Non-financial private companies are also underrepresented in the market and could play a larger role.

To meet the needs of smaller projects and borrowers, authorities and issuers can work to develop the green asset-backed securities (ABS) market. The transaction costs of bond issuances can favor large issuances that do not meet the needs of many types of projects. Using ABS, smaller projects can be aggregated, and transaction costs reduced. Another strong opportunity is to increase linkages between green loans and green bonds as green loans can meet the needs of small projects. Outstanding green loans reached RMB 9.23 trillion (USD1.37 trillion) by March 2019, accounting for 9.9% of the total outstanding loans.⁴² There is a strong opportunity for financial intermediaries to raise more capital for loans through green bonds. Specific measures could include raising awareness amongst banks, developing purpose-built institutions like green banks, and developing tailored regulations and incentives to enable greater participation by banks.

Increasing alignment with international standards can draw more international investors. Clean coal is not allowed under international standards and allocations to working capital should be limited to less than 5%.

Strengthen the monitoring, reporting and verification system

A robust MRV system will help enforce transparency and boost credibility in the green bond market. Some of our analysis was limited due to the lack of project-level details which remains difficult to find or incomplete. For financial bonds, the largest category of green bonds, ex-post reporting is readily available but disclosure often remains at the category-level. Details on whether

the proceeds are used for new or existing projects are often unavailable, although this is not unique to the Chinese market. Finally, due to the banks' role as intermediary lenders, disclosure on the project-level use of proceeds by loan recipients remain difficult to verify.

Specific measures that regulators can take include establishing a centralized depository of green bond financial and environmental data. A major challenge to understanding the green bond market in China is the difficulty gathering the reporting. A centralized depository could be set up by an independent

entity that would hold all reporting data and make it accessible to third parties in a free and transparent manner. Another measure is to introduce a standardized framework for environmental impact reporting that provides common methodologies and metrics for issuers to track and report on the impact of their green bonds. This will allow market to better understand and communicate the benefits of green bonds and attract environmentally conscious investors, both domestic and abroad.

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Annex

Methodology

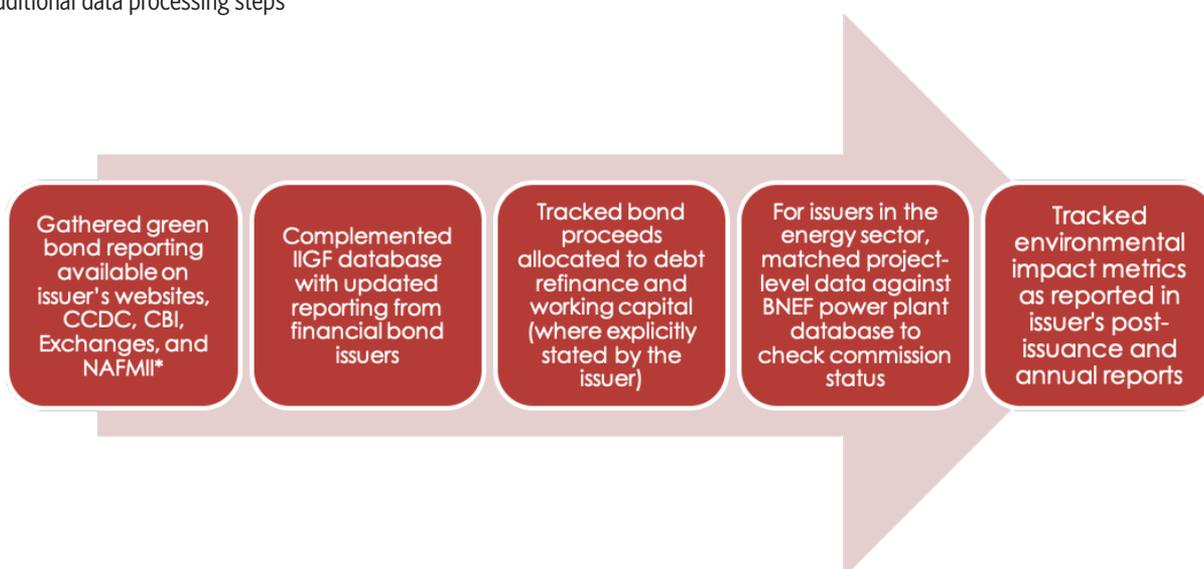
This report focuses on the state and effectiveness of the green bond market in China aiming to answer the following series of questions:

- How have green bond proceeds been used to-date and what type of green investment has been generated?
- How is the market functioning, what are the operational and structural elements and barriers?
- Who are the key players and how are they incentivized?
- Is there additionality in the market (i.e. are we seeing a shift from the BAU scenario)?
- What data are available to evaluate green bonds, and what are the deficits?
- What are actions that could be taken to increase the effectiveness and impacts of the market?

RESEARCH APPROACH

The report is primarily based on desk research supplemented by semi-structured interviews. The aim was to build up a comprehensive understanding of the market. We focused on quantitative assessments where possible, noting any limitations posed by the lack of quality and availability of data, and providing relevant recommendations.

Figure 12 Additional data processing steps



DATA COLLECTION

Our analysis focused on China’s domestic bond issuance and project-level data. We used the Green Bond Database maintained by the Central University of Finance and Economics and the affiliated International Institute of Green Finance (IIGF) in Beijing, and supplemented these data with other data sources including issuer websites, China Central Depository & Clearing (CCDC), Climate Bonds Initiative (CBI), Shanghai Stock Exchange, Shenzhen Stock Exchange, Shanghai Clearing, National Association of Financial Market Institutional Investors (NAFMII), the WIND Financial Terminal and Bloomberg Energy Finance (BNEF).

The data used in this report cover domestic issuances in China (i.e. excluding offshore issuances, asset-backed securities and loans), as well as unlabeled green bond issuances (i.e. bonds that have not been marketed as a green bond by the issuer but include green projects). Unless stated otherwise, the figures in this report apply only to China’s domestic green bond market.

Once data was collected, additional processing steps were taken as illustrated in Figure 12. These steps were necessary to understand specific trends in how proceeds have been allocated. For proceeds that were not explicitly reported as allocated to debt refinancing or working capital, a further level of analysis was undertaken to determine the construction status of the underlying projects. This was done by matching the project-level data of issuers in the energy sector, where available, with the BNEF database to verify the commission status of the projects.

Environmental impact data were collected from various post-issuance reports, including the issuer's sustainability and annual reports.

Semi-structured interviews were carried out with local stakeholders in China, including green bond verifiers and issuers. This engagement informed our analysis on the green bond market.

LIMITATIONS

Limitations in the data were primarily due to lack of a standard reporting framework and limited transparency in the Chinese green bond market. Some of the challenges include:

- Most pre-issuance reports do not contain project-level data, rather only expressing the issuer's intent to allocate proceeds to projects in accordance with the People's Bank of China Green Bond Project Catalogue. This stems largely through the large share of issuances by

financial institutions which are intermediaries and lend to projects and other entities which may not be known at the time of bond issuance.

- Post-issuance reporting tends to provide more granular data on proceeds allocation but financial bond issuers often do not disclose individual project details, but rather the aggregate number of projects undertaken within each green bond category.
- For environmental impact data, issuers usually provide aggregate figures at the green bond category level or bond-level, instead of at the project-level.

These data limitations significantly affected our ability to carry out project-level verification and provide conclusions on the use of proceeds, environmental impacts and additionality of Chinese green bonds. Improving the quality and increasing the availability of green bonds reporting could significantly increase transparency and credibility in the market.

Green Bond Regulations

	People's Bank of China (PBoC)	China Securities Regulatory Commission (CSRC)	National Association of Financial Market Institutional Investors (NAFMII)	National Development and Reform Commission (NDRC)
Bond Type	Financial bond	Corporate bond	Non-Financial Corporate Debt Instrument	Enterprise bond
Allocation of Proceeds	100% of proceeds are required to be invested in green projects	Issuers can use up to 30% of the bond proceeds to repay loans and invest in working capital.	100% of proceeds are required to be invested in green projects	Issuers can use up to 50% of the bond proceeds to repay bank loans and invest in working capital.
Issuance Limits	N/A	N/A	N/A	Green bonds are exempt from quotas for bond issuance and granted special review process
Use of Proceeds Monitoring	Separate accounts	Separate accounts	Separate accounts	No requirement
Environmental Monitoring	No requirement	No requirement	No requirement	No requirement
Use of Proceeds Reporting	Quarterly disclosure	Annual disclosure	Biannual disclosure; Changes to use of proceeds announced publicly	No requirement
Environmental Reporting	Required monitoring for green projects above a certain threshold amount	Targets disclosed at issuance; monitoring required	Targets disclosed at issuance; monitoring encouraged	No requirement
Standardized Reporting	Template available	Not available	Template available	Not available
Pre-issuance Verification	Encouraged	Encouraged	Encouraged	No requirement
Post-issuance Verification	Encouraged	Encouraged	Encouraged	No requirement

PBoC Green Bond Catalogue

1 Energy Saving	1.1.Industrial Energy Saving	1.1.1 Device/Facility Construction and Operation
		1.1.2 Energy-saving Technology Improvement
	1.2 Sustainable Building	1.2.1 Newly-built Green Building
		1.2.2 Energy Saving Technology Improvement on Existing Building
	1.3 Energy Management Center	1.3.1 Facility Construction and Operation
	1.4 Urban and Rural Infrastructure Construction with Energy Saving Efficiency	1.4.1 Facility Construction
2 Pollution Prevention and Control	2.1 Pollution Prevention and Control	2.1.1 Facility Construction and Operation
	2.2 Environmental Restoration Project	2.2.1 Project Implementation
	2.3 Clean Utilization of Coal	2.3.1 Device/Facility Construction and Operation
3 Resource Conservation and Recycling	3.1 Water Saving and Unconventional Water Use	3.1.1 Facility Construction and Operation
	3.2 Redevelopment and Integrated Utilization of Tailings and Associated Mine	3.2.1 Device/Facility Construction and Operation
	3.3 Recycling and Utilization of Industrial Solid Wastes, Exhaust Gas, and Effluent	3.3.1 Device/Facility Construction and Operation
	3.4 Recycling, Processing and Utilization of Renewable Resource	3.4.1 Facility Construction and Operation of Recycling, Sorting and Dismantling System
		3.4.2 Processing Device/Facility Construction and Operation
	3.5 Remanufacturing of Electromechanical Products	3.5.1 Device/Facility Construction and Operation
	3.6 Recycling and Utilization of Biomass Resource	3.6.1 Device/Facility Construction and Operation
	4.1 Railway Transportation	4.1.1 Facility Construction and Operation
	4.2 Urban Rail Transit	4.2.1 Facility Construction and Operation
	4.3 Public Urban and Rural Transportation	4.3.1 Vehicle Purchase
4.3.2 Facility Construction and Operation		
4 Clean Transportation	4.4 Waterway Transportation	4.4.1 Vessel Purchase
		4.4.2 Waterway Regulation
	4.5 Clean Fuel	4.5.1 Device/Facility Construction and Operation
		4.5.2 Manufacturing of Auto Fuel Products
	4.6 New Energy Automobile	4.6.1 Parts and Whole Car Manufacturing
4.6.2 Supporting Facility Construction and Operation		
4.7 Internet Application on Transportation	4.7.1 Facility Construction and Operation	
5 Clean Energy	5.1 Wind Power Generation	5.1.1 Facility Construction and Operation
	5.2 Solar Photovoltaic (PV) Power Generation	5.2.1 Facility Construction and Operation
	5.3 Smart Grid and Energy Internet	5.3.1 Facility Construction and Operation/Upgrading
	5.4 Distributed Energy Resource	5.4.1 Facility Construction and Operation
	5.5 Solar Thermal Application	5.5.1 Device/Facility Construction and Operation
	5.6 Hydropower Generation	5.6.1 Facility Construction and Operation
	5.7 Other New Energy Application	5.7.1 Facility Construction and Operation
6 Ecological Protection and Climate Change Adaption	6.1 Natural Ecological Protection and Protective Development of Tourism Resource	6.1.1 Facility Construction and Operation
	6.2 Ecological Agriculture, Husbandry and Fishery	6.2.1 Project Implementation and Facility Construction and Operation
	6.3 Forestry Development	6.3.1 Project Implementation and Facility Construction and Operation
	6.4 Emergency Prevention and Control of Disaster	6.4.1 Facility Construction and Operation