

Evaluating the Potential of Green Municipal Bonds as a Financing Solution for Chinese Cities

EC-Link Policy Brief



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Executive Summary

Pollution, environmental degradation, and greenhouse gas emissions are byproducts of China's rapid urbanization, industrialization, and economic growth over the past four decades. In order to address climate challenges, China must develop cities that integrate sustainable solutions for their buildings, energy provision, transportation networks, waste recycling, and other infrastructure. As much as 6.6 trillion RMB is needed to construct low-carbon cities across China from 2016-20, of which 15% can come from the public sector and the remaining 85% must be catalyzed from the private sector. Green bonds can play a key role in meeting high urban green investment needs in years to come through private capital.

The key advantages of green municipal bonds in the Chinese context include:

1. **The ability to mobilize private capital.** This source of financing is necessary because the public cannot meet investment needs alone; it is also increasingly possible as the Chinese domestic capital market matures. The three conditions that private investors put forward for projects financed by green bonds are: (1) the business case for the private sector must be convincing, (2) the return on equity needs to be clearly defined, and (3) the risk must be manageable
2. **A green premium and broader investor base.** Compared to conventional municipal bonds, a labeled green bond could have a lower cost of capital. Literature on green premiums of green bonds—both globally and in China—is showing with increasing certainty that cost of capital is lower for labelled green bonds. This is likely to be the case for green municipal bonds as well.
3. **Policy signal value and green reputation.** As China transitions towards a low-carbon economy, and as cities are on the forefront of this change, there is a reputational value to issuing green bonds. This advantage has been voiced by many Chinese non-municipal green bond issuers. From a municipality's perspective, issuing green bonds demonstrates the municipality's ambitious implementation of Ecological Civilization goals to higher levels of government. Issuance is also a signal for green companies that are deciding where to locate in China.

While green municipal bonds have clear advantages, only one such bond has been issued so far in China, by Ganjiang New Area in Jiangxi Province. This is due to the unresolved challenges below. Recommendations to address each challenge are included:

1. **Inability to label municipal bonds as green.** With Chinese green bond regulations issued by the National Development and Reform Commission (NDRC) and the People's Bank of China (PBoC) each covering different types of issuing organizations, none of the regulations specifically cover municipal issuers. The Ganjiang New Area's green municipal bond was issued under the PBoC regulations on the Shanghai Stock Exchange. Since municipal debt raising allowance is given by the Ministry of Finance (MoF), this paper recommends that the MoF issue green bond-specific regulations for municipalities.
2. **Local government debt levels.** With debt levels increasing substantially over the last decade, local governments have undergone substantial debt restructuring to deleverage. The MoF has consequently focused on reducing debt rather than greening debt. To do both simultaneously, this paper recommends that the MoF institute a higher debt ceiling for green bonds compared to conventional bonds.

3. **Knowledge and information scarcity.** It is critical to develop the expertise of municipalities' Financial Bureaus and to guide their green bond issuance in the early stages of market development, when no demonstration cases exist. Awareness, skills, and best practices can proliferate between municipalities once a larger number of green municipal bonds have been issued. To spark and guide the market in its early stages, this paper recommends that the MoF and PBoC issue guidelines specifically for municipalities and invite municipalities to become members of the Green Finance Committee, a key knowledge and organizing organ in Chinese green finance.
4. **Inefficient green project design and planning.** In most municipalities, planners of the local Development and Reform Commission (DRC) and financiers of the Financial Bureau work separately. This division results in many planned low-carbon projects making technical sense but not necessarily financial sense. Without the latter, the projects are consequently not carried out. This paper recommends greater integration of financial concerns into the work of planners as well as cross-staffing between the two departments to avoid these problems.
5. **Projects' lack of bankability.** With most investors only interested in holding green bonds funding highly bankable projects, municipalities need ways to separate such projects from public welfare projects. This paper recommends that municipalities establish project preparation facilities (PPFs) and feasibility study funds to develop a larger pipeline of bankable projects, which ultimately can be bundled together as designated projects to be financed by a green municipal bond. Municipalities should also pursue green building, building retrofitting, and land value capture projects.
6. **Additional costs affiliated with monitoring, reporting, and verification (MRV).** Compared to conventional bonds, labeled green bonds entail a designated external verification plus regular reporting on the green performance of the bond. All else being equal, MRV increases the transaction costs for green bond issuers. To avoid this added cost, which discourages potential municipal issuers, this paper recommends national and/or provincial level schemes for compensating municipalities for the added MRV costs—similar to a scheme that currently (and paradoxically) exists at the city level in Huzhou, China.
7. **Insufficient financial incentive schemes.** Without sufficient existing cases that demonstrate the value of green bonds to municipalities, financial incentives can play a key role in scaling up the green municipal bond market. This has proven to be a successful practice for Chinese non-municipal issuers. As such, this paper recommends the implementation of national and/or provincial level incentive schemes for municipal issuers and projects financed by green bonds, learning from first cases like the green bond interest rate subsidy in Jiangsu Province.

Other cities can look to Ganjiang New Area's landmark green municipal bond issuance in June 2019 as a first case for guidance. The bond followed the People's Bank of China's regulations on use of proceeds categories and was issued to finance smart utility pipelines. Being oversubscribed 12 times over, the issuance shows a great demand from the investor side. Another pioneering issuance could come from the Shenzhen International Low Carbon City (ILCC), which already issued two unlabeled green municipal bonds through affiliate local government financing vehicles (LGFVs) in 2012-13. The ILCC is a flagship demonstration project of the China-E.U. Partnership on Sustainable Urbanization and displays a wide array of low-carbon technologies. This makes it a prime candidate for issuing a labeled green



municipal bond in the future. With both investor interest and municipalities' increasing consciousness of the advantages of green bonds, we expect to see more green municipal bonds issued for city projects in the coming years as challenges are gradually addressed.

Key Words: Cities, Green Finance, Green Bonds, Municipal Bonds

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1. Background circumstances

1A. Environmental issues and sustainable urban development in China

Four decades of urbanization has fundamentally transformed China. The flourishing of the country's economy since Reform and Opening Up began under former President Deng Xiaoping in 1978 has concentrated market activity and job opportunities in cities, drawing hundreds of millions of migrants from the countryside. Today, more than half of China's citizens live in cities and urban areas. By 2020, 60% of the population, or roughly 845 million people, are projected to reside in cities—the greatest number of any country.¹ China's urban population by 2030 is projected to equal those of the European Union (E.U.), North America, and Japan combined.² Urbanization and economic development fueled by coal-based energy consumption, road-based transportation, and a carbon-intensive industrial structure have also contributed to environmental degradation.³ A recent study of air quality in China highlighted how nearly 90% of the country's cities suffer from air pollution. Visible and unresolved problems of air, water, and soil pollution raise the question of sustainable urbanization, which has become a major concern for both the central government and the urban population.⁴ Globally, cities occupy 2% of the world's landmass but are responsible for more than two-thirds of energy use and greenhouse gas (GHG) emissions.⁵ This statistic is reflected in China, where cities account for more than 70% of domestic energy-related carbon emissions.⁶

Hovering above the level of cities are the national and international questions of China's contribution to global warming as the world's largest carbon emitter.⁷ In 2014, China became one of the first Asian countries to announce a strong commitment to combat climate change and to adapt to its future impacts.⁸ That same year, President Xi Jinping pledged to peak China's carbon emissions around 2030 and more than double the share of renewable energy sources in the economy from 8.3% in 2010 to about 20% by 2030.⁹ China is also a signatory to the Paris Climate Agreement and submitted an intended Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015.¹⁰ The comprehensive NDC spans national and regional climate strategies and emissions reduction goals in key sectors: energy, industry, buildings, transportation, etc.¹¹

Altogether, three interrelated factors—the rapid pace of urbanization, the urgency of tackling harmful pollution at local levels, and the ambition of China's climate change targets—have driven central, provincial, and municipal governments to experiment with designated “eco-cities” and “low-carbon cities.”¹² In 2008, low-carbon city pilot projects began in

¹ Paulson Institute, Energy Foundation China, and China Renewable Energy Industries Association, “Green Finance for Low Carbon Cities” (Bloomberg Philanthropies, Green Finance Committee of China Society for Banking and Finance, June 2016), <https://www.bbhub.io/dotorg/sites/2/2016/06/Green-Finance-for-Low-Carbon-Cities.pdf>.

² Dwight H. Perkins, “Foreword,” in *China's Urban Century* (Cheltenham, UK: Edward Elgar Publishing, 2015), xx, xvii.

³ World Bank and Institute for Health Metrics and Evaluation (IHME) at the University of Washington, Seattle, “The Cost of Air Pollution: Strengthening the Economic Case for Action” (Washington, D.C.: World Bank Group, 2016), <http://documents.worldbank.org/curated/en/781521473177013155/pdf/108141-REVISED-Cost-of-PollutionWebCORRECTEDfile.pdf>.

⁴ Francois Gipouloux, “Introduction,” in *China's Urban Century* (Cheltenham, UK: Edward Elgar Publishing, 2015), 12–13.

⁵ Michael Lindfield, “Green Municipal Finance,” EC-Link Position Paper (Europe-China Eco Cities Link (EC-Link) Project, July 2018), Accessible at: <http://www.eclink.org/eclink/en/sectors/about>.

⁶ Klaus Rohland, “Foreword, World Bank,” in *Sustainable Low-Carbon City Development in China*, Directions in Development: Countries and Regions (Washington, D.C.: The World Bank, 2012), xix–xx.

⁷ Perkins, “Foreword.”

⁸ Lindfield, “Green Municipal Finance.”

⁹ Mike Ives, “For China's Polluted Megacities, a New Focus on Slashing Emissions,” *Yale Environment 360*, September 15, 2016, https://e360.yale.edu/features/as_china_looks_to_cut_emissions_focus_shifts_to_low_carbon_cities.

¹⁰ Columbia University, “Low-Carbon Cities,” SIPA Center on Global Energy Policy, 2019, <https://chineseclimatepolicy.energypolicy.columbia.edu/en/low-carbon-cities>.

¹¹ The PDF of China's entire NDC submitted in 2016 can be accessed here on the UNFCCC's NDC Registry: <https://www4.unfccc.int/sites/NDCStaging/Pages/Party.aspx?party=CHN>

¹² Wade Shepard, “No Joke: China Is Building 285 Eco-Cities, Here's Why,” *Forbes*, September 1, 2017, <https://www.forbes.com/sites/wadeshepard/2017/09/01/no-joke-china-is-building-285-eco-cities-heres-why/>.

Shanghai and Baoding. In 2010, the National Development and Reform Commission (NDRC) called for dozens of low-carbon city pilots to be launched nationwide.¹³ The NDRC started by selecting five provinces and eight cities for pilot activities. This number has grown to six provinces and 81 cities today.¹⁴ Low-carbon cities were mentioned again in the 12th and 13th Five Year Plans (lasting from 2010-15 and 2015-20, respectively). The 13th Five Year Plan specifically called for expanding low-carbon pilot projects to 100 cities and roughly 1,000 communities while setting specific targets for infrastructure and the built environment—for instance, green buildings should account for 50% of new construction in urban areas and methane gas recovery should be implemented at municipal landfills.¹⁵ Ensuring that both existing and newly built cities are climate resilient and emit net zero GHG emissions is perhaps the greatest opportunity for meeting national and global climate targets as well as China’s long-term development strategy.¹⁶

The environmental situations of cities in Europe, North America, and Japan since the 1970s make clear that it is possible, if not expensive, to reverse environmental degradation and decreasing GHG emissions in urban areas.¹⁷ Can municipal governments in China actually afford to build the green projects that will create truly sustainable cities? While the 13th Five Year Plan does not mention municipal financing, it is assumed that green municipal financing will become a requirement if all the Plan’s targets are to be achieved. Other pronouncements have pointed at the need for a national green development fund and green bonds.¹⁸ A 2016 research report series co-authored by the Paulson Institute, Energy Foundation China, and the Chinese Renewable Energy Industries Association estimated that 6.6 trillion RMB would be required from 2016-20 to build low-carbon cities in China. Broken down, this figure includes 1.65 trillion RMB for the construction of greener buildings and large-scale retrofits of existing houses and commercial buildings; 4.45 trillion RMB to invest in the infrastructure for urban rail, bus, electric vehicles, bikes, and city roads; and 500 billion RMB needed for distributed solar photovoltaic (PV) and other forms of renewable energy in cities.¹⁹ A more recent report from the Innovative Green Development Program (iGDP), a Beijing think tank, estimated that 1.02 trillion USD (close to 7 trillion RMB) must be invested in low-carbon urban projects if China is to achieve national climate goals in the 2016-20 period and sustain an additional 300 million additional urban residents from 2020-30.²⁰ While this paper primarily discusses low-carbon cities and climate mitigation, the financial circumstances are similar for other green objectives, where large gaps remain.²¹

¹³ Columbia University, “Low-Carbon Cities.”

¹⁴ Innovative Green Development Program (iGDP), Lawrence Berkeley National Laboratory (LBNL), and Energy Foundation China (EFC), “Progress and Prospects: China’s Cities Transitioning toward Energy Sustainability and Pursuing Early Peaking of Carbon Emissions,” Low-Carbon and Green Index for Cities (Beijing: Innovative Green Development Program (iGDP), 2017), Accessible at <http://logic.igdp.cn/>.

¹⁵ Columbia University, “Low-Carbon Cities.”

¹⁶ Paulson Institute, Energy Foundation China, and China Renewable Energy Industries Association, “Green Finance for Low Carbon Cities.”

¹⁷ Gipouloux, “Introduction.”

¹⁸ “MoHURD Eco-City Implementation Guideline for Municipal Finance,” EC Link Toolbox (Beijing: Europe-China Eco-Cities Link (EC-Link) Project, June 24, 2016), http://eclink.org/media/filer_public/80/ab/80ab7311-70e4-4cd1-961f-441d332444b0/8_mohurd_eco-city_implementation_guidelines-mf24-06-2016.pdf.

¹⁹ “1 Trillion USD Investment Needed in Five Years to Build Low-Carbon Cities in China,” Bloomberg Philanthropies, June 7, 2016, <https://www.bloomberg.org/press/releases/1-trillion-usd-investment-needed-five-years-build-low-carbon-cities-china/>.

²⁰ Innovative Green Development Program (iGDP), Lawrence Berkeley National Laboratory (LBNL), and Energy Foundation China (EFC), “Progress and Prospects.”

²¹ *Climate mitigation* is preventative and seeks to reduce the causes of climate change, such as sources of GHG emissions, and to enhance the sinks of GHGs. Technically speaking, low-carbon cities fit within climate mitigation efforts. On the other hand, *climate adaptation* addresses the actual or expected impacts of climate change, such as sea level rise.

How will China's tremendously expensive sustainable city endeavor be financed? Historically, local finance has been a driving force behind China's urbanization.²² Municipalities today need new financial instruments and mechanisms that can mobilize private capital for infrastructure projects²³ since public funds can supply only a small amount of the total investment required for sustainable urban development. The country's top financial experts have estimated that at least 85% of all the annual green investment needed in China by 2020 (3-4 trillion RMB in total) must come from the private sector.²⁴ In the specific areas of energy conservation and environmental protection, public funds might cover less than 25% of needed investment.²⁵ Given the financial challenges, this paper explores the question: **How can Chinese cities use green municipal bonds (GMBs²⁶) to finance the construction of urban climate mitigation projects at scale?**

1B. Green municipal finance in China

China has quickly become a world leader in green finance. In August 2016, the landmark Guiding Opinions on Building a Green Financial System (hereafter, "the Guidelines") became the world's first systematic green finance policy framework.²⁷ It was jointly issued by six bodies: the People's Bank of China (PBoC), Ministry of Finance (MoF), National Development and Reform Commission (NDRC), Ministry of Environmental Protection (MEP), China Banking Regulatory Commission (CBRC), China Securities Regulatory Commission (CSRC), and the China Insurance Regulatory Commission (CIRC).²⁸ The Guidelines are significant for several reasons. First, they officially define "green finance" in China as "support for environmental improvement, climate change and resource conservation, and the efficient use of economic activities." This list includes financial services for project investment and financing as well as project operation and risk management in fields such as environmental protection, energy saving, clean energy, green transportation, and green buildings. Second, the Guidelines laid out additional green standards and criteria. These are important because they determine what projects and assets in China qualify as green.²⁹

Since the Guidelines were issued in 2016, China's central government has taken even more action to develop green finance at the provincial level. In June 2017, a State Council executive meeting chaired by Premier Li Keqiang tasked five provinces—Zhejiang, Jiangxi, Guangdong, Guizhou, and Xinjiang—with developing green finance reform and innovation pilot zones. By March 2018, these pilot zones made great progress in tailoring national green finance policies to local markets and investment conditions.³⁰ However, low-carbon considerations, including low-carbon cities, do not currently play a prominent role in pilot areas'

²² Gipouloux, "Introduction."

²³ Lindfield, "Green Municipal Finance."

²⁴ Jun Ma, Michael Sheren, and Simon Zadek, "G20 Green Finance Synthesis Report" (G20 Green Finance Study Group, September 5, 2016), https://unepinquiry.org/wp-content/uploads/2016/09/Synthesis_Report_Full_EN.pdf.

²⁵ Bond Magazine (债券杂志), "Exploring the Development of Green Municipal Bonds in China (王琰: 关于我国发展绿色市政债券的探讨)," *International Institute of Green Finance of the Central University of Finance and Economics (中央财经大学绿色金融国际研究院)* (blog), October 24, 2018, <https://mp.weixin.qq.com/s/z9-3ndosGAlwxSmNNYFDOQ>.

²⁶ This paper uses the abbreviation "GMBs" to specifically refer to green municipal bonds and not to other types of green bonds. "Green bonds" is used to refer to all types of green bonds, including municipal ones.

²⁷ Scott Vaughn, "International Trends of Green Finance and China's Leadership," *Green Finance in China (First Collection)* (Beijing: International Institute of Green Finance, 2018).

²⁸ Ma, Jun, "Green Finance: China and G20." 2016.

²⁹ "Blended Finance for Green Investment in China," Post-Conference Position Paper (EC-Link Green Finance Network, Beijing: Europe-China Eco-Cities Link, 2018), 1-9.

³⁰ Li Ang and Diego Montero, "Money Grows on Trees - Financing China's Green Future," *China Watch*, accessed December 28, 2018, <http://www.chinawatch.cn/a/201812/18/WS5c18b4ada31047b156e86c14.html?from=groupmessage&isappinstalled=0>.

work plans.³¹ As of 2019, the PBoC officially endorses six categories and 31 sub-categories of qualified green projects in the bond market, which cover both climate change mitigation and adaptation projects.³² Third, the Guidelines emphasize that the main purpose of building a green financial system is to mobilize and motivate more capital investment in green industries, while also effectively curb polluting investments. Fourth, they provide incentives to support and encourage green credit, green securities, green insurance, and green public-private partnerships (PPPs).³³

Thanks to the Guidelines, China's high-level policy framework supporting green finance is fairly comprehensive. However, the implementation of policies has been piecemeal and a focus on cities is lacking. The term *green municipal finance* is therefore useful in describing the overlap of green finance's environmental and/or climate dimensions with municipal finance. Green municipal finance has two main objectives. The first is that revenues for cities should come from environmentally friendly or green sources and/or promote green outcomes where possible. Second, cities' expenditures need to be channeled to low-carbon and climate resilient investments.³⁴ This channeling can occur through:

- Recurrent expenditure, where green procurement can ensure that the inputs to city projects are environmentally positive.³⁵
- Capital expenditure, where city investment projects are explicitly designed to address climate change and green issues.³⁶ Projects developed by government designated low-carbon pilot cities in China generally use capital expenditure, as the projects are designed with the intent of reducing a city's emissions and improving environmental quality.

Green revenue sources within green municipal finance include public sector finance (intergovernmental transfers and municipalities' own revenues), private sector finance (through investment in environmentally positive services like public transportation), and external finance (through climate finance, carbon markets, etc.). All forms of revenue can contribute to green finance, but the greening of municipal government revenues in China requires a focus on transforming conventional instruments, such as issuing GMBs instead of conventional municipal bonds.

1C. Green bonds are gaining traction worldwide

Since the World Bank issued the first official green bonds in 2009, the global green bond market has reached about 500 billion USD in value. Green bonds are gaining traction alongside the mainstreaming of environmental, social, and governance (ESG) investing and impact investing.³⁷ Green bonds can cover multiple types of bonds—municipal, corporate, etc.—and have been issued with a wide range of tenors, principals, and coupons. Public and private entities have issued them to signal concern for the environment and capitalize on growing demand for sustainable investments in the financial sector. Research from Standard and Poor's (S&P) projects that the global market for labeled green bonds will shrug off wider economic uncertainty and grow to a record size by 2020. The overall combination of an

³¹ Ang and Montero.

³² Lindfield, "Green Municipal Finance."

³³ Lindfield.

³⁴ Lindfield.

³⁵ Lindfield, "Green Municipal Finance."

³⁶ Lindfield.

³⁷ Shirley Tay, "Investors Are Pouring into Green Bonds. That May Not Be for the Best," CNBC, January 29, 2019, <https://www.cnbc.com/2019/01/30/investors-are-pouring-into-green-bonds-that-may-not-be-for-the-best.html>.

increased focus on green finance and low-carbon economic transition, strong market fundamentals, and a continuous stream of new issuers and financing options may push issuance to around 180 USD billion by the end of this year, up from 167 billion USD in 2018 (a 7.78% increase).³⁸

1D. The rise and regulation of green bonds in China

China is now the world's second largest green bond market, with most issuances coming from banks, state-owned enterprises (SOEs), and private companies.³⁹ The total amount of money raised through green bonds swelled from 1 billion USD worth of issuances in 2007 to more than 30 billion USD in 2018.⁴⁰ The money raised through green bonds still only accounts for a small percentage of the projected amount that is required to fill the domestic financing gap for green projects, but the country's green bond market is booming. The mainland interbank bond market is the world's third largest behind the U.S. and Japan, at 69 trillion RMB.⁴¹ The geographic coverage of issuers and green bond distribution has also grown, partly a function of increased awareness of green finance. Two recent IIGF reports, [one summarizing China's green bond market in 2018](#) and [another analyzing the market in the first half of 2019](#), both conclude that green bonds will continue to play a role in driving China's transition to a more sustainable economy.⁴²

Bond regulation in China is quite complicated compared to some other countries. Bonds can be bought and traded on two markets: the interbank market and the exchange market. (The term "interbank market" is actually a misnomer, because the market includes a wide range of financial institutions.⁴³) Four entities regulate the interbank and exchange markets.⁴⁴ As shown in Table 2 on the next page, green bond issuers must gain approval from the relevant regulator, depending on the type of green bond. But municipal bonds (市政债券) fall outside of this framework and are in principle regulated by the MoF.⁴⁵ It should further be noted that medium-term notes and commercial paper need registration with the National Association of Financial Markets and Institutional Investors (NAFMII),⁴⁶ while small and medium enterprise (SME) placement bonds need registration with securities exchanges.⁴⁷

It should also be noted that municipal bonds in China are actually issued at the provincial level, partially because the country lacks the capacity for a city-level municipal bond

³⁸ Suzie Neuwirth, "Green Bond Market Forecast to Swell to Record Size in 2019," Peer2Peer Finance News, January 29, 2019, <http://www.p2pfinancenews.co.uk/2019/01/29/green-bond-market-forecast-to-swell-to-record-size-in-2019/>.

³⁹ Liu Zhi, "Green and Smart Infrastructure Development" (PowerPoint, November 17, 2018).

⁴⁰ Alan Xiangrui Meng et al., "China Green Bond Market 2018" (Climate Bonds Initiative and China Central Depository & Clearing Company, February 2019), <https://www.climatebonds.net/resources/reports/china-green-bond-market-2018>.

⁴¹ Gabriel Wildau, "China's Interbank Bond Market in Five Charts," Financial Times, July 3, 2017, <https://www.ft.com/content/cebed646-5e4f-11e7-91a7-502f7ee26895>.

⁴² "China Green Bond Market 2018 Summary (中国绿色债券市场 2018 年度总结)," IIGF Report (IIGF 报告) (Beijing: International Institute of Green Finance of the Central University of Finance and Economics (中央财经大学绿色金融国际研究院), February 11, 2019), <https://mp.weixin.qq.com/s/08fuUciPzqbjcJrwoCO9aw>.

⁴³ Wildau, "China's Interbank Bond Market in Five Charts."

⁴⁴ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics), In-person interview in Beijing, January 21, 2019.

⁴⁵ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics), In-person interview in Beijing, March 5, 2019.

⁴⁶ Unnamed expert (General Manager at a Chinese provincial-level commercial bank), In-person interview in Beijing, January 21, 2019.

⁴⁷ "How to Issue a Green Bond in China: A Step-by-Step Guide," Greening China's Financial Markets (Climate Bonds Initiative and the International Institute for Sustainable Development, 2018), <https://www.climatebonds.net/files/files/How-to%20GreenBonds%20China.pdf>.

market.⁴⁸ When a province issues municipal bonds on a city's behalf, the city can choose to attach its name to the bond and disclose which project(s) the bond is financing. Not every city does so, in which case only the province's name is listed. But if a city issues a GMB, it must attach its name and disclose the project(s) being financed, as disclosure is always required for a labeled green bond.⁴⁹ One complication of this provincial-level issuance system is that virtually all municipal bonds in China are rated as AAA or AAA-. This means regional differences in cities' capacities to repay municipal bonds (based on their GDP, incomes, credit histories, etc.) are not properly reflected in the bond market.⁵⁰

Table 1. Types of Chinese municipal bonds⁵¹

	General obligation bond (一般政府债券)	Revenue bond (专项债券) ⁵²
Use of Proceeds	Capital projects only	
Project Types	Public welfare projects with no revenue generation	Semi-public welfare projects with revenue generation
Source of Repayment	Tax revenue	Rent, toll, fare, user fee

Table 2. The Chinese green bond market regulatory system

Types of Green Bonds	Green Financial Bond	Green Debt Financing Instrument	Green Corporate Bond (绿色公司债)		Green Enterprise Bond (绿色企业债)	
Regulator(s)	PBOC	NAFMII	Shanghai Securities Exchange	Shenzhen Securities Exchange	NDRC	
Policy Documents & Release Dates	PBOC announcement no. 39 (Dec. 22, 2015)	NAFMII, guideline for non-financial enterprise green note (March 22, 2017)	Guidelines to Support Green Corporate Bond Issuance by CSRC (March 2, 2017)	Announcement no. 13 (2016) by Shanghai Stock Exchange (March 16, 2016)	Announcement no. 206 (2016) by Shenzhen Stock Exchange (April 22, 2016)	NDRC no. 3504 (Dec. 31, 2015)
Use of Proceeds Classifications	Green Bond Catalogue, 6 types of activities				NDRC catalogue with 12 types of activities	
Management of Proceeds	A specialized account has to be established to clearly track the management of proceeds				Unspecified	

⁴⁸ Ye Wang (Finance Center Research Analyst, Sustainable Finance Program, World Resources Institute Beijing representative office), In-person interview in Beijing, April 4, 2019.

⁴⁹ Ye Wang (Finance Center Research Analyst, Sustainable Finance Program, World Resources Institute Beijing representative office).

⁵⁰ Ye Wang (Finance Center Research Analyst, Sustainable Finance Program, World Resources Institute Beijing representative office).

⁵¹ Adapted from the table on slide 17 of: Xu Nannan, "China's Land Finance and Urbanization: An Analysis of Political Economy" (PowerPoint, June 28, 2019).

⁵² There are actually different types of revenue bonds for specific purposes, such as land banking revenue bonds (土地收购储备债券). These pay for building infrastructure like roads that are directly related to land a government will lease out.

Project Evaluation & Assessment	Third party verification			No need for third party verification; regulator decides
Information Disclosure	Each year, the issuer must notify the market on use of proceeds every quarter, show the last year's use of funds in a report, get a special auditor report before April 30, and report to the PBoC	Issuer must disclose to the market use of proceeds and development of green projects every half year	Issuer must disclose at least once a year; a guidance document is currently in preparation	Unspecified

In terms of standards, the PBoC (the central bank) is responsible for issuing green criteria for all bonds in China. However, the NDRC has also issued catalogues that define a list of projects eligible for green bond issuance by SOEs. The PBoC's and NDRC's guidelines have differed from international standards and, as more and more Chinese green bonds are being issued offshore, created complications for foreign investors.⁵³ For instance, by 2020 the PBoC is expected to include “clean coal” projects⁵⁴ in its official catalogue of items that can be financed by green bonds, which will put it at odds with the E.U. and other nations.⁵⁵

Finally, green bonds in China are classified according to the type of bond issuance: municipal, enterprise, corporate, etc. This means “green” is *not* its own official category of bond in the Chinese taxonomy (hereafter, analysis of green bonds will attempt to pair the term “green” with the bond type, such as “green municipal bond,” for precision's sake).

2. The potential and advantages of green municipal bonds in China

China has become the world's largest green bond market, with most issuances coming from banks, SOEs, and private companies. Yet, thanks to MoF inaction and other barriers, only one city in China to date has issued a municipal bond that is officially labeled as green—namely, Ganjiang New Area in Jiangxi Province. Ganjiang's issuance on June 18, 2019 is worth 300 million RMB in total and has a AAA credit rating, a term of 30 years, 33 participating bidding institutions, and an interest rate of 4.11%; it has been oversubscribed 12 times over.⁵⁶ While GMBs are regulated by the MoF in principle, since no applicable regulation exists so far, this bond was issued under the PBoC regulations on the Shanghai Stock Exchange.⁵⁷ According to information from potential issuers shared by Dr. Wang Yao, Director General of IIGF, more labeled GMB issuances in China are on the horizon. She has been in communication with the head of Shenzhen's Financial Bureau and reports that Shenzhen is attempting to issue its first GMB by the end of this year.⁵⁸ GMBs possess several key advantages and potential for scaling up that will be discussed in this section. Later, section three will analyze the reasons why only one Chinese city has issued a labeled GMB to finance municipal projects.

⁵³ Ye Wang (Finance Center Research Analyst, Sustainable Finance Program, World Resources Institute Beijing representative office), interview.

⁵⁴ Clean coal projects are generally defined as those that use advanced technologies to cut air pollution but leave carbon emissions largely unaccounted for.

⁵⁵ Li Jing, “China May Allow Green Bonds for Clean Coal in Blow to Climate Fight,” South China Morning Post, September 12, 2019, <https://www.scmp.com/economy/china-economy/article/3026748/china-expected-allow-green-bonds-fund-clean-coal-projects>.

⁵⁶ China Securities Network (中国证券网), “Jiangxi Ganjiang New Area issues country's first municipal green bond (江西赣江新区发行全国首单绿色市政专项债),” Sina Finance (新浪财经), June 21, 2019, <http://finance.sina.com.cn/stock/relnews/hk/2019-06-21/doc-ihytcerk8306348.shtml>.

⁵⁷ China Securities Network (中国证券网).

⁵⁸ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics), interview, March 5, 2019.

2A. Scope of analysis

This paper concentrates on climate mitigation projects rather than climate adaptation projects. Mentions of “low-carbon projects,” “green projects,” or “sustainable projects” in cities refer to climate mitigation projects, unless otherwise noted. The main reason for only focusing on urban climate mitigation projects is that, as a financing mechanism, green bonds are better suited to the climate mitigation investments in low-carbon cities. Climate adaptation measures are likely to have a national or transboundary reach, do not generate revenue, and are therefore prone to financing through intergovernmental transfers and external climate finance-related sources.⁵⁹ On the other hand, cities often prioritize mitigation projects that generate revenue because they have to repay green bonds just like any other bond.⁶⁰ For instance, a municipal waste treatment plant that collects organic waste from a city, treats the waste, and produces natural gas or methane gas during the treatment process is environmentally friendly; the gas can then be sold back to utilities for transportation purposes, earning the city (the plant operator) a profit that could go towards recovering the costs of the plant’s construction while also offsetting the use of fossil fuels.⁶¹ The ability of climate mitigation projects to pay for themselves in this manner and provide returns over the long-term gives them a wide array of possible funding opportunities, including via the private sector, user fees, taxation, and more. As will be discussed, green bonds’ ability to mobilize substantial amounts of private capital suits the high upfront construction costs and long-run returns that characterize climate mitigation projects.⁶²

2B. The ability to mobilize private capital

Researchers such as Reichelt⁶³ and Sullivan et al.⁶⁴ argue that bonds are an effective means to allow private sector participation in the development of climate-related projects.⁶⁵ Private investors can buy and trade green bonds on China’s interbank and exchange markets. Green bond issuance needs to meet three requirements in order to attract private sector capital:

- The business case for the private sector must be convincing.
- The return on equity (ROE) needs to be clearly defined.
- The risk for private investors must be manageable.⁶⁶

Drawing private investment to municipal projects also requires an understanding of the different ways local authorities and private investors view and perceive risk. A 2013 study of low-carbon city financing in the United Kingdom (U.K.) found that local authorities see themselves as financially and politically accountable for any losses involved with municipal projects and therefore need to underwrite risk.⁶⁷ It is reasonable to assume the viewpoint is

⁵⁹ “MoHURD Eco-City Implementation Guideline for Municipal Finance.”

⁶⁰ Lindfield, “Green Municipal Finance.”

⁶¹ Tay, “Investors Are Pouring into Green Bonds. That May Not Be for the Best.”

⁶² Lindfield, “Green Municipal Finance.”

⁶³ Heike Reichelt, “Green Bonds: A Model to Mobilize Private Capital to Fund Climate Change Mitigation and Adaptation Projects,” in *The EuroMoney Environmental Finance Handbook* (Washington, D.C.: The World Bank, 2010), 1–7, <http://documents.worldbank.org/curated/en/680921507013408005/Green-bonds-a-model-to-mobilize-private-capital-to-fund-climate-change-mitigation-and-adaptation-projects>.

⁶⁴ Rory Sullivan, Andy Gouldson, and Phil Webber, “Funding Low Carbon Cities: Local Perspectives on Opportunities and Risks,” *Climate Policy* 13, no. 4 (2013): 514–29.

⁶⁵ Changjie Zhan, Martin de Jong, and Hans de Bruijn, “Funding Sustainable Cities: A Comparative Study of Sino-Singapore Tianjin Eco-City and Shenzhen International Low-Carbon City,” *Sustainability* 10, no. 4256 (November 17, 2018): 1–15.

⁶⁶ Lindfield, “Green Municipal Finance.”

⁶⁷ Sullivan, Gouldson, and Webber, “Funding Low Carbon Cities: Local Perspectives on Opportunities and Risks.”

similar in China. On the other hand, investors will usually only commit capital if and when the risk–return profile of a project is appropriate. For riskier types of infrastructure projects, investors tend to look for annual returns of 10-15%; the expected rate of return decreases for utility-type investments that are lower risk.⁶⁸ In the absence of government mandates or incentives, private investors have a range of investment alternatives to green projects and will tend to look for market-rate returns. Thus, Chinese cities must clearly show potential private investors the risk-return profiles of their green projects and communicate their aspirations well—especially since the domestic municipal bond market is small relative to the national market for all types of bonds.⁶⁹

2C. A green premium and broader investor base

A green premium can also overcome the costs of monitoring, reporting, and verification (MRV) for projects financed by green bonds.⁷⁰ A growing body of research indicates that a green premium exists in most markets, issuers, locations, and currencies (it is generally clearest in secondary markets).⁷¹ The premium stems from a greater demand for green bonds than total green bond issuance at the moment.⁷² Such research on green premiums is also maturing in China. The 2019 book *Green Bond* finds a cost of capital benefit for most type of issuers,⁷³ while a forthcoming paper by Wang et al. finds a premium in the primary market, but not in the secondary market.⁷⁴ With just one green municipal bond issuance in China so far, statistics are not yet included. However, because a cost of capital benefit exists for all non-municipal issuing organizations, once can predict the same to be true for future municipal issuers.

Investor diversification—the ability to attract new investors interested in supporting green projects—is another part of green bonds’ ability to leverage private capital.⁷⁵ Chinese cities can look for investors with explicit environmental goals or climate-conscious portfolios to stimulate demand. Globally, investors and financial institutions are becoming more convinced of the importance of environmental protection and climate resilience. This trend bodes well for green bonds. Higher demand for green bonds also means lower coupon rates, which is more attractive for issuers.⁷⁶ Even in the absence of environmentally conscious investors, GMBs can still be sold to “plain vanilla” bond buyers without any sustainability concerns or priorities.⁷⁷ Investors of all inclinations might also prefer the added level of transparency (in the form of third party verification and the MRV process) that characterizes GMBs compared to conventional municipal bonds.⁷⁸

Interestingly, the size of the green bonds that municipalities issue also matters because larger bonds are more attractive to big investors. A green bond allows issuers to combine

⁶⁸ Sullivan, Gouldson, and Webber.

⁶⁹ Lindfield, “Green Municipal Finance.”

⁷⁰ A green premium basically means that if two bonds are identical, but one is green, more investors want to invest in the green bond. The higher demand from investors drives down the interest rate on the green bond and thereby saves the issuer money.

⁷¹ Olivier David Zerbib, “The Effect of Pro-Environmental Preferences on Bond Prices: Evidence from Green Bonds,” *Journal of Banking and Finance* 98, no. C (2019): 39–60.

⁷² Zerbib.

⁷³ International Institute of Green Finance (2019) *Green Bond*. Beijing, China: IIGF

⁷⁴ Wang, Y., Shi, Y. & Wu, Z (2019). The differences between green bonds and conventional bonds -- based on the comparative analysis of their interest rate and capital gains. Forthcoming

⁷⁵ “How to Issue a Green Bond in China: A Step-by-Step Guide.”

⁷⁶ Philip Roin, “China’s Flirtation with Green Finance,” *Dialogo Chino* (blog), May 2, 2018, <https://dialogochino.net/11080-chinas-flirtation-with-green-finance/>.

⁷⁷ Tay, “Investors Are Pouring into Green Bonds. That May Not Be for the Best.”

⁷⁸ Unnamed expert (General Manager at a Chinese provincial-level commercial bank), interview.

different environmental assets, such as solar, water, and pollution clean-up investments, into a larger bond.⁷⁹ If cities can bundle the component projects bundled into a single, large GMB are all bankable, then the potential of the bond issuance to succeed in the interbank and exchange markets becomes even higher.⁸⁰ Large GMBs may become even more effective as environmental priorities become stronger within the largest buyers of bonds in the Chinese market: banks. As of 2018, more commercial and state-owned banks are being assessed by the PBoC on green performance standards for both buying green bonds and issuing green loans.⁸¹ These standards act as incentives for green bond purchases and could lead more institutional investors in China to buy green bonds. Dr. Wang Yao of IIGF notes that institutional investors may increasingly be looking to buy green bonds because the underlying projects are genuinely profitable and provide return on investment (ROI)—as well as a boost to the investor’s reputation as environmentally conscious—and not merely because they are driven by central government incentives.⁸² (Institutional investors in China have almost the same characteristics as those in Western or OECD countries; they want stable, long-term, risk-adjusted returns on green investments.⁸³) GMBs can let cities capitalize on this market trend and grow their investor base.

2D. Policy signal value and green reputation

As China transitions towards a low-carbon economy, and as cities are on the forefront of this change, green bond issuances create signals for the public and private sectors. This advantage has been voiced by many Chinese non-municipal green bond issuers. From a municipality’s perspective, issuing green bonds demonstrates the municipality’s ambitious implementation of Ecological Civilization (生态文明) goals to national and provincial governments; piloting and issuing genuine GMBs will further play a supporting role in fiscal policy for green development.⁸⁴ Issuance is also a signal for green companies deciding where to locate in China. A city’s cost-benefit analysis about whether to issue GMBs must weigh the potential benefits of these signals. Signaling could, in theory, increase the city’s chances of receiving rewards, incentives, or support from higher levels of government. China’s central government and a growing number of provincial governments already want to support environmentally responsible bond issuers because they represent on-the-ground support for national and provincial initiatives.⁸⁵

However, policy signal value may operate differently in China than in other countries. In the U.K. and OECD countries, issuing green bonds is not about demonstrating support for the government. There, green finance is driven by the private sector and issuers see green bonds as a tool to cultivate socially and environmentally responsible reputations that will attract more investors.⁸⁶ Global practice further shows that non-municipal green bond issuers such as multilateral development banks (MDBs) may take advantage of signal value. MDBs sometimes

⁷⁹ “How to Issue a Green Bond in China: A Step-by-Step Guide.”

⁸⁰ Unnamed expert (Sustainable Urban Development Analyst, GIZ), In-person interview in Beijing, December 20, 2018.

⁸¹ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics), interview, March 5, 2019.

⁸² Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics).

⁸³ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), Phone interview, March 12, 2019.

⁸⁴ China Securities Network (中国证券网), “Jiangxi Ganjiang New Area issues country’s first municipal green bond (江西赣江新区发行全国首单绿色市政专项债).”

⁸⁵ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, March 12, 2019.

⁸⁶ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research).

issue green bonds on behalf of entities in markets that lack the capacity to do so. This substitution not only channels funds to priority sectors, but also forms a demonstration effect that highlights the value of the transaction (in that it was important enough for an MDB to step in) and informs market actors about new business lines and products, such as green bonds.⁸⁷

Ganjiang New Area and other Chinese cities that issue GMBs first will further show a willingness to experiment with innovative green financial instruments and a certain level of commitment to protecting environmental quality. In addition to inevitably positioning themselves as leaders in what will become a big bond market,⁸⁸ these cities can cultivate reputations as sustainability leaders and become promising investment opportunities in the eyes of environmentally conscious investors. It is difficult to quantify or predict the effects of a particular city's reputation changing. At the very least, cities that promote or label themselves as "green," "low-carbon," "eco," or "sustainable" while also issuing GMBs will demonstrate consistency, integrity, and transparency to the public and private sectors.

Chinese cities that issue GMBs for policy signal value and/or their own reputation could face the downside of increased public visibility and scrutiny from higher levels of government. Mr. Calvin Quek, the former Sustainable Finance Director of Greenpeace East Asia, says any city that self-promotes its low-carbon initiatives and issues GMBs to finance them will attract attention, during both the initial issuance and later steps that take place over years, such as third party verification and reporting on projects' environmental impacts. Institutional investors and officials will want to see that a city's rhetoric matches reality; some cities might purposely downplay their rhetoric as a result.⁸⁹ On a case by case basis, the first cities to issue GMBs will have to be prepared for audits and media attention.

3. Challenges and recommendations for scaling up green municipal bonds

3A. Inability to label municipal bonds as green

The MoF has not yet created a category for "green municipal bond" in China's bond taxonomy. This means that even if a city wants to issue GMBs, the bonds cannot be officially labeled as "green" on the markets and issuing becomes difficult.⁹⁰ Dr. Cheng Lin,⁹¹ an Economist at the Center for Finance and Development of Tsinghua University's National Institute of Financial Research, identifies the inability to label as the single biggest barrier to the wider use of GMBs in China. Furthermore, he says the MoF's reason for not removing this barrier is that it lacks the personnel to establish and regulate a new bond category—an excuse that should be viewed with a heavy dose of skepticism. Essentially, until the MoF supports GMBs, it is technically impossible for cities to issue labeled GMBs and enjoy the advantages described in the previous sections.⁹² For now, Chinese cities will have to resort to issuing unlabeled GMBs, i.e. conventional municipal bonds that happen to finance green projects.

⁸⁷ David Goodman, "The Potential of Green Bonds," Discussion Paper (Bonn, Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2017), <https://www.giz.de/fachexpertise/downloads/giz2017-en-climate-finance-green-bonds.pdf>.

⁸⁸ "How to Issue a Green Bond in China: A Step-by-Step Guide."

⁸⁹ Calvin Quek (former Sustainable Finance Director, Greenpeace East Asia), In-person interview in Beijing, January 21, 2019.

⁹⁰ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, March 12, 2019.

⁹¹ This paper uses the traditional naming convention for Chinese names, with the family name being placed first.

⁹² Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research).

Recommendations: The MoF should reverse course and allow for scaling up of GMB issuance in China by doing any combination of the following. These actions would grab the attention of provinces, cities, and the Chinese financial sector:

- Create a GMB category to allow cities to label their municipal bonds as green.
- Promote green bonds in regulations and public documents.
- Communicate with the NDRC to harmonize regulations and unify green bond definitions and standards in China.

3B. Local government debt levels

Following the MoF's lack of regulatory support for GMBs, the experts interviewed for this paper repeatedly mentioned local government indebtedness as the second biggest barrier for green bonds becoming a prominent financing tool for low-carbon cities. Bonds are debt instruments—their issuance increases the level of indebtedness of cities.⁹³ Bonds are thus most effective when an issuer has taken stock of its financial situation and is not already indebted, and/or is financially secure enough to repay debt if things go wrong. The current debt ratio of local governments in China is high. Many local governments have not attempted to issue municipal bonds at all because of debt. Issuing GMBs (or any type of green bond) would thus pose the risk of falling deeper into debt.⁹⁴ In recent years, the central government has enabled many more local governments to issue municipal bonds by relaxing issuance criteria. This is creating another “debt deluge” where local governments are issuing more bonds than they can realistically repay.⁹⁵

Interview findings also comport with the literature on local government debt and creditworthiness in China. Cities in many parts of the developing world face challenges related to their creditworthiness and hence their ability to tap into domestic and international capital markets. Efforts to enhance municipalities' creditworthiness in China will thereby enhance their access to bond markets.⁹⁶ The Chinese market is especially notorious for failing to price risk effectively. Many investors assume the government will bail out borrowers in danger of default, leading to moral hazard. But defaults have risen in recent years. This weakens the assumption of an implicit government guarantee for all debt.⁹⁷

A given city's financial situation is a core consideration for the use of GMBs. The wealthiest and most financially secure Chinese cities such as Beijing, Shanghai, and Shenzhen could safely issue GMBs.⁹⁸ This could be a key reason why Shenzhen, according to Dr. Wang Yao, is trying to issue a labeled GMB. Interestingly, when asked whether central and provincial governments will make exceptions for GMBs and allow debt-stricken local governments to issue more of them, she said, “I do not think they will. That is a debt problem, not a ‘green’ problem.”⁹⁹ It remains to be seen if these governments will continue to consider local government debt and the greenness of financial instruments that could affect debt ratios as totally separate issues.

⁹³ Lindfield, “Green Municipal Finance.”

⁹⁴ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), Phone interview, February 25, 2019.

⁹⁵ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link), Skype interview, January 17, 2019.

⁹⁶ Goodman, “The Potential of Green Bonds.”

⁹⁷ Wildau, “China's Interbank Bond Market in Five Charts.”

⁹⁸ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, February 25, 2019.

⁹⁹ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics), interview, March 5, 2019.

Ultimately, assessing the indebtedness and overall financial security of a low-carbon city is a necessary but not sufficient step for GMBs to become a truly feasible and effective financing tool. The more indebted a given city is, the less fundamentally effective GMBs will be for financing projects there. Even if GMB issuances succeed in raking in lots of money for low-carbon projects, the city's debt burden will worsen. A thorough accounting of whether a city has a manageable amount of debt—which, fortunately, is quantifiable and trackable—should therefore be a first step before a GMB issuance is seriously considered. Theoretically, city leaders could even make the launch of new green projects contingent upon reaching a targeted, manageable level of debt. This would require close coordination between the municipal departments that conceptualize, plan, and implement physical infrastructure projects—a big improvement on current institutional arrangements, where project design and engineering occur separately from financing.

National policymakers' and regulators' concern over local government debt has also led the MoF to impose a quota on how much debt municipalities are allowed to issue. The quota limits cities' ability to issue municipal bonds. Dr. Cheng of Tsinghua University states that many cities have an interest in issuing labeled GMBs, but these bonds would be subject to the quota as well.¹⁰⁰ This barrier may incline cities to issue green project bonds and green corporate bonds through LGFVs as a workaround (discussed further in section five).

Recommendations: The MoF has focused on reducing local government debt via a quota rather than greening debt. To reduce and green debt simultaneously, the MoF should institute a higher debt ceiling for GMBs (and possibly other green debt instruments) compared to conventional bonds.

3C. Knowledge and information scarcity

Green bonds are still a new and innovative instrument in the Chinese financial system and are not well advertised to cities by higher levels of government. When organizations such as the Cities Development Initiative Asia (CDIA) or the China Society for Urban Studies (CSUS) conduct research on sustainable projects in Chinese cities or consult for local governments, green bonds are not one of the most frequently mentioned financing instruments.¹⁰¹ The novelty of green bonds could also explain why central government quotas on local government bond issuance reflect little top-down pressure on local officials to promote or discuss green bonds as much as other financial instruments or mechanisms.¹⁰²

Being aware of green bonds as a financing option does not solve the entire problem. Few Chinese cities are familiar with labeling an instrument like a bond as green and the additional complexity that label brings.¹⁰³ This can complicate raising money for the variety of different projects that most municipal governments oversee at once—after all, cities must invest in many different areas of public goods, services, and infrastructure.¹⁰⁴ When a city needs to finance a set of projects, some of the projects may be designated as green or low-carbon while some will be traditional infrastructure. Green bonds cannot work in these cases because not all of the projects qualify as green. Municipal governments do not want this project

¹⁰⁰ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, March 12, 2019.

¹⁰¹ Unnamed expert (Researcher, Chinese Eco-City Academy; Project Manager, Europe-China Eco-Cities Link), In-person interview in Beijing, December 11, 2018.

¹⁰² Unnamed expert (Researcher, Chinese Eco-City Academy; Project Manager, Europe-China Eco-Cities Link).

¹⁰³ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics), interview, January 21, 2019.

¹⁰⁴ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics).

mismatch.¹⁰⁵ Packaging low-carbon and conventional projects together and issuing green bonds to finance all of them would constitute “greenwashing” and risk turning away environmentally minded investors. To properly issue GMBs, a city would need to place low-carbon and conventional projects in different categories and finance them separately. This split adds a layer of complexity for municipal departments.¹⁰⁶

In cities that might consider using state-backed or commercialized local government financing vehicles (LGFVs; 地方政府融资平台公司)¹⁰⁷ to issue green bonds and finance low-carbon projects, a lack of information can still be a major obstacle. Issuing project bonds is one of the main fundraising tactics of LGFVs; most do so on an annual basis because project bonds usually have lower interest rates than bank loans. In Dr. Wang Yao’s opinion, a lack of awareness is the single biggest reason why the managers of LGFVs do not consider issuing green project bonds instead of conventional project bonds (although a lack of concern for bonds being green could be another reason). She further states that Shenzhen’s ongoing efforts to issue a GMB, if successful, could provide even greater visibility and awareness for green bonds as a green municipal finance tool because of Shenzhen’s status as a first-tier Chinese city.¹⁰⁸ Shenzhen’s future efforts to build low-carbon projects using GMB proceeds can also provide best and worst practices for peer cities. At the same time, many of Shenzhen’s existing low-carbon projects fall into the category of large national priority projects. These are more likely to occur in big cities and are already well-resourced or have the funding behind them to achieve environmentally friendly designs and outcomes. But a second-tier or third-tier Chinese city with a more financially challenged or indebted situation that manages to successfully finance a low-carbon project using a GMB will provide a more realistic and replicable model for peer cities to learn from.¹⁰⁹

Recommendations: It is critical to develop the expertise of municipalities’ Financial Bureaus and to guide their green bond issuance in the early stages of market development, when no demonstration cases exist. Awareness, skills, and best practices can proliferate between municipalities once a larger number of green municipal bonds have been issued. To spark and guide the market in its early stages, the paper recommends that the MoF and PBoC issue guidelines specifically for municipalities and invite municipalities to become members of the Green Finance Committee, a key knowledge and organizing organ in Chinese green finance. Doing so will simultaneously strengthen the demand for and awareness of green bonds. Such promotion matters both symbolically and practically in the grander scheme of greening China’s financial system. As recommended in a 2016 report from the China Council for International Cooperation on Environment and Development, China’s central government should develop long-term sources of finance by promoting green bonds.¹¹⁰

3D. Inefficient green project design and planning

¹⁰⁵ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics).

¹⁰⁶ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics).

¹⁰⁷ LGFVs are state-backed or state-holding special purpose enterprises created by municipalities (they are *not* state-owned, making them different from SOEs). They arrange various resources and represent municipal governments to raise money from banks and the capital market. LGFVs have been instrumental in helping Chinese cities build high quality infrastructure at an unprecedented pace since the early 1990s. However, they are often designed to get around local debt restrictions, which is problematic.

¹⁰⁸ Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics), interview, January 21, 2019.

¹⁰⁹ Unnamed expert (Sustainable Urban Development Analyst, GIZ), interview.

¹¹⁰ “MoHURD Eco-City Implementation Guideline for Municipal Finance.”

The insufficient exploration of GMBs in China also results from the separation of urban planning and investment systems.¹¹¹ The typical institutional arrangement in Chinese cities separates the departments that can manage project financing—such as a local Financial Bureau operating under MoF guidelines—from the approval, design, and planning of projects, which might be led by the local Development and Reform Commission (DRC). This division produces projects that are aesthetically and technically strong but financially dubious.¹¹² Why is this the case? Essentially, municipal planners are “totally separated” from financing, feasibility, and implementation of projects, according to Ms. Ruan Xiaocun, a professional planner who has worked for more than twenty years in the Netherlands and consults for Chinese urban planning organizations. In the past few decades, most urban planners and designers in China have been educated in architecture and spatial urban planning, with little knowledge of finance, economics, or other disciplines.¹¹³ The typical planning process can also be so non-transparent and top-down that planners do not even know the budget for a given project.¹¹⁴ This increases the likelihood of a “good” but costly plan, with a budget exceeding what a city can afford to finance. Furthermore, the assessment teams that conduct environmental feasibility studies of urban projects usually lack an economist or financial expert and consist solely of engineers. This leads local design institutes to perform detailed engineering and design feasibility studies without asking basic financial questions—for instance, “Can this project secure a bank loan?”—to specialists within the municipal government.

In contrast, Ms. Ruan describes how in Europe, urban planners must evaluate project designs based on feasibility first and aesthetics second, or feasibility and aesthetics in combination. While all aspects of a plan matter, the most important criteria for a “good” plan should be its feasibility. This includes calculating the costs of building infrastructure and of moving people displaced by construction activities. Even if one works for a firm or studio that does design work exclusively, clients will always share how much a given project will cost.¹¹⁵ When it comes to green urban infrastructure projects, the planning process must be especially pragmatic because these projects are often more technologically sophisticated and capital intensive than conventional or “grey” infrastructure projects. Thus, while many municipal governments in China have the political willingness to build green projects, set environmental targets (for water and air pollution, CO₂ intensity, etc.), and write up action plans to achieve those targets, the lack of a methodology to link steps such as master planning and financing hinders real progress.¹¹⁶

Recommendations: The general corrective to urban planning in Chinese cities is integrating financing concerns and potential financing tools or mechanisms into the earliest stages of project planning, lasting all the way through to feasibility assessments of projects. To accomplish this, this paper recommends cross-staffing the local departments responsible for projects to increase collaboration, so that economists and planners can be in the same room and better include each other’s targets and consider GMBs at the earlier, conceptual stages.¹¹⁷ This is not yet standard thinking and practice in China, but the situation is slowly changing.¹¹⁸

¹¹¹ Lindfield, “Green Municipal Finance.”

¹¹² Ye Wang (Finance Center Research Analyst, Sustainable Finance Program, World Resources Institute Beijing representative office), interview.

¹¹³ Ruan Xiaocun (Key Expert, Europe-China Eco-Cities Link; Founder, East West Urban Consultancy), Skype interview, December 11, 2018.

¹¹⁴ Ruan Xiaocun (Key Expert, Europe-China Eco-Cities Link; Founder, East West Urban Consultancy).

¹¹⁵ Ruan Xiaocun (Key Expert, Europe-China Eco-Cities Link; Founder, East West Urban Consultancy).

¹¹⁶ Unnamed expert (Senior Analyst at a Chinese environmental think tank), In-person interview in Beijing, January 22, 2019.

¹¹⁷ Unnamed expert (Researcher, Chinese Eco-City Academy; Project Manager, Europe-China Eco-Cities Link), interview.

¹¹⁸ Unnamed expert (Sustainable Urban Development Analyst, GIZ), interview.

A more straightforward recommendation for municipal governments is to include at least one economist on every project planning team (CDIA’s consulting teams always have one) to assess the profitability of each project. For example, if a city builds a three-story shopping mall, the economist can help estimate the revenue earned over a certain time frame after construction is completed or the increase in land value the mall will create. CDIA uses such analysis to compile the most bankable, promising projects for their client cities and then link those projects to financing from banks.¹¹⁹

3E. Projects’ lack of bankability

A key consideration for any project that requires financing is whether the project is “bankable” or commercially viable—in other words, whether its developers can make a compelling business case to investors and lenders.¹²⁰ Bankability is one of the enabling conditions that needs to be in place to foster private sector investment in municipal infrastructure.¹²¹ A prerequisite for most urban infrastructure projects is that a city is in the position to not only design the infrastructure in accordance with its major policy objectives for low-carbon development, but also to attract the private sector to a business opportunity that offers acceptable profits and risks.¹²² Indeed, the worldwide structure of climate finance shows that bankability matters because the mobilization of private sector capital is of paramount importance for low-carbon development.¹²³

GMBs will be much more feasible and effective tool for low-carbon urban development when the underlying projects are highly bankable.¹²⁴ The private sector is often not interested in investing in municipal public welfare (i.e. non-commercial) projects, so cities need to be able to develop attractive business cases that are risk-reduced and provide a clearly defined profit.¹²⁵ The fact that green projects usually cost more upfront than non-green ones raises the importance of making a convincing case to investors.¹²⁶ Cities can prioritize climate mitigation projects that are revenue-generating for green bond financing in order to guarantee repaying the bonds.¹²⁷ These projects can offer greater ROI in the long-term, in addition to environmental and social co-benefits that are attractive to investors. Co-benefits include lower climate risk and the costs saved from not having to clean up pollution produced by a project—for instance, smokestack emissions from a factory located on a city’s periphery.¹²⁸

Cities in China generally lack experience conceptualizing and preparing bankable low-carbon infrastructure projects. They need help from project preparation facilities (PPFs), organizations whose basic function is to assist clients with preparing a pipeline of viable, investment-ready projects and to link those projects to financing.¹²⁹ Assisting cities with this task has been a core part of the work of the Europe-China Eco-Cities Link (EC-Link) project and CDIA (a PPF), which have both consulted pro-bono for many green projects. Their track records shows how adequate project preparation and a long, thorough planning period are key

¹¹⁹ Unnamed expert (Sustainable Urban Development Analyst, GIZ).

¹²⁰ Goodman, “The Potential of Green Bonds.”

¹²¹ “MoHURD Eco-City Implementation Guideline for Municipal Finance.”

¹²² “MoHURD Eco-City Implementation Guideline for Municipal Finance.”

¹²³ “MoHURD Eco-City Implementation Guideline for Municipal Finance.”

¹²⁴ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, February 25, 2019.

¹²⁵ Lindfield, “Green Municipal Finance.”

¹²⁶ Unnamed expert (Sustainable Urban Development Analyst, GIZ), interview.

¹²⁷ Lindfield, “Green Municipal Finance.”

¹²⁸ Unnamed expert (Sustainable Urban Development Analyst, GIZ), interview.

¹²⁹ Basil Oberholzer et al., “Summary of Good Practice of Successful Project Preparation Facilities” (Basel, Switzerland: City Climate Finance Leadership Alliance, February 2018).

to creating win-win situations where the advantages of financing low-carbon city projects are clearly defined for both municipalities and private investors.¹³⁰ In cases where the assistance of a PPF is unavailable, a city can conduct one or more pre-feasibility studies (PFS) during project preparation to help ensure bankability. A PFS is an extra step beyond the feasibility study (FS) that all Chinese commercial banks require before they lend money to municipal projects.¹³¹

There is an innovative PPF worth mentioning inside the Shandong Green Development Fund (SGDF),¹³² a fund spearheaded by the Asian Development Bank (ADB) that will begin operations in Shandong Province by the end of 2019.¹³³ Shandong was chosen because the province faces top-down pressure from the central government to curb its carbon emissions.¹³⁴ Mr. Hubert Jenny, Principal Infrastructure Finance Specialist for the ADB's PRC Resident Mission, explained how the SGDF is unique using his insider knowledge. First, the Fund uses international green standards from the Green Climate Fund (GCF), which are much stricter than those in China. Second, the Fund's PPF will be the first in China to link amounts of funding given to municipal projects with the greenness of projects.¹³⁵ It will be interesting to see how the Fund performs in Shandong and whether any improvements its PPF brings to low-carbon city project preparation and financing can be replicated in other provinces.

Irrespective of PPFs, cities can prioritize green building and building retrofitting projects that are typically more bankable than other infrastructure. Newly constructed green buildings and older buildings that have been retrofitted with energy efficient systems are generally self-financing because they constantly use less electricity and water, which reduces bills for utilities.¹³⁶ Lower utility costs save money every month and pay back the costs of the building's development over time.¹³⁷ Green buildings are also low-hanging fruit from an environmental perspective. Rapid urbanization has led buildings to supplant industry as the largest source of carbon emissions in China.¹³⁸ Furthermore, many types of buildings—from apartments to industrial facilities—can be retrofitted and become qualified as green according to China's three-star rating system. The direct savings on utilities for large factories, for instance, can amount to millions of RMB per month.¹³⁹ Green buildings are also in high demand on the Chinese market. Large Chinese private real estate and property development companies like Vanke (万科) are now trying to brand their products and buildings as green, energy efficient, and/or low-carbon.¹⁴⁰ But collateralizing energy efficiency improvements, from solar panels on roofs to efficient interior lights, is inherently difficult. This can deter banks from making loans to municipal governments or building owners for retrofitting, even when

¹³⁰ Lindfield, "Green Municipal Finance."

¹³¹ Unnamed expert (Sustainable Urban Development Analyst, GIZ), interview.

¹³² In his interview, Mr. Lindfield gave important points to clarify the SGDF. First, the SGDF is a financing structure, not a financial instrument. He states, "The key fact about structures is that they can apply instruments flexibly, depending on the needs of a particular local government. It is therefore important to look at where and how Chinese cities lack capacity to put together green projects that are appropriate for financing. Moreover, PPFs do not have to be part of funds like the SGDF. A central government organ, such as the Ministry of Housing and Urban-Rural Development (MoHURD) or the Ministry of Ecology and Environment (MEE), could establish and operate a PPF."

¹³³ More information on the SGDF can be found on the ADB's website: <https://www.adb.org/projects/51194-001/main>

¹³⁴ Hubert Jenny (Principal Infrastructure Finance Specialist, PRC Resident Mission, Asian Development Bank), In-person interview in Beijing, January 4, 2019.

¹³⁵ Hubert Jenny (Principal Infrastructure Finance Specialist, PRC Resident Mission, Asian Development Bank).

¹³⁶ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link), interview.

¹³⁷ Unnamed expert (Sustainable Urban Development Analyst, GIZ), interview.

¹³⁸ Unnamed expert (Researcher, Chinese Eco-City Academy; Project Manager, Europe-China Eco-Cities Link), interview.

¹³⁹ Unnamed expert (Sustainable Urban Development Analyst, GIZ), interview.

¹⁴⁰ Unnamed expert (Researcher, Chinese Eco-City Academy; Project Manager, Europe-China Eco-Cities Link), interview.

the retrofit projects are rather bankable and/or environmentally high impact. GMBs, being relatively low risk, seem better suited to financing building retrofits in China than loans.¹⁴¹

One other way cities can develop bankable, revenue generating projects is land value capture. Developing land increases its value, and cities can then turn a profit on the sale or rent of that land. (In China, the profits of land value capture are taken by either the government or by the private sector.¹⁴²) Most green projects increase the value of land more than conventional projects thanks to environmental co-benefits. For example, a green corridor that runs through a city can beautify the landscape, provide public green space for residents, and reduce flood risk. By charging several thousand RMB per year per unit of housing along or inside the corridor, the municipal government can impose a tolerable cost on residents who benefit most from the corridor while generating a lot of revenue.¹⁴³ The municipal government might also capture more value from the land used for the corridor project by up-zoning it.¹⁴⁴

Recommendations: With most investors only interested in holding green bonds funding highly bankable projects, municipalities need ways to separate such projects from semi-public welfare and pure public welfare projects. This paper recommends that municipalities establish PPFs and feasibility study funds to develop a larger pipeline of bankable projects, which ultimately can be bundled together as designated projects to be financed by a GMB. Bundling can allow the income earned by the bankable projects to cover the investment or offset the costs of the non-bankable projects. In other cases, it would be more attractive for investors to separate the two types of projects and only include the most bankable ones in a GMB.

There are two other case-by-case recommendations. First, packaging different environmental assets, such as solar, water, and pollution clean-up investments, into a larger green bond can be a smart strategy for municipalities because larger bonds are normally more attractive to big institutional investors.¹⁴⁵ Third, as more Chinese investors begin prioritizing the carbon footprints and environmental impacts of their portfolios, municipalities can price positive and negative environmental externalities into projects' ROI to ensure the projects are bankable. Internalizing positive externalities will add value and lead to an increase in a project's ROI, whereas internalizing negative externalities will increase a project operator's costs and thus decrease the project's ROI.¹⁴⁶ Failing to internalize both types of externalities risks the chance that projects are financially feasible but environmentally harmful.

Since green building and building retrofitting projects are often more bankable than other types of urban climate mitigation projects, cities should pursue these types of projects and employ methods like land value capture. In turn, bankability will:

- Bolster private investor confidence, regardless of whether investors are especially environmentally conscious.
- Tend to attract more private investment, thereby increasing the likelihood of high-performing green bond issuances.
- Guarantee repayment of the green bonds issued.
- Prevent the ill-advised development of green projects that lack solid ROI.

3F. Additional costs affiliated with monitoring, reporting, and verification (MRV)

¹⁴¹ Unnamed expert (Project Leader for a U.S. university environmental research center), Skype interview, April 11, 2019.

¹⁴² Unnamed expert (Sustainable Urban Development Analyst, GIZ), interview.

¹⁴³ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link), interview.

¹⁴⁴ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link).

¹⁴⁵ "How to Issue a Green Bond in China: A Step-by-Step Guide."

¹⁴⁶ Zhan, de Jong, and de Bruijn, "Funding Sustainable Cities: A Comparative Study of Sino-Singapore Tianjin Eco-City and Shenzhen International Low-Carbon City."

In addition to the normal procedures of getting a rating agency and a third party auditor like Deloitte or PWC, cities that issue GMBs will require the institutional capacity of various local government departments to monitor, report on, and verify the projects they are financing. All green bond issuers must be able to disclose that their assets and projects qualify as green, and most issuers report at least annually on their green credentials.¹⁴⁷ According to the PBoC's green bond policy, each issuer in China must report the types of projects paid for by green bond proceeds every quarter. This kind of report might show, for instance, that 1 billion RMB of a 2 billion RMB bond goes toward a solar farm, while the other 1 billion goes toward a green building.

All else being equal, MRV unavoidably increases the transaction costs for green bond issuers, in terms of both time and money.¹⁴⁸ Some Chinese cities have therefore set aside dedicated sums of money to reimburse issuers' MRV costs. Dr. Cheng of Tsinghua University mentions how the municipal government of Huzhou in Zhejiang Province has earmarked 1 billion RMB from their municipal budget for reimbursing local green bond issuers—effectively a subsidy for green bonds. Huzhou is the first Chinese municipality to operate this sort of reimbursement mechanism.¹⁴⁹ (The city has also been a leader in creating a standards system for green projects, green enterprises, and green banks.¹⁵⁰)

The timing differences stemming from MRV are yet another barrier for the financing of certain categories of low-carbon city projects, such as green buildings. According to China's national standards for green buildings, the first round of project development includes a pre-certification for the design of each building. Then, once a building is finished, the developer must prove that it fulfilled the different certification steps for the building's implementation and operation. But before a bank will invest money or approve a loan for said building, they want to verify that their investment meets environmental standards. The banker's concern comes far before the building is actually certified as green. Even after a unified standard of greenness exists, the timing mismatch can create issues and deter investors.¹⁵¹ Thus, both green standards and the timing of green investments must be reconciled in order for more low-carbon projects to become reality.¹⁵²

Recommendations: The costs affiliated with MRV are not a problem for green bond issuers as long as the overall cost of the green bond remains lower than that of a conventional bond. But this has not been the usual case in China.¹⁵³ To create more scenarios where MRV costs are manageable, this paper recommends that governments play a supporting role by finding ways to lower the costs of MRV to the point where GMBs are more cost-effective than conventional municipal bonds. There is no reason why the type of reimbursement mechanism seen in Huzhou cannot be scaled up to the provincial level. This means Zhejiang Province should offer to reimburse any of its cities that issue GMBs, not just Huzhou. The mechanism could also be tweaked to suit a provincial government's capabilities: it could span the full range of green bond issuers or cover only municipalities, fully or partly reimburse issuers, and reimburse only certain parts of the MRV process.

3G. Insufficient financial incentive schemes

¹⁴⁷ "How to Issue a Green Bond in China: A Step-by-Step Guide."

¹⁴⁸ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link), interview.

¹⁴⁹ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, February 25, 2019.

¹⁵⁰ Ang and Montero, "December 12, 2018."

¹⁵¹ Unnamed expert (Researcher, Chinese Eco-City Academy; Project Manager, Europe-China Eco-Cities Link), interview.

¹⁵² Unnamed expert (Researcher, Chinese Eco-City Academy; Project Manager, Europe-China Eco-Cities Link).

¹⁵³ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link), interview.

The ability to mobilize private capital is an appealing aspect of green bonds, but cities will also be more likely to issue GMBs if they can take advantage of incentives. Financial incentive schemes—such as discounts and rewards, tax benefits and exemptions, credit enhancements, project guarantees, and subsidies that reduce MRV costs or the interest rates of green bonds—give governments everywhere a technology-neutral tool to encourage the flow of capital to low-carbon projects.¹⁵⁴ Interest rate subsidies, for instance, can ensure that green bonds have a pricing advantage over conventional bonds.¹⁵⁵

There are still no such incentives for green bonds at the national level in China. The MoF has seemingly left the task of implementing incentives to different ministries in provincial governments and local governments.¹⁵⁶ In the opinion of Mr. Lindfield from EC-Link, GMBs may not become the best option for Chinese low-carbon cities unless incentives are present.¹⁵⁷ Incentive schemes create better deals for municipal issuers and give them clear signals that the government supports their choice of financing tool. Without them, cities might just default to issuing conventional municipal bonds instead of GMBs. National or provincial government incentives can also broaden the range of low-carbon projects cities seriously consider, usually by making climate adaptation projects (which are less likely to be revenue-generating and bankable than climate mitigation projects) financially viable.¹⁵⁸ According to Dr. Zhu Shouqing, the Chief Technical Advisor of the SDG Financing Initiative at UNDP China, incentives will also be important for kicking off the Chinese GMB market but will vary depending on the depth of provincial and local governments' pockets.¹⁵⁹ Recent data shows that many local governments focused on research and deployment of green bond incentive policies in 2018. New incentive mechanisms were also better structured.¹⁶⁰ In fact, state-managed funds dedicated to reimbursing issuers for the actual costs of issuing green bonds—such as the aforementioned MRV reimbursement mechanism managed by the city of Huzhou—can be understood as a type of incentive scheme because they lower the hurdle for issuers.¹⁶¹

Jiangsu Province is one example of a provincial government that is beginning to use incentives to support green bond issuance at the local level. As of October 2018, Jiangsu was preparing to offer an interest rate discount of up to 30% on green bonds and green asset-backed securities (ABS). According to the “Implementation Opinions on Promoting the High-Quality Development of Green Finance Services Eco-Environment” being proposed by the relevant departments within the Jiangsu government, the 30% discount will apply to non-financial enterprises that successfully issue green bonds and will last for two years at a maximum of 2 million RMB per year.¹⁶² This is one of the first such discounts in China and is set at an aggressive rate.¹⁶³ However, the discount excludes municipal governments—and therefore

¹⁵⁴ “How to Issue a Green Bond in China: A Step-by-Step Guide.”

¹⁵⁵ Calvin Quek (former Sustainable Finance Director, Greenpeace East Asia), interview.

¹⁵⁶ Bond Magazine (债券杂志), “Exploring the Development of Green Municipal Bonds in China (王琰: 关于我国发展绿色市政债券的探讨).”

¹⁵⁷ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link), interview.

¹⁵⁸ Lindfield, “Green Municipal Finance.”

¹⁵⁹ Zhu Shouqing (Chief Technical Advisor, SDG Financing Initiative, UNDP China), In-person interview in Beijing, April 11, 2019.

¹⁶⁰ “China Green Bond Market 2018 Summary (中国绿色债券市场 2018 年度总结).”

¹⁶¹ Calvin Quek (former Sustainable Finance Director, Greenpeace East Asia), interview.

¹⁶² China Securities Journal - China Securities Network (中国证券报-中证网), “Jiangsu plans to discount green bonds by 30% (江苏拟对绿色债券贴息 30%),” Sina Finance (新浪财经), October 10, 2018, <https://finance.sina.com.cn/money/bond/market/2018-10-11/doc-ihmhafiq9068377.shtml>.

¹⁶³ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, February 25, 2019.

GMBs—in Jiangsu. Expanding the discount’s scope to cover GMBs is possible if the provincial government is not worried about the debt levels of cities that might want to issue such bonds.

One reason Jiangsu is so aggressive with its interest rate subsidy is because the province is one of the wealthiest in China. In fact, the three provinces in China currently implementing such a subsidy—Jiangsu, Guangdong, and Zhejiang—are all rich. These provinces possess the twin enabling conditions of (1) “fiscal space” to experiment with subsidies that can jumpstart sustainable development and transformation, and (2) governments that are determined to spend their resources on climate mitigation.¹⁶⁴ Ms. Qiyong Hu, Project Director for GIZ’s Jiangsu Low-Carbon Development Project, explains how Jiangsu’s government has prioritized low-carbon urban development since at least the beginning of the 12th Five Year Plan in 2011. The province now contains five or more national low-carbon pilot cities. GIZ’s ongoing work in Jiangsu also aims to introduce German experience with “integrated energy,” a holistic combination of projects to increase energy efficiency, reduce energy needs and consumption, and deploy more renewable energy.¹⁶⁵ Most other provinces, which lack Jiangsu’s political will and wealth, will likely not implement strong green bond subsidies in the next few years.

Jiangsu, Guangdong, and Zhejiang might still pave the way for other government incentive schemes that make GMBs a superior choice of financing tool for low-carbon cities. Yet the existence of incentives can be necessary but not sufficient for cities to issue GMBs—the strength of the incentives also matters. Do incentives compensate for or override factors like local government indebtedness that would dissuade many Chinese cities from issuing GMBs? Time will tell if Jiangsu’s interest rate discount and other new incentive schemes will prove powerful enough.

Recommendations: Central government actors—particularly the MoF—should actively design financial incentive schemes or encourage provincial governments to do so. In Jiangsu and other provinces that have already pioneered incentives for green bonds, this paper recommends that the scope of incentives be expanded to cover GMBs and/or include a focus on municipal issuers. Cities are essential players in achieving provincial goals for ecological/environmental protection, pollution reduction, reduction and peaking of carbon emissions, and other environmental targets. Giving municipal governments more reasons to issue GMBs will benefit both provinces’ and cities’ long-term development. Particularly in provinces with a greater amount of low-carbon city pilot projects designated by the central government, incentives that include cities can easily align with the goals of pilot programs and demonstrate a provincial government’s commitment to achieving national policy agendas.

Finally, incentives for GMBs should be precise in their definitions of “green.”¹⁶⁶ If an incentive uses a standard of greenness that does not fit existing green bond standards or is unreasonably high, then Chinese cities will not be able to take advantage.

Table 3. Summary of challenges for scaling up GMBs and associated recommendations

Challenge	Recommendations
Issuers cannot officially label municipal bonds as green	The MoF should categorize GMBs, promote GMBs, and harmonize green bond standards with the NDRC

¹⁶⁴ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, March 12, 2019.

¹⁶⁵ Hu Qiyong (Project Director, Jiangsu Low-Carbon Development Project, GIZ), In-person interview in Beijing, October 30, 2018.

¹⁶⁶ Calvin Quek (former Sustainable Finance Director, Greenpeace East Asia), interview.

Local government debt levels are generally high	The MoF should institute a higher debt ceiling for GMBs compared to conventional bonds
Scarce knowledge and information about green bonds at the local level	The MoF and PBoC should issue guidelines specifically for municipalities and invite municipalities to become members of the Green Finance Committee
Inefficient green project design and planning, with a lack of financial considerations	Cross-staff local departments (ex. DRC, Financial Bureau) responsible for projects to increase collaboration Include economists on project planning teams
Many green urban projects are not bankable	Municipalities should establish PPFs and feasibility study funds to develop a larger pipeline of bankable projects, bundle or separate bankable and non-bankable projects, package environmental assets into larger bonds, price externalities into projects' ROI, and pursue more bankable project types (green buildings, building retrofitting, and land value capture)
MRV imposes additional transaction costs and time on issuers	Governments should use reimbursement mechanisms and other methods to lower costs of MRV
Financial incentive schemes have been insufficient to stimulate GMB issuance	The MoF and other central government actors should design incentive schemes or encourage provinces to do so

4. Green bonds issued by LGFVs as an alternative to green municipal bonds

Shenzhen could be the first major Chinese city to issue a labeled GMB given its past experiments with innovative financing for urban sustainability, most notably in the Shenzhen International Low-Carbon City (ILCC).¹⁶⁷ The ILCC is a flagship demonstration project of the China-E.U. Partnership on Sustainable Urbanization located in the Longgang District of Shenzhen, at the border of Dongguan and Huizhou in Guangdong province. It aims to display China's achievements in low-carbon technology and has enjoyed considerable success since its launch in 2012.¹⁶⁸ By 2014, planners in Shenzhen had built a couple of demonstration low-energy public buildings, including an exhibition hall that serves as an educational center on green buildings and green development. Local residents can now enjoy green outdoor spaces in 1 km² start-up zone where construction has been completed; a 5 km² expansion zone will soon follow. The total planned area is 53.4 km².¹⁶⁹ The ILCC upgrades the existing built environment in Longgang District by retrofitting older industrial spaces and will eventually provide replicable examples of low-carbon development for future waves of Chinese urbanization.¹⁷⁰ Cities without the low-carbon label can still learn from the ILCC's use of green bonds to begin financing their own projects.

The Shenzhen ILCC arguably pioneered the use of green bonds to finance urban low-carbon infrastructure in China. Two local government financing vehicles (LGFVs) involved in the ILCC issued corporate bonds that were, functionally speaking, green bonds because the proceeds from the bonds paid for urban climate mitigation infrastructure. While the corporate

¹⁶⁷ For more information on the design, planning, and environmental dimensions of the ILCC, see the detailed 2017 case study by C40 Cities Climate Leadership Group, Inc. [on pages 140-163 of this online report.](#)

¹⁶⁸ Zhan, de Jong, and de Bruijn, "Funding Sustainable Cities: A Comparative Study of Sino-Singapore Tianjin Eco-City and Shenzhen International Low-Carbon City."

¹⁶⁹ Dorinda Elliot, "The Best Part Is What Shenzhen Didn't Do," Paulson Institute, November 14, 2014, <http://www.paulsoninstitute.org/paulson-blog/2014/11/14/the-best-part-is-what-shenzhen-didnt-do/>.

¹⁷⁰ Zhan, de Jong, and de Bruijn, "Funding Sustainable Cities: A Comparative Study of Sino-Singapore Tianjin Eco-City and Shenzhen International Low-Carbon City."

bonds the Shenzhen LGFVs issued in 2012-13 would not have been labeled or marketed as “green” at the time—this was several years before the Chinese government released the foundational 2016 green finance guidelines and “green bond” became a recognized term—the LGFVs could label them as green under the current classifications for different types of bonds in China.¹⁷¹ The bonds’ function and the types of projects they financed were effectively the same as modern green bonds. Past experience with unlabeled green bonds in the ILCC makes it even more likely that the Shenzhen municipal government will be a pioneer in issuing labeled GMBs sometime in the near future.

The two LGFVs involved in partially financing the ILCC are Shenzhen Special Zone Construction and Development Group Co., Ltd. (CDG) and Longgang District Urban Construction and Investment Co., Ltd. (DUCI). CDG was founded by the Shenzhen municipal government while the DUCI was founded by the Longgang District government, both prior to the launch of the ILCC. The companies are responsible for acting on the behalf of their respective governments for financing and investment, infrastructure development, investment promotion, operation, and management—for the ILCC as well as other municipal and district projects in Shenzhen.¹⁷² CDG was responsible for six major projects in the ILCC’s start-up area with a total investment of 3 billion RMB. This sum was raised through bank loans, registered private placement bonds, and short-term financing bonds.¹⁷³

Table 4. Projects constructed by CDG and total investment

Project	Total investment (in million RMB)
Temporary conference and exhibition center of the ILCC	189
Green reformation of Haka round houses	80
Green building reformation of industrial premises	461
Pilot block construction projects	2,030
Construction of roads and infrastructure	34.74
Dingshan River Eco-park and environmental management demonstration project	150
Total	2,944.74

Based on: Table 2 in Zhan, Changjie, and Martin de Jong. “Financing Eco Cities and Low Carbon Cities: The Case of Shenzhen International Low Carbon City.” *Journal of Cleaner Production* 180 (April 2018): page 122. Source: Interviews with CDG staff.

Ms. Ye Wang of the World Resources Institute notes that a state-backed LGFV like CDG issuing corporate bonds would not have been unusual around 2012. Prior to the 2014 Budget Law amendment that allowed Chinese municipalities to directly issue debt through municipal bonds and to access capital markets, many municipalities created and relied on LGFVs to finance construction off-balance because the municipal governments themselves lacked the money to do so.¹⁷⁴ However, the 2014 State Council’s Opinions on Strengthening Local Government Debt Management changed this practice. State-backed LGFVs face more constraints for issuing corporate bonds. This means that CDG’s surging issuance of corporate

¹⁷¹ Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research), interview, February 25, 2019.

¹⁷² Zhan, de Jong, and de Bruijn, “Funding Sustainable Cities: A Comparative Study of Sino-Singapore Tianjin Eco-City and Shenzhen International Low-Carbon City.”

¹⁷³ Changjie Zhan and Martin de Jong, “Financing Eco Cities and Low Carbon Cities: The Case of Shenzhen International Low Carbon City,” *Journal of Cleaner Production* 180 (April 2018): 116–25.

¹⁷⁴ Ye Wang (Finance Center Research Analyst, Sustainable Finance Program, World Resources Institute Beijing representative office), interview.

bonds to finance the ILCC circa 2012-13 is no longer possible in China.¹⁷⁵ Today, CDG would have to issue bonds linked to different climate mitigation projects in the ILCC.¹⁷⁶ But the end result of the bonds would be the same: funding green projects. CDG and DUCI are therefore still relevant parts of the Shenzhen case study despite the change in regulation.

Furthermore, Ms. Ye explains that Shenzhen's large GDP and municipal budget mean the city can afford to experiment with innovative financing methods in order to circumvent financial barriers and constraints (although the city has also crafted some of the best regulations and frameworks for raising money at the city level in China). This was true back in 2011 when CDG and DUCI were founded, so the city's financial capacity has remained the same even as the central government's regulation of LGFVs has progressed. Shenzhen municipality also made a clever choice that allowed the state-backed CDG to operate as a commercialized LGFV by today's standards.¹⁷⁷ By packing prime assets into CDG during its founding in 2011, the city gave CDG the ability to repay debt on its own, thereby avoiding the scenario of Shenzhen needing to cover CDG in case of default.¹⁷⁸ (In China, a LGFV finances or partially finances projects based on the strengths of its land holdings and other assets.¹⁷⁹)

Changjie Zhan, Martin de Jong, and Hans de Bruijn—three scholars who co-published the most in-depth studies of the Shenzhen ILCC's financials—suggest that other Chinese cities could follow the model of CDG and DUCI by using their LGFVs to issue bonds and help finance low-carbon infrastructure. In response to this, several interviewees commented that LGFVs are a very common entity in China and that there is nothing to stop them from turning themselves into dedicated green investment platforms. Mr. Lindfield sees three interesting ways that cities could reimagine LGFVs to play a greater role in financing projects with green bonds:¹⁸⁰

- Create new LGFVs dedicated to financing green projects.¹⁸¹
- Repurpose existing LGFVs to focus on financing green projects.
- Put LGFVs in charge of retrofitting existing urban areas to become greener.¹⁸²

A municipal or district government pursuing any of these three options would be a strong signal of environmental concern and willingness to innovate existing financing mechanisms to prioritize green development. But relying on LGFVs to finance projects on a city's behalf is still not ideal and can be viewed as a temporary alternative for municipalities that are too indebted or otherwise constrained to directly issue GMBs. For instance, greening

¹⁷⁵ Ms. Ye says that the 2014 Opinions made clear that (1) LGFV debts are no longer recognized as public sector liabilities, and (2) LGFV bonds are not backed by municipal governments. Additionally, 2015 and 2016 regulations from the CBRC (now CBIRC) and Exchanges laid down the rule that prevented issuers that derive more than 50% of their revenue from government sources, including LGFVs, from issuing corporate bonds. (Note that this rule was only relaxed in March 2019.)

¹⁷⁶ Specifically, the options CDG would have for bond financing are (1) *Corporate bonds* (regular; regulated by the 50% rule mentioned in footnote 173 above) and (2) *Project revenue bonds* (a type of corporate bond dedicated to municipal development projects; they are strictly traceable to projects.)

¹⁷⁷ Ms. Ye says the CDG could be seen as an “advanced” form of LGFV, since it also develops urban projects rather than serving as a mere financing vehicle.

¹⁷⁸ Ye Wang (Finance Center Research Analyst, Sustainable Finance Program, World Resources Institute Beijing representative office), interview.

¹⁷⁹ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link), interview.

¹⁸⁰ Michael Lindfield (Senior Municipal Finance Expert, Europe-China Eco-Cities Link).

¹⁸¹ Here, it should be noted that the Ministry of Finance is working on the transformation of LGFVs. The MoF recently announced a work plan in March 2019 that will prevent the creation of any new “Financing Platform Companies” (another name for LGFVs). Therefore, point 1. about cities creating new LGFVs dedicated to financing green projects could soon be irrelevant, pushing cities toward repurposing LGFVs along the lines of points 2. and 3.

¹⁸² Mr. Lindfield notes for clarification here that LGFVs, as defined by the MOF, are different from area-based companies such as the Qingdao Jingling Ocean Technology Co., Ltd. (which may fall under industrial park legislation).

an existing LGFV might prove difficult in practice. Consider CDG and DUCI issuing conventional corporate bonds, which were used for the refinancing of the companies' entire operations. Both LGFVs funneled the proceeds toward low-carbon infrastructure, making their bonds *de facto* green but not *de jure* green. Mr. Quek speculated that if the LGFVs were to try and issue labeled green bonds (the LGFVs are state-backed, so these would need to be labeled green project bonds) on the Chinese markets today, the issuance would entail ring-fencing all of the money raised by the bonds for qualifying green projects. Ensuring that CDG and DUCI only deal with projects and financing instruments that meet green standards or definitions would be harder than Shenzhen municipality giving the LGFVs a broader environmental mission with some flexibility.¹⁸³ After all, CDG and DUCI are responsible for projects besides those in the ILCC, which probably include non-green infrastructure.

Recalibrating LGFVs' funding structures to become fundamentally greener would also be a challenge. Each LGFV has a web of existing funding partners such as corporate banks. If the LGFV's mission or project portfolio shifts significantly, its web and the relationships therein will need to be renegotiated as well. Moreover, whether each of the LGFV's individual funding partners could actually help it with the issuance of green bonds would be up in the air. For these reasons, LGFVs around the world—not just in China—are hesitant to “play around” with their funding structures. Change at higher levels of management takes time, as does revising the details of projects on-the-ground.¹⁸⁴ If LGFVs do issue more green bonds in the future, it will be because the business benefits of doing so outweigh the regulatory complications and costs. Mr. Quek states that one of his professional contacts at the Asian Infrastructure Investment Bank (AIIB), who helps companies in China issue green bonds, says LGFVs will not issue green bonds to finance low-carbon projects from a place of altruism. Green bond issuance is a fairly transactional exercise; companies wanting to build a green brand do “minimal work” to prove their green credentials to the market.¹⁸⁵

Despite these challenges, a recent example from the city of Wuhan points to LGFVs playing a greater role in green financing for urban infrastructure. The Wuhan Metro Group Co., Ltd. set a milestone in November 2018 when its debut offshore green bonds sold for 400 million USD.¹⁸⁶ Moody's Investor Service assigned a Green Bond Assessment (GBA) rating of GB1 (Excellent) to the bonds, in the estimation that all proceeds will be allocated to expanding low-carbon public transportation in Wuhan and align with the LGFV's sustainability strategy.¹⁸⁷ In such cases, LGFV-issued green bonds could solve maturity mismatches for infrastructure projects, such as metro systems, that require long-term investments (Wuhan Metro's bonds have tenors of 10 years or more, about twice as long as most bank-issued Chinese green bonds).¹⁸⁸

Summary: Three illustrative points can be taken from case of the Shenzhen International Low-Carbon City:

- The ILCC's experience with unlabeled green bonds circa 2012 gives Shenzhen a precedent and advantage in issuing labeled GMBs in the near future.

¹⁸³ Calvin Quek (former Sustainable Finance Director, Greenpeace East Asia), interview.

¹⁸⁴ Calvin Quek (former Sustainable Finance Director, Greenpeace East Asia).

¹⁸⁵ Calvin Quek (former Sustainable Finance Director, Greenpeace East Asia).

¹⁸⁶ Morgan Davis, “Wuhan Metro Seals Landmark Green Deal for LGFVs,” Global Capital Asia, November 29, 2018, <https://www.globalcapital.com/article/b1c12qj1rmd7p2/wuhan-metro-seals-landmark-green-deal-for-lgfv>.

¹⁸⁷ “Moody's Assigns Green Bond Assessment (GBA) of GB1 to Wuhan Metro's Proposed Green Senior Perpetual Securities,” Moody's Investors Service, November 20, 2018, https://www.moody's.com/research/Moodys-assigns-Green-Bond-Assessment-GBA-of-GB1-to-Wuhan-PR_391149.

¹⁸⁸ Lucy Hornby, “Greener Tint to China Project Finance,” Financial Times, October 9, 2018, <https://www.ft.com/content/e6745e52-ad34-11e8-8253-48106866cd8a>.

- Using LGFVs to issue green bonds would still be a suboptimal alternative for Chinese cities that cannot issue GMBs because of indebtedness or other reasons. Wuhan Metro's example shows that LGFV green bond issuances are possible today.
- Chinese cities could potentially repurpose their LGFVs for green municipal finance, although it is hard to argue for LGFVs as green city financing mechanisms if they have not been not working well for urban financing in general.

5. Conclusion: Prospects for scaling up green municipal bond issuance

Green municipal bonds will have a growing role in the Chinese and global financial sectors going forward. As a debt instrument that can harness private capital for high cost, long-term ROI projects, green bonds appear naturally suited to the needs of cash-strapped cities in China that are trying to achieve low-carbon transition. This paper analyzes findings from interviews conducted with 17 experts in 2018-19, scholarly literature, and the latest data on Chinese green bonds—all of which indicate that labeled green municipal bonds would be the best point of entry for Chinese cities into the green bond market and the most desirable financing option for urban climate mitigation projects. First, GMBs, being state-backed, will always carry higher average ratings than green corporate bonds or green project bonds. This means they should perform better with private investors (and in general) on China's interbank and exchange markets. Second, cities relying on LGFVs to issue green bonds is a riskier proposition than issuing GMBs, given that the regulation of LGFV bond issuances and off-balance debt in China has tightened in recent years. Third, GMBs can best demonstrate a city's alignment with high level environmental policy goals and low-carbon objectives to both the public and private sectors. If a city issues green corporate or project bonds through commercialized or semi-commercialized LGFVs, it becomes harder to link those bonds' policy signal value or green reputation benefits to that city.

As long as China's regulatory, legal, and policy frameworks for green finance and green bonds can free up GMBs for wider use by municipalities—combined with the current trends of new government incentives and growing demand from institutional investors—then GMBs should contribute greatly to the estimated 6.6 trillion RMB¹⁸⁹ needed for low-carbon city construction in China during the 13th Five Year Plan period and beyond. This is a cautiously optimistic conclusion about GMBs as a financing tool for Chinese cities, one that relies on many variables that may move independently. While there is no short-term guarantee that the MoF will adjust its regulations and allow municipal bonds to be officially labeled as green, the Ganjiang New Area issuance demonstrates that they can still be issued under the PBoC regulations. There is also no guarantee that improvements in national green bond standards will ease the processes of MRV or preparing bankable projects for cities. However, the upward trend for China's green bond market and the country's rise as a green finance leader forecast more labeled GMB issuances in 2019-20. Should Shenzhen or another major city follow Ganjiang New Area, more and more cities are likely to issue as well. As Chinese cities learn from each other's experiences in coming years, issuing GMBs will become increasingly streamlined and cost-effective as the bond market expands and demand increases. Researchers and analysts can also draw on larger financial data sets, new conceptual and empirical financial models, better case studies, a more mature Chinese financial sector to study cities' application of green bonds down the road. Finding scientific, data-driven methods of maximizing green bonds' effectiveness would be a worthwhile pursuit.

¹⁸⁹ “1 Trillion USD Investment Needed in Five Years to Build Low-Carbon Cities in China.”



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Green bonds are ultimately a means to an end: the large-scale construction and retrofitting of urban building, transport, energy, land use, and other infrastructure projects in ways that will help the world's most polluting country minimize its GHG emissions. Chinese cities harnessing green finance will be a win-win for the country and the world. Hundreds of millions of Chinese urbanites will breathe cleaner air, enjoy greener public spaces, and live longer with better health outcomes, while the cities they inhabit will push us all closer to a sustainable future spared from the worst effects of climate change.

References

- “1 Trillion USD Investment Needed in Five Years to Build Low-Carbon Cities in China.” Bloomberg Philanthropies, June 7, 2016. <https://www.bloomberg.org/press/releases/1-trillion-usd-investment-needed-five-years-build-low-carbon-cities-china/>.
- Ang Li and Diego Montero. “Money Grows on Trees - Financing China’s Green Future.” China Watch. Accessed December 28, 2018. <http://www.chinawatch.cn/a/201812/18/WS5c18b4ada31047b156e86c14.html?from=groupmessage&isappinstalled=0>.
- “Blended Finance for Green Investment in China,” 1–9. Post-Conference Position Paper. Beijing: Europe-China Eco-Cities Link, 2018.
- Bond Magazine (债券杂志). “Exploring the Development of Green Municipal Bonds in China (王琰: 关于我国发展绿色市政债券的探讨).” *International Institute of Green Finance of the Central University of Finance and Economics (中央财经大学绿色金融国际研究院)* (blog), October 24, 2018. <https://mp.weixin.qq.com/s/z9-3ndosGAIwxSmNNYFDOQ>.
- Cheng Lin (Economist, Center for Finance and Development, Tsinghua National Institute of Financial Research). Phone interview, February 25, 2019.
- . Phone interview, March 12, 2019.
- “China Green Bond Market 2018 Summary (中国绿色债券市场 2018 年度总结).” IIGF Report (IIGF 报告). Beijing: International Institute of Green Finance of the Central University of Finance and Economics (中央财经大学绿色金融国际研究院), February 11, 2019. <https://mp.weixin.qq.com/s/08fuUciPzqbjcJrwuCO9aw>.
- China Securities Journal - China Securities Network (中国证券报-中证网). “Jiangsu plans to discount green bonds by 30% (江苏拟对绿色债券贴息 30%).” Sina Finance (新浪财经), October 10, 2018. <https://finance.sina.com.cn/money/bond/market/2018-10-11/doc-ihmhafiq9068377.shtml>.
- China Securities Network (中国证券网). “Jiangxi Ganjiang New Area issues country’s first municipal green bond (江西赣江新区发行全国首单绿色市政专项债).” Sina Finance (新浪财经), June 21, 2019. <http://finance.sina.com.cn/stock/relnews/hk/2019-06-21/doc-ihytcerk8306348.shtml>.
- Columbia University. “Low-Carbon Cities.” SIPA Center on Global Energy Policy, 2019. <https://chineseclimatepolicy.energypolicy.columbia.edu/en/low-carbon-cities>.
- Davis, Morgan. “Wuhan Metro Seals Landmark Green Deal for LGFVs.” Global Capital Asia, November 29, 2018. <https://www.globalcapital.com/article/b1c12qj1rmd7p2/wuhan-metro-seals-landmark-green-deal-for-lgfvs>.
- Elliot, Dorinda. “The Best Part Is What Shenzhen Didn’t Do.” Paulson Institute, November 14, 2014. <http://www.paulsoninstitute.org/paulson-blog/2014/11/14/the-best-part-is-what-shenzhen-didnt-do/>.
- Gipouloux, Francois. “Introduction.” In *China’s Urban Century*, 12–13. Cheltenham, UK: Edward Elgar Publishing, 2015.
- Goodman, David. “The Potential of Green Bonds.” Discussion Paper. Bonn, Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, 2017. <https://www.giz.de/fachexpertise/downloads/giz2017-en-climate-finance-green-bonds.pdf>.
- Hornby, Lucy. “Greener Tint to China Project Finance.” Financial Times, October 9, 2018. <https://www.ft.com/content/e6745e52-ad34-11e8-8253-48106866cd8a>.

- “How to Issue a Green Bond in China: A Step-by-Step Guide.” Greening China’s Financial Markets. Climate Bonds Initiative and the International Institute for Sustainable Development, 2018. <https://www.climatebonds.net/files/files/How-to%20GreenBonds%20China.pdf>.
- Hu Qiyang (Project Director, Jiangsu Low-Carbon Development Project, GIZ). In-person interview in Beijing, October 30, 2018.
- Innovative Green Development Program (iGDP), Lawrence Berkeley National Laboratory (LBNL), and Energy Foundation China (EFC). “Progress and Prospects: China’s Cities Transitioning toward Energy Sustainability and Pursuing Early Peaking of Carbon Emissions.” Low-Carbon and Green Index for Cities. Beijing: Innovative Green Development Program (iGDP), 2017. Accessible at <http://logic.igdp.cn/>.
- Ives, Mike. “For China’s Polluted Megacities, a New Focus on Slashing Emissions.” Yale Environment 360, September 15, 2016. https://e360.yale.edu/features/as_china_looks_to_cut_emissions_focus_shifts_to_low_carbon_cities.
- Jenny, Hubert (Principal Infrastructure Finance Specialist, PRC Resident Mission, Asian Development Bank). In-person interview in Beijing, January 4, 2019.
- Jing Li. “China May Allow Green Bonds for Clean Coal in Blow to Climate Fight.” South China Morning Post, September 12, 2019. <https://www.scmp.com/economy/china-economy/article/3026748/china-expected-allow-green-bonds-fund-clean-coal-projects>.
- Lindfield, Michael (Senior Municipal Finance Expert, Europe-China Eco-Cities Link). Skype interview, January 17, 2019.
- Lindfield, Michael. “Green Municipal Finance.” EC-Link Position Paper. Europe-China Eco Cities Link (EC-Link) Project, July 2018. Accessible at: <http://www.eclink.org/eclink/en/sectors/about>.
- Liu Zhi. “Green and Smart Infrastructure Development.” PowerPoint, Institute of South-South Cooperation and Development, Peking University, November 17, 2018.
- Ma Jun, Michael Sheren, and Simon Zadek. “G20 Green Finance Synthesis Report.” G20 Green Finance Study Group, September 5, 2016. https://unepinquiry.org/wp-content/uploads/2016/09/Synthesis_Report_Full_EN.pdf.
- Meng, Alan Xiangrui, Monica Filkova, Ivy Lau, Sherry Shangguan, Jin Shang, and Xiaopeng Chen. “China Green Bond Market 2018.” Climate Bonds Initiative and China Central Depository & Clearing Company, February 2019. <https://www.climatebonds.net/resources/reports/china-green-bond-market-2018>.
- “MoHURD Eco-City Implementation Guideline for Municipal Finance.” EC Link Toolbox. Beijing: Europe-China Eco Cities Link (EC-Link) Project, June 24, 2016. http://eclink.org/media/filer_public/80/ab/80ab7311-70e4-4cd1-961f-441d332444b0/8_mohurd_eco-city_implementation_guidelines-mf24-06-2016.pdf.
- “Moody’s Assigns Green Bond Assessment (GBA) of GB1 to Wuhan Metro’s Proposed Green Senior Perpetual Securities.” Moody’s Investors Service, November 20, 2018. https://www.moody.com/research/Moodys-assigns-Green-Bond-Assessment-GBA-of-GB1-to-Wuhan--PR_391149.
- Neuwirth, Suzie. “Green Bond Market Forecast to Swell to Record Size in 2019.” Peer2Peer Finance News, January 29, 2019. <http://www.p2pfinancenews.co.uk/2019/01/29/green-bond-market-forecast-to-swell-to-record-size-in-2019/>.

- Oberholzer, Basil, Katharina Schneider-Roos, Charlotte Boulanger, and Maryke van Staden. “Summary of Good Practice of Successful Project Preparation Facilities.” Basel, Switzerland: City Climate Finance Leadership Alliance, February 2018.
- Paulson Institute, Energy Foundation China, and China Renewable Energy Industries Association. “Green Finance for Low Carbon Cities.” Bloomberg Philanthropies, Green Finance Committee of China Society for Banking and Finance, June 2016. <https://www.bbhub.io/dotorg/sites/2/2016/06/Green-Finance-for-Low-Carbon-Cities.pdf>.
- Perkins, Dwight H. “Foreword.” In *China’s Urban Century*, xx, xvii. Cheltenham, UK: Edward Elgar Publishing, 2015.
- Quek, Calvin (former Sustainable Finance Director, Greenpeace East Asia). In-person interview in Beijing, January 21, 2019.
- Reichelt, Heike. “Green Bonds: A Model to Mobilize Private Capital to Fund Climate Change Mitigation and Adaptation Projects.” In *The EuroMoney Environmental Finance Handbook*, 1–7. Washington, D.C.: The World Bank, 2010. <http://documents.worldbank.org/curated/en/680921507013408005/Green-bonds-a-model-to-mobilize-private-capital-to-fund-climate-change-mitigation-and-adaptation-projects>.
- Rohland, Klaus. “Foreword, World Bank.” In *Sustainable Low-Carbon City Development in China*, xix–xx. Directions in Development: Countries and Regions. Washington, D.C.: The World Bank, 2012.
- Roin, Philip. “China’s Flirtation with Green Finance.” *Dialogo Chino* (blog), May 2, 2018. <https://dialogochino.net/11080-chinas-flirtation-with-green-finance/>.
- Ruan Xiaocun (Key Expert, Europe-China Eco-Cities Link; Founder, East West Urban Consultancy). Skype interview, December 11, 2018.
- Shepard, Wade. “No Joke: China Is Building 285 Eco-Cities, Here’s Why.” *Forbes*, September 1, 2017. <https://www.forbes.com/sites/wadeshepard/2017/09/01/no-joke-china-is-building-285-eco-cities-heres-why/>.
- Sullivan, Rory, Andy Gouldson, and Phil Webber. “Funding Low Carbon Cities: Local Perspectives on Opportunities and Risks.” *Climate Policy* 13, no. 4 (2013): 514–29.
- Tay, Shirley. “Investors Are Pouring into Green Bonds. That May Not Be for the Best.” *CNBC*, January 29, 2019. <https://www.cnn.com/2019/01/30/investors-are-pouring-into-green-bonds-that-may-not-be-for-the-best.html>.
- Unnamed expert (General Manager at a Chinese provincial-level commercial bank). In-person interview in Beijing, January 21, 2019.
- Unnamed expert (Project Leader for a U.S. university environmental research center). Skype interview, April 11, 2019.
- Unnamed expert (Researcher, Chinese Eco-City Academy; Project Manager, Europe-China Eco-Cities Link). In-person interview in Beijing, December 11, 2018.
- Unnamed expert (Senior Analyst at a Chinese environmental think tank). In-person interview in Beijing, January 22, 2019.
- Unnamed expert (Sustainable Urban Development Analyst, GIZ). In-person interview in Beijing, December 20, 2018.
- Vaughn, Scott. “International Trends of Green Finance and China’s Leadership.” *Green Finance in China* (First Collection). Beijing: International Institute of Green Finance, 2018.
- Wang Yao (Director General, International Institute of Green Finance of the Central University of Finance and Economics). In-person interview in Beijing, January 21, 2019.

- . In-person interview in Beijing, March 5, 2019.
- Wildau, Gabriel. “China’s Interbank Bond Market in Five Charts.” *Financial Times*, July 3, 2017. <https://www.ft.com/content/cebed646-5e4f-11e7-91a7-502f7ee26895>.
- World Bank, and Institute for Health Metrics and Evaluation (IHME) at the University of Washington, Seattle. “The Cost of Air Pollution: Strengthening the Economic Case for Action.” Washington, D.C.: World Bank Group, 2016. <http://documents.worldbank.org/curated/en/781521473177013155/pdf/108141-REVISED-Cost-of-PollutionWebCORRECTEDfile.pdf>.
- Xu Nannan. “China’s Land Finance and Urbanization: An Analysis of Political Economy.” PowerPoint presented at the The 2019 International Conference on China Urban Development, Beijing, China, June 28, 2019.
- Ye Wang (Finance Center Research Analyst, Sustainable Finance Program, World Resources Institute Beijing representative office). In-person interview in Beijing, April 4, 2019.
- Zerbib, Olivier David. “The Effect of Pro-Environmental Preferences on Bond Prices: Evidence from Green Bonds.” *Journal of Banking and Finance* 98, no. C (2019): 39–60.
- Zhan Changjie and Martin de Jong. “Financing Eco Cities and Low Carbon Cities: The Case of Shenzhen International Low Carbon City.” *Journal of Cleaner Production* 180 (April 2018): 116–25.
- Zhan Changjie, Martin de Jong, and Hans de Bruijn. “Funding Sustainable Cities: A Comparative Study of Sino-Singapore Tianjin Eco-City and Shenzhen International Low-Carbon City.” *Sustainability* 10, no. 4256 (November 17, 2018): 1–15.
- Zhu Shouqing (Chief Technical Advisor, SDG Financing Initiative, UNDP China). In-person interview in Beijing, April 11, 2019.



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