

Belt and Road Initiative & Green Urban Finance

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Preface

Announced in 2013, the Belt and Road Initiative aims to strengthen China's connectivity with the world. It combines new and old projects, covers an expansive geographic scope, and includes efforts to strengthen hard infrastructure, soft infrastructure, and cultural ties. In February 2020, the Plan touched 138 countries with a combined Gross Domestic Product of almost \$30 trillion and around 4.5 billion people.

Supporting a diverse array of initiatives that enhance connectivity throughout Eurasia and beyond could serve to strengthen China's economic and security interests while bolstering overseas development. At the first Belt and Road Forum in Beijing in May 2017, President Xi Jinping noted that, "In pursuing the Belt and Road Initiative, we should focus on the fundamental issue of development, release the growth potential of various countries and achieve economic integration and interconnected development and deliver benefits to all."

The essence of a green and sustainable Belt and Road is to integrate green development, ecological and environmental protection into every aspect of the development of the Belt and Road with the principle of energy conservation and environmental protection under the guidance of green development concepts and of sustainable development goals settled by United Nations.

The commitment to monitor and implement BRI initiatives, both by China and by partner countries, is a key prerequisite to reducing the environment impacts of BRI projects. Setting targets that aim to achieve an ambitious proportion of projects that combat climate change would help orient BRI funding toward greater sustainability.

At first sight, China's and the EU's different approaches seem to lead to competition. Yet, China's BRI and the EU's new connectivity strategy also entail complementary aspects that might encourage greater cooperation. Within the current rising trend of protectionism and the raising of individualism, China and the EU provides a link between the world's second and third largest economies, as well as with the wider area of East Asia, indeed the most dynamic region in the world. China and the EU can also use the BRI as

a platform to contribute to solving present regional issues and security challenges, thus filling the gap of leadership and offering solutions in global governance.

Toward this end, the EU has developed its own strategy for connectivity in Asia to promote the sustainable urbanization, construction of transport, digital, and energy infrastructure between Europe and Asia. The strategy aims to provide a framework of European standards for connectivity projects and seeks to provide high-quality alternatives. The EU is seeking to provide credible alternatives; given the growing pushback against the BRI in some recipient countries, the EU certainly has an opportunity to present itself as a more attractive partner by offering connectivity projects based on sustainable financing, avoiding debt traps, and taking into account environmental impact.

EC-Link Project has been developing a series of research papers meant to trigger Chinese and EU experts' cooperation to drive the planning of resilient cities and more sustainable projects among BRI:

- Belt and Road Initiative & Sustainable Urbanization
- Belt and Road & Initiative Sustainable Transport
- Belt and Road Initiative & Industry 4.0
- Belt and Road Initiative & Green Finance

Such topics, where chosen by EC-Link Team because seen as mostly relevant and pertinent in view of the future development of the Belt and Road Initiative; taking into account several levels on analysis: national, regional and international, we try to offer recommendations for the improvement of on-going dynamics in view of a better and more sustainable relations in Eurasia market. With each research paper, EC-Link Project wants to contribute not only in providing additional useful information for a better understanding of BRI but also to support an open dialogue on such relevant subject providing a fruitful baseline for further discussion.

* English Translation of <http://cpc.people.com.cn/n1/2019/0320/c64094-30984416.html>



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Terms and Abbreviations

2DS	Two Degrees Scenario
ABN AMRO	Algemene Bank Nederland-Amsterdam Rotterdam Bank
ADB	Asian Development Bank
AFD	Agence Francaise de Developpement
AI	Artificial Intelligence
AIIB	Asian Infrastructure and Investment Bank
BAU	Business as Usual
BRF	Belt and Road Forum
BRI	Belt and Road Initiative
BRIGC	Belt and Road Initiative Green Coalition
BRT	Bus Rapid Transit
CBI	Climate Bond Initiative
CBIRC	China Banking and Insurance Regulatory Commission
CBRC	China Banking Regulatory Commission (predecessor of CBIRC)
CDB	China Development Bank
CIDCA	China International Development Cooperation Agency
CIRC	China Insurance Regulatory Commission (predecessor of CBIRC)
COCZ	Overseas Economic and Trade Cooperation Zones
CSOP	Consumer Stock Ownership Plan
CSR	Corporate Social Responsibility
CSRC	China Securities Regulatory Commission
CZ	Czech Republic
DE	Germany
DFID	Department for International Development of the British Government
DNSH	Do-no-significant-harm
DRC	local Development and Reform Commission in the People’ s Republic of China
DUCI	Longgang District Urban Construction and Investment Co., Ltd.
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECB	European Central Bank
EIB	European Investment Bank
ELENA	European Local Energy Assistance
EP	European Parliament
EPCs	Engineering, procurement and Construction Companies
ESC	Energy-saving Contracting
ESCO	Energy service company

ESG	Environment, Social, Governance
ETS	Emission Trading System
EU	European Union
EUR	Euro
EV	Electric Vehicle
EWS	Elektrizitätswerke Schönau GmbH
EximBank	China Export-Import Bank
FALCO	Financing Ambitious Local Climate Objectives
FIZ	Free Industrial Zone
FSC	Shanghai Green Urban Financing and Services Co., Ltd
FTZ	Free Trade Zone
GB/T	GB: Guóbiāo Tuijiàn (National standard recommended); T: Tuijiàn (Recommended)
GBA	Green Bond Assessment
GBIF	Global Biodiversity Information Facility
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIP	Green Investment Principles
GIZ	German Corporation for International Cooperation
ICBC	Industrial Commercial Bank of China
IFC	International Finance Corporation
IFI	International Financial Istitution
ILCC	Shenzhen International Low-Carbon City
IoT	Internet of Things
IT	Information Technology
KfW	Kreditanstalt für Wiederaufbau (German Development Bank)
LGFV	Local Government Finance Vehicle
LTER	Network Information System Data Portal
LTS	Long-Term Strategy
MEE	Ministry of Ecology and Environment of the PRC
MEP	Ministry of Environmental Protection (predecessor of the MEE)
MFF	Multiannual Financial Framework
MoF	Ministry of Finance of the PRC
MoFCOM	The Ministry of Commerce of the PRC
MoHURD	China's Ministry of Housing and Urban-Rural Development of PRC
MRV	Monitoring, Reporting and Validation

NDC	Nationally Determined Contribution
NDCR	National Development and Reform Commission of the PRC
NEV	New Energy Vehicle
NGO	Non-governmental organization
ODI	Overseas Direct Investment
OECD	Organisation for Economic Co-operation and Development
OECD DAC	OECD Development Assistance Committee
PAM	Project Administration Manual
PBoC	People's Bank of China
PIC	Private, Institutional, and Commercial
PPP	Public Private Partnerships
PRC	People's Republic of China
PV	Photovoltaic
REIT	Real Estate Investment Trust
RE	Renewable Energie
RMB	Ren min bi, Chinese Yuan (0.13 EUR/RMB, 0.14 USD/RMB)
SCORE	Supporting Consumer Co-Ownership in Renewable Energies
SDGs	Sustainable Development Goals
SDIHG	Shandong Development & Investment Holding Group
SEPA	State Environmental Protection Administration
SEZ	Special Economic Zone
SGDF	Shangong Green Development Fund
SME	Small and Medium Enterprise
SMG	Shanghai Municipal Government
TCFD	Taskforce for Climate-Related Financial Reporting
TEEC	Transition Énergique et Écologique pour le Climat
UNDP	United Nations Development Programme
USD	United States Dollars
WRI	World Resources Institute

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1 Executive Summary

International cooperation in frameworks like the Belt and Road Initiative (BRI) provide ample opportunities for economic growth, high returns on investments and social development. At the same time, investments for development will lead to an acceleration of pollution, greenhouse gas (GHG) emissions and loss of biodiversity if we follow current trajectories. Simply said, current policies and investment activities are insufficient to tackle the goal of having a zero-carbon society by 2050 in Europe, in China and in the BRI.

In urban areas, it in particular the investment in the transport sector, industrialization and sustainable urbanization that have a great influence on future green growth trajectories. Therefore, in addition to policies on renewable energy, energy efficiency, clean transport, green urbanization (such as buildings) on the demand-side, policy makers have to improve policies for green domestic and cross-border finance.

To understand the current situation and potential future trajectories, this report analyzes green urban finance developments in China, Europe and the BRI. We provide an overview of the green finance policy perspective, analyze developments of public and private finance and provide relevant 5 green urban finance case studies from Europe (Paris (FR), Litoměřice (CZ) and Essen (DE)) and China (Shandong, Shenzhen) among many other smaller examples.

Based on our findings, we draw 11 recommendations on how to accelerate green urban finance in the BRI. The recommendations are:

1. Provide Green Urban Project Preparation Facilities
2. Harmonize Green Finance Standards across international markets
3. Improve capacity for integrated planning for green urban development for lower financing costs
4. Build a Sino-European green city fund for the BRI
5. Increase use of blended finance instruments
6. Establish an open platform for green urban projects to improve the investment pipeline

7. Apply digital technologies for monitoring, reporting and validation (MRV)
8. Establish a strong platform for MRV data sharing
9. Create and apply standards for integrated reporting
10. Provide open learning platform for best practice exchanges of policy, project design and implementation
11. Improve green investment incentives in China and the EU for green overseas investments in BRI cities

In conclusion: Climate change mitigation, climate change adaptation and green urban growth in the Belt and Road Initiative (BRI) is all but certain. There is, however, a good opportunity to drive green urban growth when investors, city planners and policy makers in Europe, China and in the countries of the BRI step up efforts to steer investments smartly into green projects.

2 Introduction

The year 2020 marks the 5th anniversary of the Paris Agreement; the international agreement signed by 189 countries to tackle climate change and to keep global warming below the 1.5° C threshold. Yet, despite the science being clear that the planet is warming to dangerous levels and a global agreement limiting global warming being reached, years of underinvestment in green development, climate change mitigation and adaptation have led to the situation where trillions in economic product and billions of people are vulnerable to the consequences of climate change and loss of biodiversity. Green investment needs far exceed what public resources can provide in Europe, in China, in the BRI countries and globally. Attracting more commercial finance and private expertise in green development is thus a critical challenge for the future development. Meaningful increases in private green investment will require removing key constraints on private sector participation in climate infrastructure and building effective institutional structures to mobilise, steer and manage such finance.

To achieve the goal of green development, cities will play an outsized role: in the year 2030, cities are expected to be responsible for 60 to 80% of global emissions¹. More than 60% of the global population will live in cities by 2050 and 600 mega-cities are expected to generate 60% of the world's GDP² by 2025, according to McKinsey. Consequently, the range of challenges posed by climate change, economic and demographic transformations in the region is huge, with governments and city mayors facing increasing pressure to find sustainable solutions, e.g. for sustainable transport³, sustainable urbanization⁴ or the fourth industrial revolution more simply put industry 4.0⁵ for economic activity. Ensuring that cities are sustainable is critical for the future of our planet and our population.

By supporting green urban development, cities support the global framework of the sustainable development-

goals (SDGs) on many accounts (see Figure 1). Particularly impacted SDGs by greening urban development are:

- SDG 11 – Sustainable Cities and Communities: “There needs to be a future in which cities provide opportunities for all, with access to basic services, energy, housing, transportation and more”.
- SDG 13 – Climate Action: “Climate change is a global challenge that affects everyone, everywhere”.
- SDG 5 – Gender Equality: “Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world”.
- SDG 6 - Clean Water and Sanitation: “Clean, accessible water for all is an essential part of the world we want to live in”.
- SDG 7 – Affordable and clean energy: “Energy is central to nearly every major challenge and opportunity”.
- SDG 8 – Decent work and economic growth: “Sustainable economic growth will require societies to create the conditions that allow people to have quality jobs”.
- SDG 9 – Industry, innovation and infrastructure: “Investments in infrastructure are crucial to achieving sustainable development”.
- SDG 10 – Reduced inequalities: “To reduce inequalities, policies should be universal in principle, paying attention to the needs of disadvantaged and marginalized populations”.
- SDG 15 – Life on land: “Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss”.
- SDG 17 – Partnerships: “Revitalize the global partnership for sustainable development”.



Figure 1: 17 Sustainable Development Goals (SDGs)

Therefore, mobilizing and steering finance into green and low-carbon urban infrastructure and technology is more important than ever.

Many European cities, Chinese cities and the rapidly developing cities of the Belt and Road Initiative (BRI) are willing to take on a leadership role and identify possibilities to cooperate, learn and invest in green urban development. With urban transportation, industry 4.0 and urbanization being the sectors most closely linked to CO2 emissions in cities, this paper analyzes the approaches and pathways to accelerate green finance in them.

Accordingly, this paper outlines recent approaches to finance green urban development in China and in Europe including supporting government policies, identifying gaps of urban finance particularly in light of different financing needs for public and private investments. It studies different successful cases of mobilizing finance for cooperative green urban development in China and

the EU and finishes with concrete recommendations for future improved Sino-European cooperation on urban green finance. The paper focuses on China and Europe as the largest green finance markets to draw conclusions for green urban finance cooperation in the Belt and Road Initiative.

The report aims to draw on experiences of green urban finance from China, Europe and selected BRI countries to find a cooperative development model to accelerate green finance application for sustainable urban development. The paper is structured as follows: it first provides a background on challenges of green urban development in the BRI and the consequences for sustainable investment requirements. We then analyze green urban finance practices, challenges and cases in China (chapter 3), in Europe (chapter 4) and the BRI countries (chapter 5). Chapter 6 provides recommendations to strengthen cooperation and chapter 7 draws conclusions from the overall analysis.

¹ OECD, “Competitive Cities and Climate Change.”
² Dobbs et al., “Urban World: Mapping the Economic Power of Cities.”
³ Nedopil Wang, “Belt and Road Initiative & Sustainable Transport.”
⁴ Kraubitz, “Belt and Road Initiative & Sustainable Urbanization.”
⁵ Kress and Deacon, “Belt and Road Initiative & Industry 4.0.”

Box 1: Definitions

The primary topic of this paper is green urban finance for both public and private investments.

Green finance can be understood as efforts to increase levels of financial flows (from banking, micro-credit, insurance and investment) from the public, private and not-for-profit sectors to sustainable development priorities⁶.

Green finance encompasses efforts to increase investments into⁷:

- Climate change mitigation
- Climate change adaptation
- Sustainable and protection of water and marine resources
- Transition to a circular economy
- Pollution prevention and control
- Protection and restoration of biodiversity and ecosystems

Green finance can be promoted through changing countries' regulatory frameworks, harmonizing public financial incentives, increasing green financing from various sectors, increasing investment in clean and green technologies, and aligning public sector decisions with the environmental dimension of the United Nations Sustainable Development Goals.

In China, many policies relate to low carbon investment, urban infrastructure, or green finance through its broad and systematic green finance policy framework that includes multiple ministries and regulators. It covers green securities (including bonds), green credit, green insurance and green funds, with a green industry catalogue and a green bond catalogue that sets out definitions for industries and projects that are considered green.

In Europe, green finance has grown consistently over the past decades, with institutions like the German KfW beginning to invest in 'protecting the environment' in the 1960s⁸. In 2019, the European Union introduced the landmark guidance "EU Taxonomy" with purpose-based inclusion and do-no-significant-harm (DNSH) frameworks that have become the latest and most stringent addition of green investment frameworks⁹.

Urban transport: In this paper, urban transport refers to physical assets in public transport, private transport and freight transport. Physical transport assets located in cities typically exhibit two features: market monopolies for public transport and transport infrastructure with long lifetimes of 20 to 30 years, compared to the high fragmentation of ownership of assets for private transport and freight transport with rapidly evolving technologies (e.g. electric mobility).

Industry 4.0: In this paper, Industry 4.0 refers to the intelligent networking of machines and processes in industry with the aid of information and communication technology. Industry 4.0 is the comprehensive digitization of industrial production in order to equip it better for the future, much of it happening in cities as the hub for industrial activity. Physical assets typically exhibit different ownership structures in China than in Europe, where China's state-driven investment allows for focus areas of digitalization of industries, compared to Europe's market-driven and therefore disbursed investment approach.

Sustainable Urbanization: In this paper, sustainable urbanization refers to the planning and implementation of urban development of physical spaces and processes that contribute to the long-term viability of cities with low emissions, pollution and protection of biodiversity, while the well-being of people and economic development.

Belt and Road Initiative (BRI): The Belt and Road Initiative is a Chinese-led investment and cooperation strategy for increased economic and cultural exchange between China and the countries of the BRI. It was announced by the Chinese President Xi Jinping in 2013 and as of March 2020 included more than 130 countries.

6 UN Environment, "Green Financing."
7 EU Technical Expert Group on Sustainable Finance, "EU Taxonomy."
8 KfW Development Finance, "Environmental and Climate Protection Has Always Been a Priority at KfW."
9 EU Technical Expert Group on Sustainable Finance, "EU Taxonomy."

3 Understanding the challenge of green urban development and green urban finance in the BRI

Within the next 30 years, cities around the world are expected to grow by 2.5 billion people; in other words, in 2050 68% of the global population will live in cities¹⁰. Particularly cities in the countries of the Belt and Road Initiative (BRI) are expected to experience remarkable population growth, as the BRI encompasses most emerging economies with younger populations and the possibility for fast economic development.

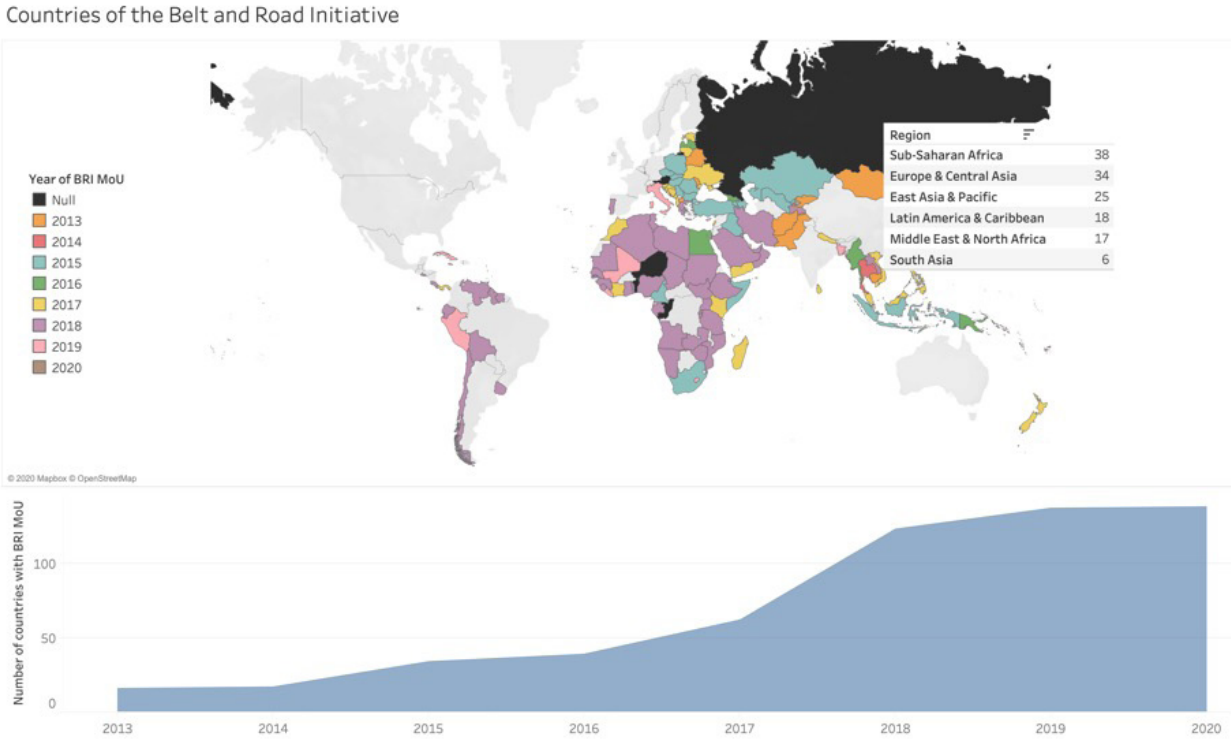
3.1 The Belt and Road Initiative and its impact on urbanization

The Belt and Road Initiative (BRI) aims to increase economic activity by improving connectivity of economic areas through infrastructure investment; it is a Chinese led initiative that has seen annual investments of EUR 100-200 billion in the 131-138 BRI countries¹¹.

As of March 2020, about 131-138 countries were part of the BRI on all continents but North America. Many countries of the BRI are emerging economies with lower incomes, while Italy is the only G7 country having signed a Memorandum of Understanding to join the BRI in April 2019.

With the goal to increase connectivity and economic activity, cities along the BRI, both within China and outside China are expected to see increasing investment while even new cities, such as Khorgos in Kazakhstan¹², are developing as new centers for trade.

Figure 2: Countries of the Belt and Road Initiative as of March 2020 (Source: www.green-bri.org)



10 United Nations, "68% of the World Population Projected to Live in Urban Areas by 2050, Says UN."
11 green-bri.org, "Countries of the Belt and Road Initiative (BRI) – Green Belt and Road Initiative Center."
12 Mauk, "Can China Turn the Middle of Nowhere Into the Center of the World Economy?"

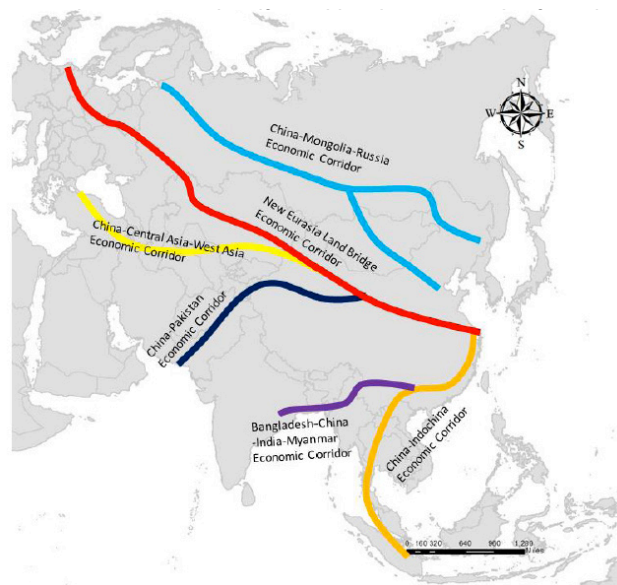


Figure 3: Economic Corridors of the Belt and Road Initiative¹³

Along these corridors, many cities are being connected and can thus be understood as being affected by the BRI. In their study, Derudder et al. analyzed the network externalities and connectivity of cities within these corridors (in terms of degree centrality, and closeness centrality). They discovered that the following cities are particularly integrated into the current BRI – though within different communities (see Figure 4, Table 1):

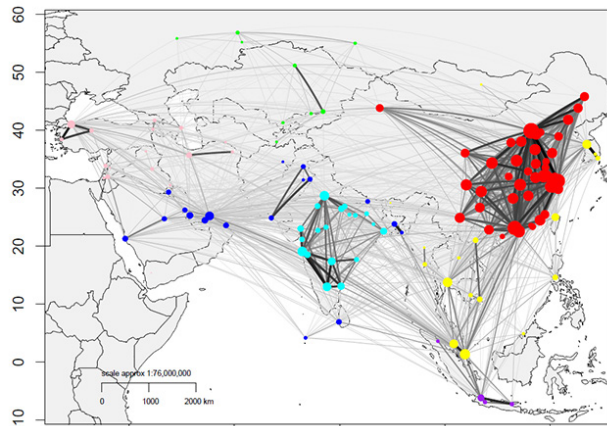


Figure 4: City networks in the BRI¹⁴

Table 1: Relevant BRI cities along different economic corridors¹⁵

Continental analysis	China-Mongolia-Russia	Eurasian Land Bridge	China-Central Asia-Western Asia	China-Indochina	China Pakistan	Bangladesh-China-India-Myanmar
Beijing	Beijing	Shanghai	Istanbul	Guangzhou	Xian	Chengdu
Shanghai	Shenyang	Zhengzhou	Tehran	Shenzhen	Chengdu	Nanning
Guangzhou	Harbin	Xian	Ankara	Shanghai	Lanzhou	Kunming
Nanjing	Tianjin	Nanjing	Urumqi	Nanning	Urumqi	Chongqing
Shenzhen	Changchun	Hefei	Antalya	Hangzhou	Chongqing	Guiyang
Hangzhou	Dalian	Wuhan	Lanzhou	Changsha	Xining	Liuzhou
Wuhan	Shijiazhuang	Xuzhou	Izmir	Xiamen	Baoji	Guilin
Zhengzhou	Jinan	Suzhou	Yekaterinburg	Nanchang	Taiyuan	Neijiang
Xi'an	Tangshan	Jinan	Almaty	Kunming	Karachi	Beihai
Chengdu	Jinzhou	Luoyang	Zhangye	Guilin	Yinchuan	Mianyang
Hong Kong	Novosibirsk	Urumqi	Xining	Hong Kong	Urumqi	Kolkata
Singapore	Yekaterinburg	Almaty	Adana	Singapore	Rawalpindi	Dhaka
Dubai	Hohhot	Krasnodar	Konya	Hanoi	Bahawalpur	Yangon
Mumbai	Tyumen	Astana	Bishkek	Bangkok	Hami	Patna
Istanbul	Baotou	Yekaterinburg		Kuala Lumpur		Dhanbad
Delhi	Qingdao	Lanzhou		Yangon		Guiyang
Seoul						Qujing
Jakarta						Dazhou
Bangkok						Suining

13 Derudder, Liu, and Kunaka, “Connectivity Along Overland Corridors of the Belt and Road Initiative.”

14 Derudder, Liu, and Kunaka.

15 Derudder, Liu, and Kunaka.

Three factors will play a role in how the BRI will impact these cities’ green urbanization:

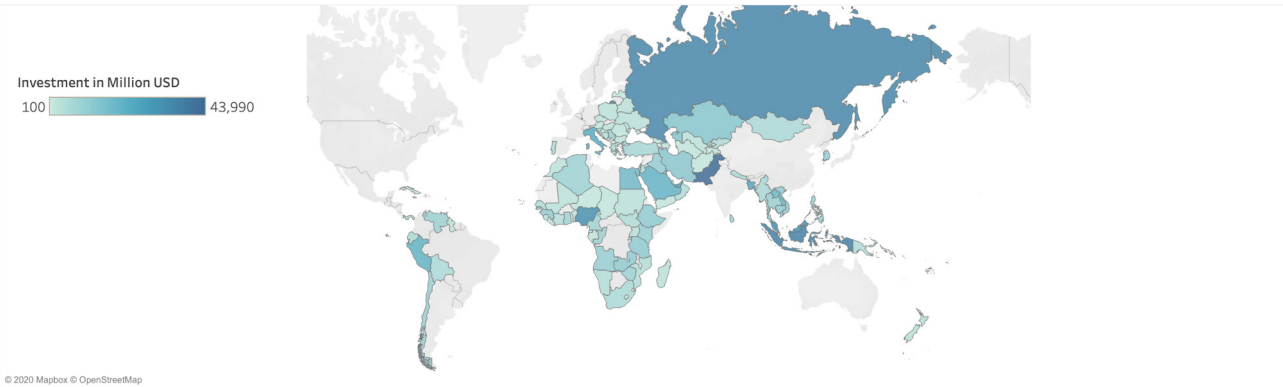
1. Supply of funds to invest in e.g. urban infrastructure and the awareness of investors to invest in green assets;
2. Demand of services, e.g. by attracting people and new citizens to cities and urban areas;
3. Capacity of local authorities to plan and implement green urban development, e.g. to control growth and urban sprawl.

Within the BRI and more broadly, Chinese cities and regions have established partnerships with 1023 sister cities in 61 countries between 2013 and 2018¹⁶.

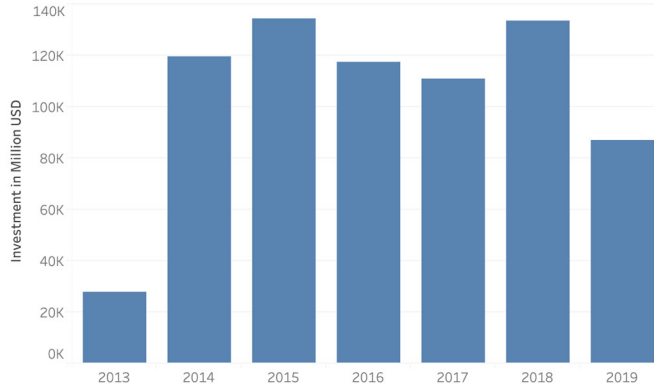
3.2 Investments in the Belt and Road Initiative

Since its establishment in 2013, about USD 750 billion have been invested in countries that have joined the BRI. About 38% went into energy investments and about 26% into transport investments. While some investments have indeed been resource deals to support the domestic economy in China, most of the investments are locally applied investments for energy, transport, or real estate development.

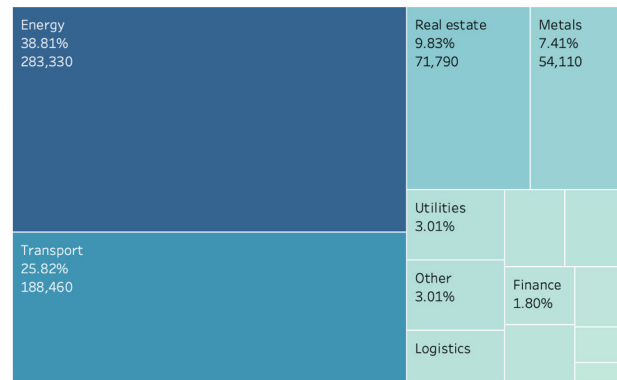
Figure 5: Investments in the BRI 2013-2019 (Data: American Enterprise Institute¹⁷, own depiction)



BRI investment over time



Sector split (investments in Million USD)



16 China Development Bank and United Nations Development Programme, “Harmonizing Investment and Financing Standards towards Sustainable Development along the Belt and Road.”

17 Derek, “China Global Investment Tracker 2019.”

In addition to capital investments, China also invests in special economic zones (SEZs) or free trade zones (FTZs) to support economic development around urban areas of BRI cities. As of April 2019, there were 82 SEZs – dubbed Overseas Economic and Trade Cooperation Zones (COCZ) in 24 BRI corridor economies¹⁸, up from 75 in 2018¹⁹, claiming to have generated 300,000 jobs²⁰. More COCZ are expected to be built as part of the BRI²¹. These include, for example the Alat FTZ near Azerbaijan's Capital City and major Caspian Sea Port of Baku that comprises the Baku International Sea Port as well as the soon to be opened Free Trade facilities; it also includes the Poti Free Industrial Zone (FIZ) in Georgia, which was established in 2011. This zone, for instance covers 3 square kilometers of land that allows the establishment of facilities in the industrial, logistics, chemical and metallic processing²². Within these zones, China supports manufacturing activities and these zones are therefore particularly important for the potential integration of Industry 4.0 technologies in production processes.

3.3 The challenges for green urban development

Today's investment and technological advancements of the fourth industrial revolution, such as in transport and industry 4.0, add significant development challenges to cities in Europe, China and the BRI countries.

In general, threats for cities related to the 'fourth industrial revolution' are:

- Intensive urban growth (can lead to greater poverty), with local governments unable to provide services for all people.
- Concentrated energy use leads to greater air pollution with significant impact on human health.
- Automobile exhaust produces elevated lead levels in urban air.
- Large volumes of uncollected waste create multiple health hazards.
- Urban development can magnify the risk of environmental hazards such as flash flooding.
- Pollution and physical barriers to root growth promote loss of urban tree cover.
- Animal populations are inhibited by toxic substances, vehicles, and the loss of habitat and food sources.

The fourth industrial revolution could also exacerbate existing threats to environmental security or create entirely new risks that will need to be considered and managed:

- Demographic Shifts: Population growth will be impacted the manufacturing field; significant demographic shifts such as the increasing number of population growth in developing countries, a growing middle class, consumer market shifts and an aging population are influencing future industrial activities.
- Urbanisation: Urban infrastructure is required to support the growing demand; industry 4.0 facilitates more mixed urban development by bringing bringing factories back to towns, which will be closer to housing areas to housing areas. This promotes the realisation of compact cities and is made possible because of two features of Industry 4.0, diminishing lot sizes and environmentally friendly integrated urban production.
- Knowledge and Talent Gap: The decreasing talent pool possess a real challenge to employers.
- Deindustrialisation: Major productivity gains in manufacturing have tapered off; involving a decrease

in the relative size and importance of the industrial sector in an economy. Deindustrialisation will invariably involve developed economies moving towards service-based economies.

- Market Globalisation vs Protectionism: Different approaches divide the already uncertain global manufacturing industry; technology will continue to be a big enabler of globalisation. Although most economies are more open to trade today, as countries seek to expand domestic manufacturing employment, a surge in protectionism and the undoing of trade agreements will create an institutional environment less supportive to openness.
- Game-Changing Business Models: The changing pace of every industry causes continuous disruption; information technology, operational technology, and global megatrends are on a collision course that demand business owners to adopt new ways of thinking and execution.
- Convergence of Technologies: Technology convergence is the key to realizing industry 4.0; New technologies are also known as disruptive technologies that include the use of autonomous robots, Internet of Things (IoT), Big Data, augmented-reality-based systems, cyber security, cloud computing, additive manufacturing to horizontal and vertical system integration.
- Robots on the Rise: Smart technology complements; Advancements in information technology (IT), robotics, drones, self-driving cars, machine learning and artificial intelligence (AI) are increasingly allowing machines to take over tasks once performed only by humans and in the process causing economic disruptions that will irreversibly change the workforce.
- Cybersecurity; Cybersecurity is an integral part to support the transformation; Central to the Industry 4.0 concept is the freedom of information exchange within the value chain, which includes collecting all data generated for a product throughout the phases of its lifecycle from conceptualisation, design, ordering, customisation, manufacturing, operation, repair and even to recycling.

- Global Sustainability; Ensuring common goals for the betterment of all; There is a lack of progress on product design and manufacturing processes which can help facilitate the better use of materials.
- Privacy: IoT applications collect, analyze and relay data without the knowledge or agreement of the user, and thus require clear and enforceable privacy laws to prevent abuse and the infringement of personal rights.
- Infrastructure: stable infrastructure required (reconciling old with the new, such as power supply and broadband internet).
- Local IoT expertise: for adjustments, implementation and maintenance of IoT applications to the special needs of their developing counterparts.

3.4 The impacts on emissions of the Belt and Road Initiative

The developments and economic activities of the Belt and Road Initiative in the fourth industrial revolution can have negative environmental impacts on the BRI countries.

A 2019 study on the impacts on the BRI found (see also Figure 6)²³:

- BRI countries accounted for just 28% of emissions in 2015. If they follow the conventional growth pathways (BAU) while the rest of the World adheres to the Paris Climate Accord (limit global warming to less than 2 degrees Celsius), the BRI countries could account for 66% of global emissions by 2050. This would result in global carbon emissions double the level necessary to meet the Paris Agreement.
- If BRI countries follow historical carbon-intense growth patterns ("Worst in Class" growth), it may be enough to result in a 2.7 degrees path even if the rest of the World adheres to levels of emissions necessary to meet the Paris Agreement.

18 CGTN, "Data Tells."

19 Derudder, Liu, and Kunaka, "Connectivity Along Overland Corridors of the Belt and Road Initiative."

20 Chinese Academy of International Trade and Economic Cooperation and United Nations Development Programme, "Report on Fostering Sustainable Development through Chinese Overseas Economic and Trade Cooperation Zones along the Belt and Road."

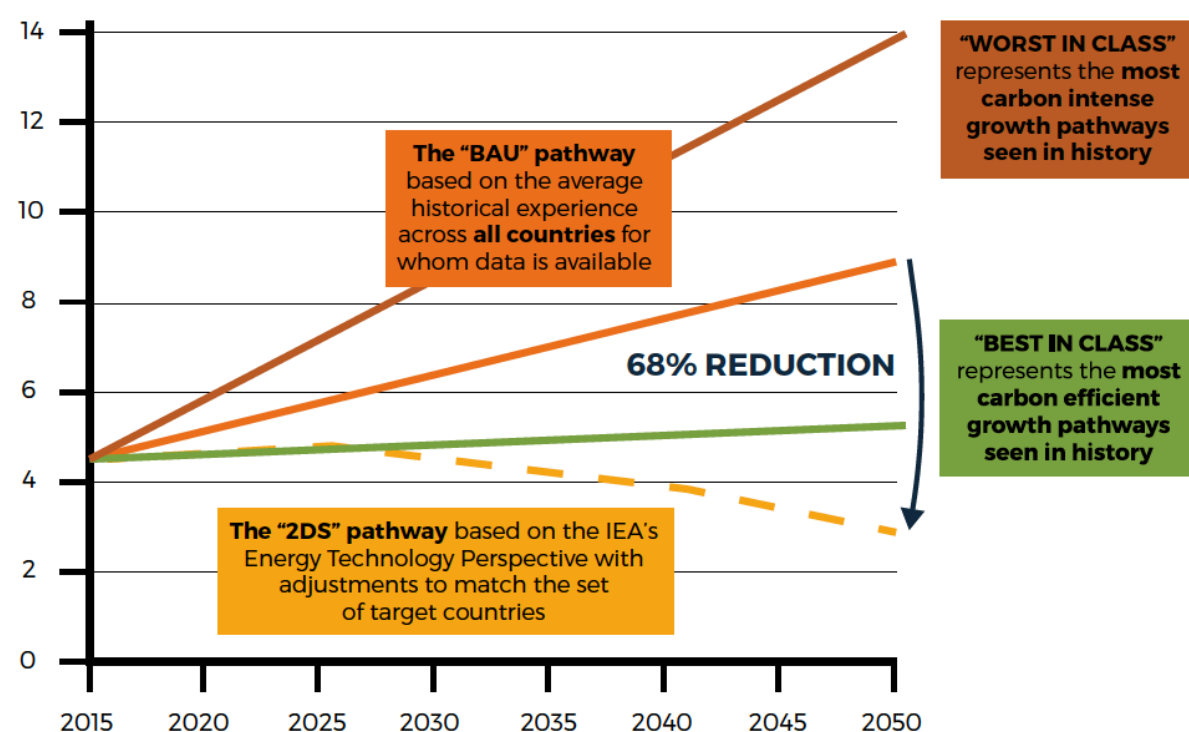
21 State Council, "Opinions of the State Council on Promoting Innovation and Upgrading of National Economic and Technological Development Zones to Create a New Heights for Reform and Opening (Guo Fa [2019] No. 11) Government Information Disclosure."

22 Devonshire-Ellis, "Free Trade Zones on China's Belt & Road Initiative"; Chatzky and McBride, "China's Massive Belt and Road Initiative."

23 Ma and Zadek, "Decarbonizing the Belt and Road - a Green Finance Roadmap."

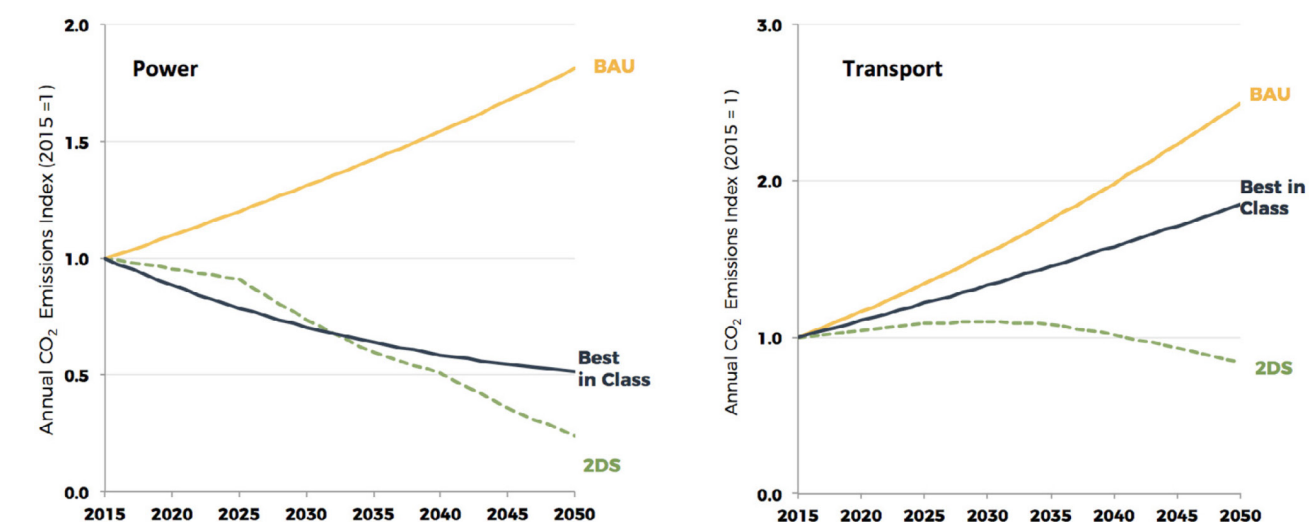
- If BRI countries follow a best practice growth and emission scenario (i.e. effectively deploying leading-edge green technologies already in use, at a pace commensurate with their stage of development measured by income per capita), their emissions in 2050 could be 39% lower in 2050 than in the business-as-usual scenario.
- However, even with a best in class growth scenario the BRI countries would still fall short of the reduction required to align with the Paris Agreement; according to the study the whole world still have 17% of excess GHG emissions even if non-BRI countries adhere to the Paris Accord while the BRI countries continue on current best practice trajectories of growth.

Figure 6: Different emission and development scenarios of the Belt and Road Initiative countries²⁴



²⁴ Ma and Zadek.

Figure 7: Energy and transport are particularly contributing to GHG emissions in the BRI (Source: Ma, Zadek 2019)



The most relevant sectors contributing to GHG emissions in the BRI are energy and transport – the two sectors that are also receiving the largest Chinese investments in the BRI countries (see Figure 7).

At the same time, the “Digital Silk Road” could potentially bring a green transformation to both infrastructure and economic models in emerging markets:

- adding new technologies, the Digital Silk Road will help make the new infrastructure the most competitive, efficient and sustainable.
- bringing advanced IT infrastructure to the BRI countries, such as broadband networks, e-commerce hubs and smart cities.

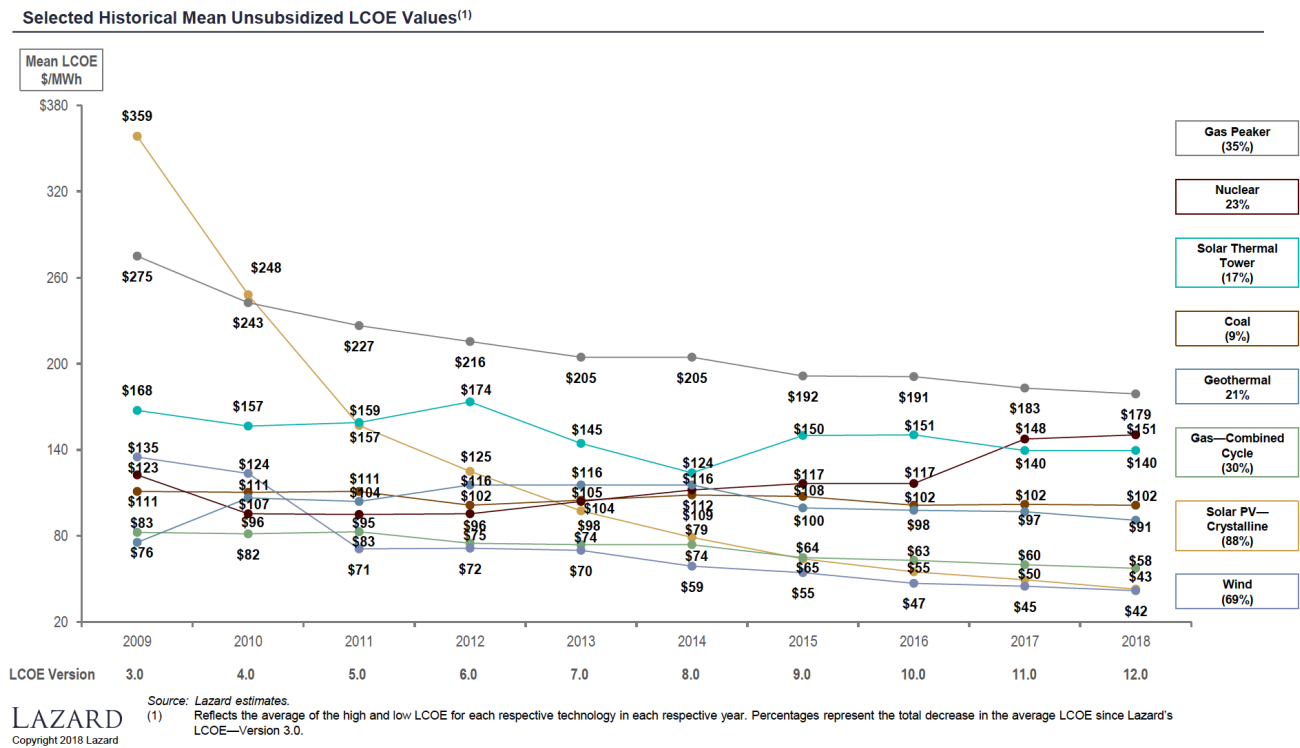
- connecting more and more medium and small merchants to global trading via digital networks, the Digital Silk Road can also support a smart cross-border logistics system.

- and through the harnessing and application of big data to directly solve environmental challenges (for example to better respond to water security issues, climate change and natural disasters.)

This requires particularly investments in renewable energy to reduce environmental impacts of energy generation necessary for urban life and industry 4.0. Indeed, this seems increasingly viable with decreasing levelized cost of energy from renewable energy sources (see Figure 8)²⁵.

²⁵ Lazard, “Levelized Cost of Energy Analysis - Version 12.0.”

Figure 8: [Selected Historical Mean Unsubsidized Levelized Cost of Energy Values](#) (Source: Lazard)

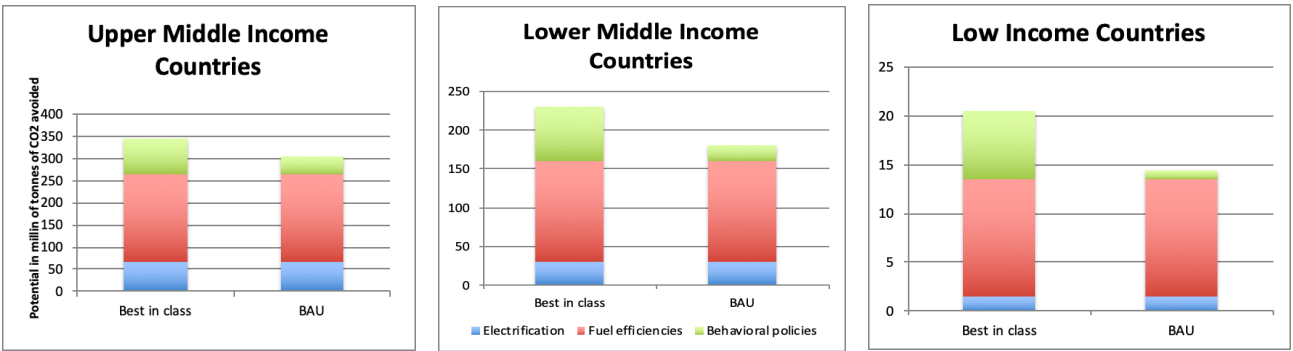


More difficult will be green development in urban transport and related investments. Green urban transport will only be possible by moving people using low-energy and high-occupancy vehicles, such as public transportation in electric buses and subways as well as by non-motorized transport, such as bikes and walking. In addition to investment in assets and planning capacity, this also requires investment in behavioral changes (see Figure 9). Accordingly, countries need to invest between 0.2

and 0.4% of their GDP for a low-carbon urban transport development – if they have proper institutional capacity with integrated urban and transport planning. The alternative, however, is much higher investments to deal with the consequences of climate change and non-green growth.

Figure 9: [Investment in urban transport](#) (Source: Nedopil

Wang, 2020, based on Wagner 2018²⁶⁾



What this chapter shows is that the green development path for BRI cities is difficult, yet possible. One of the foundations is an unprecedented acceleration of green finance.

3.5 Green urban finance as a solution

Green urban finance can be understood as efforts to increase levels of financial flows (from banking, micro-credit, insurance and investment) from the public, private and not-for-profit sectors to sustainable development priorities in cities²⁷.

Green finance encompasses efforts to increase investments into²⁸:

- Climate change mitigation
- Climate change adaptation
- Sustainable and protection of water and marine resources
- Transition to a circular economy

- Pollution prevention and control
- Protection and restoration of biodiversity and ecosystems

Green finance can be promoted through changing countries' regulatory frameworks, harmonizing public financial incentives, increasing green financing from various sectors, increasing investment in clean and green technologies, and aligning public sector decisions with the environmental dimension of the United Nations Sustainable Development Goals.

To understand how green finance can be accelerated in the BRI, chapters 3 & 4 will analyze the development of the two largest green finance markets in the World: China and the European Union, both in regard to financial and regulatory developments. Chapter 5 will analyze current efforts within the BRI to accelerate green urban finance.

²⁶ Wagner, "The Billion Dollar Question - How Much Will It Cost to Decarbonise Cities' Transport Systems."
²⁷ UN Environment, "Green Financing."
²⁸ EU Technical Expert Group on Sustainable Finance, "EU Taxonomy."

4 Green urban finance in China

Over the past 40 years, since the start of China's economic Reform and Opening in 1979, China's urban population increased from 170 million to 831 million in 2018²⁹ - with the Chinese urban population surpassing its rural population in 2011. With increased urbanization came adverse environmental consequences, such as air pollution, water pollution, changing weather patterns as well as high greenhouse gas emissions. With urban population on the rise, China has become the second most vulnerable country to climatic disasters, incurring more than USD 490 billion of economic losses as a result of climatic disasters in the period from 1998-2017³⁰.

To build resilient and eco-friendly cities, China would have needed investments of around 7 trillion RMB for the years 2016-20³¹ for the construction of greener buildings, large-scale retrofit of existing houses and commercial buildings (about 1.65 trillion RMB), transport infrastructure (about 4.5 trillion RMB) and energy infrastructure such as distributed photovoltaic (PV) (about 500 billion RMB).

To understand how China is approaching its green urban finance, the following paragraphs will provide an overview of green finance policies and institutions, public sector finance, private sector finance, two cases on the application of green finance principles for urban finance, as well as a summary of challenges for the way forward.

4.1 Recent developments in Chinese green urban finance

4.1.1 Supporting policies accelerating green urban finance in China

China's work on green finance stretches back almost

two decades; since then various green finance policies on green credit, green securities and green insurance were released. China's green finance system was strengthened in 2016 when seven ministerial agencies including the People's Bank of China (PBoC) and the Ministry of Finance jointly released the Guidelines for Establishing the Green Financial System (the "Guidelines"), setting out, for the first time, the official definition of green finance, incentives, disclosure requirements, development plan for green financial products, as well as risk mitigation.

To understand what drives green urban finance in China, some relevant policies and policy frameworks are discussed. Apart from the direct development of a green finance system that allows for the acceleration of green urban finance, a number of policies and initiatives that indirectly support an acceleration of investments in green urbanization, green transportation and green Industry 4.0 have also been introduced on different levels of the Chinese regulatory system:

- A national carbon market, as called for in China's Nationally Determined Contribution (NDC), can promote green finance for cities by putting a price on carbon emissions; accordingly, money would be channeled to assets with lower climate impacts. Although China designated seven carbon market pilot provinces and cities (Hubei, Guangdong, Shenzhen, Beijing, Tianjin, Shanghai, and Chongqing) in 2011 already, the development of the national (or sub-national) carbon markets has not seen the progress necessary as of January 2020³².
- Construction of hundreds of "eco-cities" and "low-carbon cities" was pushed³³ to highlight development potentials and channel money into green development at both the national and provincial level. For the period from 2016 to 2021, the total investment in constructing low-carbon cities in China is expected to reach RMB 6.6 trillion. By 2008, low-carbon city pilot projects already began in Shanghai and Baoding. In 2011, 30 pilot cities for energy savings and emis-

sions reduction were divided into three groups with RMB 600 million per year provided for provincial level cities, RMB 500 million per year for provincial capitals, and RMB 400 million per year for other cities. Cities receive 50% of the budget each year in advance and the remaining 50% according to the results of the annual performance evaluation. The funding in 2012 and 2013 was about RMB 4 billion each, in 2016 was RMB 5.3 billion and in 2018 was about RMB 3.8 billion³⁴.

- National energy policy and energy saving policies for industrial, commercial and private users have been implemented (see Appendix 1 for selected policies).

Accordingly, projects that are supported by investment and financing of green urban and rural construction include:

- New green building projects. Green building is a life-saving period that saves resources, protects the environment, reduces pollution, and provides people with health, fitness, and efficiency. Uses space to maximize the quality of buildings where people live in harmony with nature. The projects to be supported should be residential buildings, public buildings and industrial buildings, and align with the "Green Building Evaluation Standard" GB/T 50378 two-star and above standards.
- Low-energy buildings and near-zero energy buildings. Low-energy buildings and near-zero energy buildings are focused on achieving low emissions and energy consumption. Focuses include enclosures, energy and equipment systems, lighting, intelligent control, and renewable energy utilization.
- Assembled construction projects. Prefabricated buildings where parts or all of the building are completed in a factory and then transported to the construction site. The building is assembled by means of reliable installation and installation machinery construction method. It is estimated that by 2025, the total investment will be about 1.03 trillion RMB, which include the investment in full refurbishment, the investment in fixed assets of new parts and components, and the distribution of new parts and components.
- Urban drainage flood control project. The urban drainage flood control project mainly enhances urban comprehensive drainage, flood control capacity and water source conservation through the increase of drainage and storage space, new rainwater pipelines, large rainwater drainage corridors, machine drainage pumping stations, and emergency drainage facilities.
- Urban waste-water remediation project. The focus of black and odor water management includes: Source pollution control, non-point source pollution control, endogenous pollution control and other pollution (excessive standards for tail water in urban sewage plants, accidents from industrial enterprises, fall leaves, etc.).
- Urban sewage treatment quality improvement project. The urban sewage treatment quality improvement project includes new sewage pipe networks, old sewage pipe network reconstruction, combined pipe network transformation, new sewage treatment facilities, and sewage treatment facility upgrades.
- Urban water supply facilities renovation and construction projects. Urban water supply facilities' renovation and construction projects include the transformation of urban secondary water supply facilities and the increase of county water use rates.
- Urban rail transit projects & Urban road facilities construction and renovation projects. Construction and renovation projects of urban rail and road facilities include the addition of urban roads, new bridges, as well as addressing the problems of partial damage, insufficient supply, and insufficient auxiliary facilities in the county road system.
- Construction projects for urban garbage disposal facilities. The construction of urban garbage disposal facilities includes the construction of urban domestic garbage disposal facilities and county garbage disposal facilities.

29 National Bureau of Statistics of China, "城镇化水平显著提高 城市面貌焕然一新——改革开放 40 年经济社会发展成就系列报告之十一."

30 UN SDR and Centre for Research on the Epidemiology of Disasters, "Economic Losses, Poverty & Disasters 1998-2017."

31 Gu, Liu, and Ren, "1 Trillion USD Investment Needed in Five Years to Build Low-Carbon Cities in China." authored by the Paulson Institute, Energy Foundation China and the Chinese Renewable Energy Industries Association, estimates that 6.6 trillion RMB (\$1 trillion

32 Hong, "IGF 观点 | 中国碳市场 2019 年度总结 [Annual Review of China's Carbon Market]."

33 Shepard, "No Joke: China Is Building 285 Eco-Cities, Here's Why."

34 Sohu.com, "23 城冬季清洁取暖国家补贴 -3 年 303 亿!" [The Second Batch of Winter Clean Heating Pilot Cities Added 23 New Ones, with a Three-Year Financial Subsidy of RMB 30.3 Billion]."

4.1.2 Development of public green urban finance

As of 2017, about 80% of finance for urban infrastructure was provided by or through municipal governments. The three pillars of municipal finance were tax revenue (29%), land lease receipts (28%), and financing companies set up by local governments (26%), with the remainder coming from investments by public and private enterprises³⁵.

4.2.1.1 Phase 1: From land lease to government debt

Over the past 40 years, funding for urban development has undergone three different phases, where the governments decreased their share of urban finance from 95% before the 1990s to about 80% in 2017. In the first years of China's opening up, China's cities raised funds by selling land (leases), which covered around 50% of city government budgets³⁶. This not only allowed cities to quickly build necessary infrastructure (often a sign of success and reason for promotion for local government officials), but also led to the rapid use of surrounding farmland for urban development – resulting in urban crawl³⁷. After the financial crisis of 2008, more stringent central government policies were put in place to limit the sale of land. This made local governments more reliant on other sources of funding. Apart from raising funds by generating revenues through taxation, cities increasingly relied on lending from state-owned banks, such as China Development Bank (CDB); CDB provides soft loans for local governments in line with national strategic initiatives.

4.1.2.2 Phase 2: From Public Private Partnerships to local government finance vehicles (LGFVs)

When debt levels reached unsustainable levels, China's cities turned to public-private partnerships (PPPs). In this model "private" vehicles with government guarantees would get loans often from government-owned financial institutions for projects developed as PPPs with local

governments and state-owned enterprises. This model was also driven by the fact that Chinese municipal governments can not go directly to commercial banks to take out loans (see also paragraph 3.1.4). To circumvent this, municipal governments set up local government finance vehicles (LGFVs) that could borrow from commercial banks. These platforms have mushroomed from about 6,500 in 2010 to 10,000 in 2017³⁸. As of 2015, the Chinese government restricted this practice and from mid-2018, LGFVs were only allowed to issue bonds for their own sake, therefore this practice has been on the decline.

Box 2: Shanghai District Financing Vehicle³⁹

The Shanghai Municipal Government (SMG) has launched a pilot District Financing Vehicle (DFV) to leverage money from the private sector to finance infrastructure investments for suburban districts. Then, "building on the experience of the DFV, the proposed financial intermediary (Shanghai Green Urban Financing and Services Co., Ltd, or FSC) will raise medium- to long-term funds in the capital markets and on-lend to specific subprojects based on project appraisal and fiduciary oversight capacity." If the pilot project results are successful in the area of Shanghai, it could be implemented in other provinces of China.

4.1.2.3 Phase 3: Municipal bonds

When the PPP model was proved to be partly unsustainable, China's central government further encouraged the issuance of provincial and municipal bonds for the financing of urban development starting in 2009. Municipal bonds in China are issued at the provincial level, partially because the country lacks the capacity for a city-level municipal bond market. When a province issues municipal bonds on behalf of a city, 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. One complication of this provincial-level issuance system is that virtually all municipal bonds in China are rated as AAA or AAA-. This means that 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.

Table 2: [Types of Chinese municipal bonds](#)⁴⁰

	General obligation bond (一般政府债券)	Revenue bond (专项债券) ⁴¹
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

From January to end of April 2020, Chinese local governments issued RMB 1.3 trillion in bonds⁴², 63% more than in the same period in 2019⁴³ (although over the course of the year, restrictions on local bonds were loosened and the year ended up with a total of RMB 3.05 trillion of new local government bonds issued in 2019⁴⁴ with outstanding local government bonds exceeding RMB 27 trillion). In April 2020, another 1 trillion RMB of special loans was

approved in the wake of the nCovid-19 pandemic⁴⁵. With the acceleration of local government debt, the sustainability of this debt remains a source of worry:

- the risk of default on local government financing vehicles remains high⁴⁶. Local debt levels and difficulties refinancing existing debt could act as a major constraint on urban infrastructure finance in the years ahead.
- the majority of this capital raised did not go to green development (China's annual investment in energy efficiency and environmental protection is estimated to be about USD 100 billion⁴⁷ (see Table 3)).

35 Shusong, "城市基础设施融资路在何方? 巴曙松访谈纪要 (Pathways for Urban Infrastructure Finance in China, an Interview with Ba Shusong."

36 Xie, "从各地财政看土地依赖的困局," [The Dilemma of Land Dependence from Local Finances].

37 China's major cities are still much more densely populated than for example cities in North America. However, the suburban areas of major cities and lower-tier cities continue to be suburban.

38 Hu, "中国地方政府投融资平台转型发展评价报告 .2017" [China Local Government Investment and Financing Platform Transformation Development Evaluation Report. 2017].

39 The World Bank, "The World Bank - Urban Financing and Innovation Project."

40 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).

41 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.

42 China Securities Journal, "地方专项债发行破万亿 疏通项目堵点是关键 _ 中证网 [Breaking Trillions of Local Special Debt Issuance]." This investment volume in 2020 was also driven by an economic downturn due to the Coronavirus outbreak in January 2020.

43 Xinhua, "China Expedites Issuance of Govt Special Bonds to Fund Infrastructure Projects - Xinhua | English.News.Cn."

44 China Banking News, "China Issues 4.36T Yuan in Local Government Bonds in 2019, Issuance Expected to Accelerate and Expand in 2020."

45 Caixin News, "第三批专项债额度已下达 5月发行量或创历史新高 - The Third Batch of Special Bonds Has Been Approved in May - a Record High"; Trivium China, "These Bonds Are Special - China Tip Sheet April 28, 2020 - Trivium China - Policy Monitoring, Government Engagement, Public Affairs."

46 Weinland, "China Local Governments Sound Alarm on Debt Obligations"; Wu and Shen, "PBOC to Become Bank of Jinzhou Biggest Shareholder in Latest Bailout - Caixin Global."

47 中国领跑全球清洁能源发展 " [China Leads Global Clean Energy Development].

Table 3: Central and local climate-related expenditures, 2015-2017 (billion RMB)⁴⁸

	Central government			Local government		
	2015	2016	2017	2015	2016	2017
Energy Conservation & Environmental Protection	40.0	29.5	35.1	440.2	443.9	526.7
Total Expenditure	8064.0	8680.5	9490.9	17587.8	9503.94	10817.7
Growth	0.50%	0.30%	0.30%	2.50%	4.67%	4.87%

4.1.2.4 Phase 4: Special municipal bonds

As most of the urban financing still comes from municipal governments, Chinese cities have played with different types of bonds to accelerate green urban development such as green municipal bonds. While green municipal bonds have clear advantages, only one labelled green bond has been issued so far in China by a province in 2018: a 300 million RMB green bond by Jiangxi Province for urban underground pipeline with a 30 year maturity and a coupon rate of 4.11%.

For example, in 2019, a 1.6 billion RMB bond and a 420 million RMB bond, both issued by Gansu Province for waste-water treatment with 20 year maturities and a coupon rate of about 3.65% were aimed to be green bonds but were eventually issued as regular bonds.

The scarcity of green municipal bonds is due to a variety of unresolved challenges:

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

(which would have to be the Ministry of Finance).

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.
3. **Capacity and information gaps.** Municipalities' Financial Bureaus do not always have the necessary experience to guide their green bond issuance in the early stages of market development. Awareness, skills, and best practices can proliferate between municipalities once a larger number of green municipal bonds have been issued.
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 that make technical sense but do not necessarily financial sense.
5. **Lack of bankability of projects.** With most investors only interested in holding green bonds that fund highly bankable projects, municipalities need ways to separate these projects from public welfare 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.

While cities themselves struggle to issue green municipal bonds, their local government financing vehicles can and do issue green bonds – having issued about USD 5.9 billion in 2018⁴⁹. Yet, with stricter regulation on LGFVs (see above), the issuance by LGFVs has dropped to RMB 23.35 billion (or about USD 3.6 billion) in 2019.

Box 3: Shenzhen Municipal Special Subway Bond 2017

In December 2017, the Shenzhen municipal government issued the first special subway bond on the Shenzhen Stock Exchange worth 2 RMB billion to be used for the Shenzhen Metro Transit Line 14 project⁵⁰. The total investment for Line 14 is expected to be RMB 39.4 billion. About 49.4% will be provided by the government budget, while 50.6% of the capital demand (RMB 20 billion) will be funded through a special bond issuance. The bonds will be repaid by income from commercial asset development, ticket income and other income related to the Metro Line 14 project⁵¹.

4.1.2.5 Phase 5: Green taxes

To further raise revenues and address green growth, China is experimenting with green taxes. The Environmental Protection Tax Law came into effect on 1st January 2018. It requires businesses and public institutions that discharge air, water, solid waste, and noise pollution to pay taxes accordingly. The law replaces local pollutant discharge fees, of which the central government took a 10% cut. Now, all the tax income goes to city governments. The effectiveness and revenues of these taxes have yet to be studied.

4.1.3 (Green) commercial urban finance developments in China

To address the green urban development financing gap, private capital needs to be mobilized (estimates show that at least 85% of all the annual green investment needed in China by 2020 must come from the private sector⁵²). To this end, China has issued a number of green finance policies. China's first national green finance policy appeared in 2006 when the State Environmental Protection Administration (SEPA – now MEP) limited the ability of banks to extend or give loans to polluting enterprises. In 2012, the China Banking Regulatory Commission (now China Banking and Insurance Regulatory Commission) issued guidelines for green credit, and in 2015 the State Council released its eco-civilization plan, which called for the development of a green finance system in China.

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 framework⁵³. It was jointly issued by seven 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). The Guidelines are significant for several reasons:

- They officially define "green finance" in China as "support for environmental improvement, climate change and resource conservation, and the efficient use of economic activities."
- They emphasize that the main purpose of building a green financial system is to mobilize and motivate more social (non-government) capital to invest in green industries.
- They provide incentives to support and encourage green credit, green securities, green insurance, green funds, and green public-private partnerships (PPPs)⁵⁴.

48 GIZ - german cooperation, "Climate Finance for Low-Carbon Urban Infrastructure in China." ??

49 GIZ - german cooperation.

50 Chinabond.com, "Data on Shenzhen Municipal Subway Bond in 2017."

51 Chinabond.com; GIZ - german cooperation, "Climate Finance for Low-Carbon Urban Infrastructure in China."

52 Ma, Sheren, and Zadek, "G20 Green Finance Synthesis Report."

53 People's Bank of China (PBOC) et al., "Guidelines for Establishing the Green Financial System."

54 Lindfield, "Green Municipal Finance."

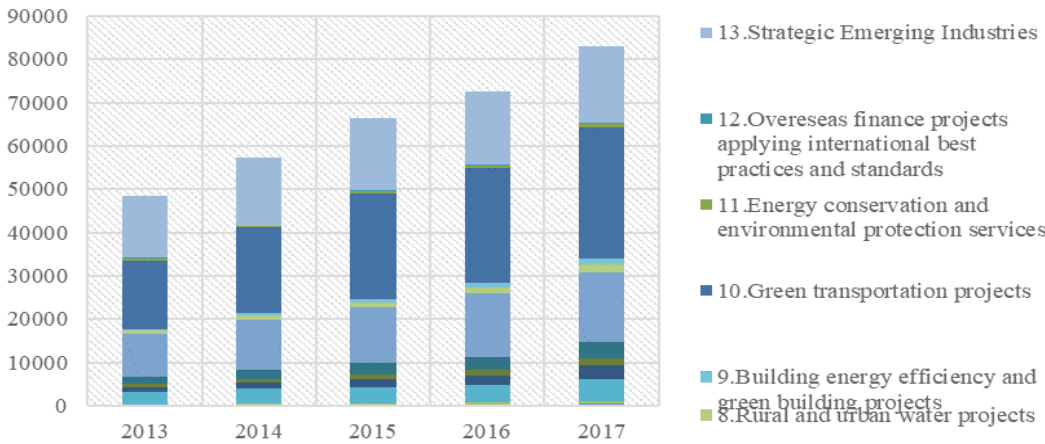
This guideline also strengthened the development of the green bond market in China (based on the 2015 Guidelines for Green Bond Issuance). Depending on the definition, China was either the first, second, or third largest issuer of green bonds in 2019. According to the Climate Bonds Initiative (CBI), Chinese institutions issued about 23 billion USD worth of green bonds (with France and the USA having larger green bond markets).

Another tool is green credit (which, in contrast to green bonds, are not as easily traded on public bond markets). According to the Green Credit Guidelines and the Green Credit Statistics System, China's green credit has two elements⁵⁵:

- supporting loans for three strategic emerging industries: (1) energy conservation and environmental protection, (2) new energy, and (3) new energy vehicles.
- supporting loans for energy-conservation and environmental protection projects and services.

Figure 10 provides an overview of green credit provision by green sectors of the Chinese economy, which amounted to about 8 trillion RMB.

Figure 10: 2013-2017 green credit allocation by 13 CBIRC sectors (100 million RMB (亿元))⁵⁶



55 China Banking and Insurance Regulatory Commission (CBIRC), “绿色信贷指引” [Green Credit Guidelines].”

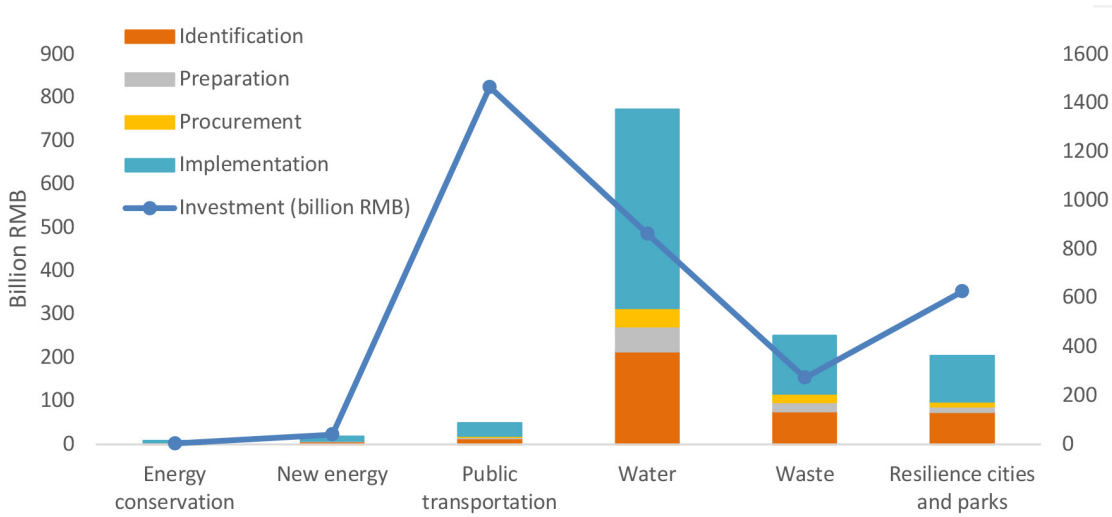
56 China Banking and Insurance Regulatory Commission (CBIRC), 2019: “The Green credit data of 21 major banks from 2013 to June 2017”, <http://www.cbirc.gov.cn/EngdocView.do?docID=70AF0D4D2954480F831F37C43804DA1D>

Another important development for urban finance in transport, urbanization and industry 4.0 has been the recent expansion of real estate investment trusts (REITs) in China. At the end of April 2020, in the wake of the Covid-19 pandemic, Chinese authorities (NDRC, CSRC) announced a pilot program for REITs in the Beijing-Tianjin-Hebei region the Yangtze River Delta, the Xiongan economic zone, the Hong Kong Zhuhai Macao area and the Hainan Province. Through REITs, public participation in infrastructure projects can be accelerated, where REITs buyers own a share of the infrastructure. In the pilot, REITs can be issued for projects including logistics and warehouses, toll roads and transportation infrastructure, urban utilities, sewage and garbage processing, information networks and others in strategic and emerging industries⁵⁷.

4.1.4 Public Private Partnerships (PPP)

In public private partnerships, ideally private and public money and capacity are combined to contribute to sustainable development. PPPs are used in China to develop municipal utilities, transportation infrastructure, support urban development, etc. By March 2020, the national PPP Project Database compiled by MoF listed 9.459 projects, with total investments of RMB 14.4 trillion. Figure 11 shows the distribution of PPPs, where water-related PPPs are particularly popular, while public transportation and new energy PPPs are relatively irrelevant.

Figure 11: Urban Climate-related PPP Projects, by Development Phase and sector (as of December 2018)⁵⁸



Since 2017, the Ministry of Finance and NDRC have released a range of documents to support and guide green PPP development to support green infrastructure, pollution control, resource efficiency, etc in particular. However, due to improvements needed in China's overall PPP regulatory framework, progress of green PPP application has been slow⁵⁹.

4.1.5 Green Funds

In 2010, the first green fund appeared in China, and the number of new green funds has increased steadily year after year. In September 2015, the State Council issued the “Ecological Civilization Master Plan,” and proposed the establishment of the green financial system's overall plan to support the establishment of green funds.

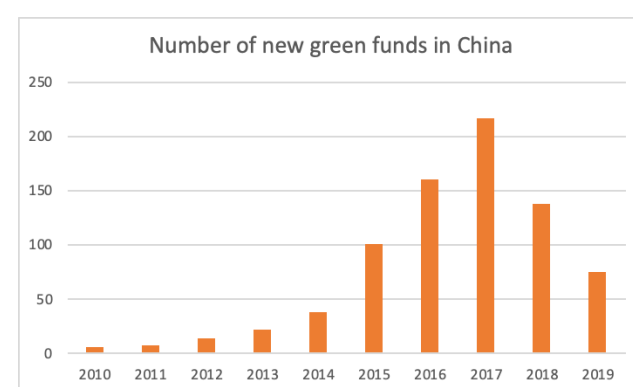
In August 2016, the Green Finance Committee published the “Guidance on building green financial system” proposing to support the establishment of a green development fund. In 2017 the State Council decided to set up green finance reform and innovation pilot zones to promote the development of local green funds in the five provinces (autonomous regions) Zhejiang, Jiangxi, Guangdong, Guizhou and Xinjiang. Driven by the continuous improvement of the green financial system and the related favorable policies of the country, the number of green funds in China increased rapidly from 2015 (88 funds) to 2017 (567 funds). To counter the overheating of the system and control financial risks, the People's Bank of China in its “Guidance on Regulating financial institutional asset management business,” restricted qualified investors, requiring clearer requirements for the issuing of “funds” (this brought down the number of new green funds to 137 in 2018). In January 2019, the Ministry of Ecology and Environment issued the “Opinions on Supporting the Green Development of Private Enterprises,” which proposed to accelerate the establishment of a national green development fund, to encourage local governments and social capital to jointly initiate regional green development funds, and support private enterprises, with conditions.

58 GIZ - german cooperation, “Climate Finance for Low-Carbon Urban Infrastructure in China.”

59 Wang and Zadek, “Establishing China's Green Financial System: Progress Report 2017.” publisher: “UNEP Finance Initiative”, publisher-place: “Beijing”, title: “Establishing China's Green Financial System: Progress Report 2017”, URL: “https://wedocs.unep.org/bitstream/handle/20.500.11822/22285/China_Green_Finance_ProgressRep_ES_EN.pdf?sequence=1”, author: [{"family": “Wang”, given: “Yao”}, {"family": “Zadek”, given: “Simon”}], issued: [{"date-parts": [{"2018}]}], schema: “https://github.com/citation-style-language/schema/raw/master/csl-citation.json”}

In 2019, there were 77 green funds established nationwide and filed with the China Securities Investment Fund Association, including 75 privately-funded and 2 publicly-funded green funds (see Figure 12).

Figure 12: Number of new green funds in China (Source: China Securities Investment Fund Association, Wind Database)



In 2019, the funds were used for new energy (51%), biodiversity conservation (45%), circular economy (2%) and energy saving (2%).

4.1.6 International finance institutions

International financial institutions, including development finance institutions, have contributed to financing green urban infrastructure in China. In 2018, the Asian Development Bank (ADB), for example, committed around \$1.8 billion for 9 sovereign loans and \$22 million for 36 technical assistance projects to support China via “local government programs that promoted sustainable and inclusive economic development⁶⁰.” ADB is currently funding efforts to reduce pollution in Beijing, Tianjin, and Hebei, including low-carbon heating and transport in Hebei province. ADB is also leading the Shandong Green Development Fund, a sovereign fund designed to promote climate finance in Shandong province⁶¹. The French AFD committed about EUR 1.3 billion since

2004 to 28 projects with 13 million tons of CO2 emissions avoided and 450,000 hectares of biodiversity areas protected⁶²; the German KfW has committed about EUR 577 million in 8 projects with a focus on provincial sustainability⁶³.

Box 4: Green Bus System in Qingdao⁶⁴

EC-Link Project has been cooperating with the SGDF and ADB to develop a Green Bus Project in Qingdao. The project is expected to be fully completed in 10 years for a planned cost of RMB 1.69 billion (USD 242 million). According to ADB statistics, Qingdao Municipal Government will provide 25.4% of the total investment amount, while the proposed fund will be accountable for 61% of it. The estimated revenues for the 10 year long project is estimated to be around RMB 2.07 billion, coming from fares, battery recycling and advertisements. The benefits of the project include the improvement of transport services, reduced commuting time for citizens, battery recycling and CO2 reduction.

Although total financing through development finance institutions to China represents a small portion of financing for urban infrastructure, they can play a catalyzing role to provide proof of concept and build capacity for green urban development and finance. At the same time, development finance institutions often allow for blended finance, which both attracts private capital at market rates and concessionary financing at below market rates to finance projects that would otherwise not receive funding.

Box 5: Blended finance (Source: IIGF)

Blended finance is a form of structuring finance to allow for lower financing cost. According to the OECD, “blended finance is the strategic use of development finance for the mobilisation of additional finance towards sustainable development in developing countries.” A project’s financing can therefore combine different instruments (e.g. equity, debt) which are provided by fund sources (from those such as development banks, public institutions and donors) with a willingness to provide concessionary financing (that is financing at rates below market return rates) with money (from those such as commercial institutions or private sectors) that require market returns.

Figure 13 shows an example: a project that requires 100,000 investments and has a negative return of 1%. After one year of the project operation, it has therefore lost 1,000 and can only pay out 99,000. If using blended finance, this project could attract private investors. The project receives a donation of 5,000, gets concessionary financing from development banks (50,000 with an expected return of 2%) and attracts private investors (45,000 with an expected return of 6%).

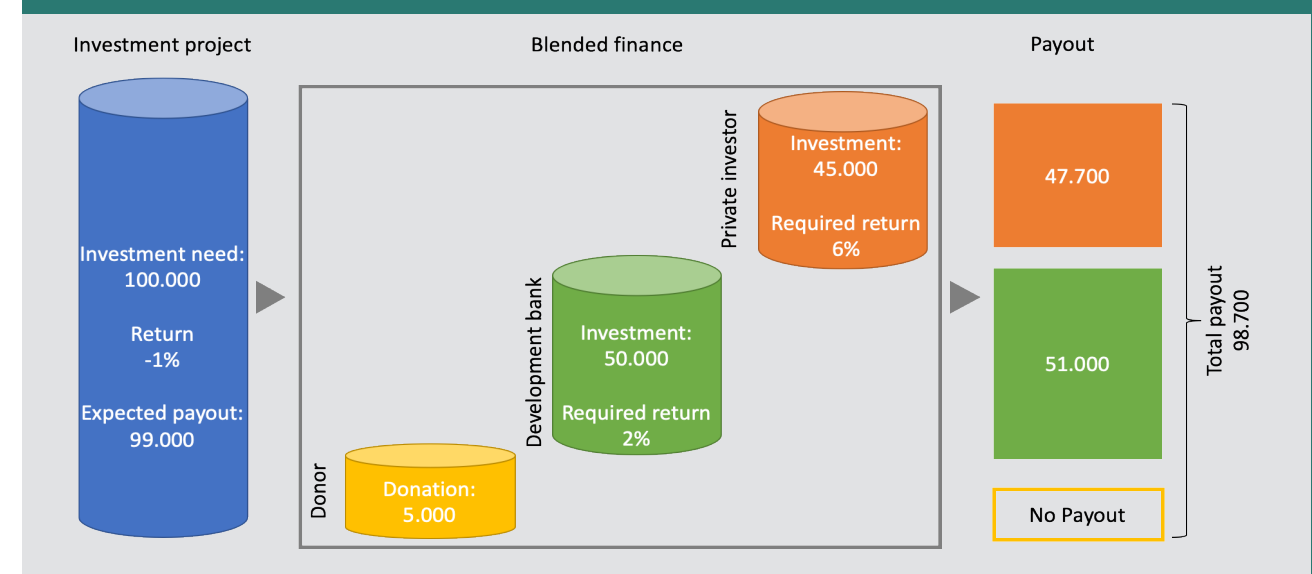


Figure 13: Example of blended finance (Source: IIGF)

As such, blended finance is an instrument that allows for the mobilization of private investors into projects with lower and even negative returns, while avoiding crowding out private capital through concessionary loans or grants. Blended finance does not work, however, when projects don’t generate revenues at all.

4.2 Case studies for green urban finance in China

In this section, we look at two cases of green urban finance in China that can serve as a role model for international cooperation in the Belt and Road Initiative. The cases were selected based on their potential to be scaled-up to the context of cities of the Belt and Road

Initiative. There were many more cases that could have been selected, but we aimed to select cases that have relevance for both large scale and small scale application, their past and current relevance to the Chinese market and for their example of combining EU and Chinese experiences in the green finance sector.

⁶⁰ Asian Development Bank (ADB), “Asian Development Bank and the People’s Republic of China.”

⁶¹ Asian Development Bank (ADB), “Shandong Green Development Fund Project.”

⁶² Agence Française de Développement (AFD), “China | AFD - Agence Française de Développement.”

⁶³ KfW Development Finance, “KfW Entwicklungsfinanzierung | Weltweites Engagement.”

⁶⁴ Jenny et al., “Catalyzing Climate Finance: Shandong Green Development Fund People’s Republic of China.”

4.2.1.1 Shandong Green Development Fund (SDGF)

The Shandong Green Development Fund (SDGF) is a \$1.5 billion public-private financing facility, targeting higher risk climate-resilient infrastructure subprojects, green and high technology manufacturing businesses, and investment in municipal and sectoral sub-funds in China’s Shandong Province. With a population of about 100 million people and 10 cities with more than 5 million people, this province is one of the largest energy and coal consumers in China. The SDGF responds to the key challenges of climate finance in China – “being a lack of pipelines of viable climate positive projects, particularly new technology projects, inability of the capital market to address higher risk profiles of climate investments and to attract PIC finance into such investments, and inadequate systems for defining, monitoring and evaluating climate investments – identified by the Ministry of Finance (MoF) and the ADB.”

Overview of the SDGF

The fund is set up for 20 years with the goals of:

- mobilize at both fund and subproject level additional capital from public and private sources, and
- contribute to capacity development in the PRC in general and in Shandong in particular for climate finance and climate resilience.

Figure 14: Shandong Green Development Fund distribution (Source: ADB)

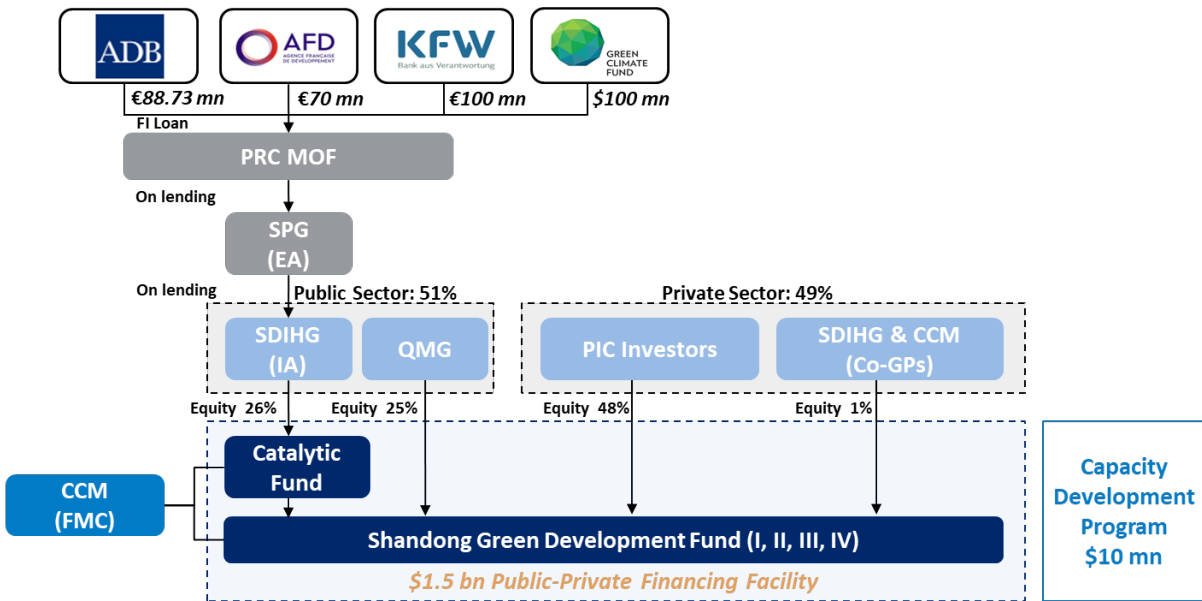
Debt	Max Funding	Max Tenor	Interest Rate**	Equity	Max Funding*	Invest. Horizon
Transformational	67%	8 years	Discount	Transformational	50%	<8 years
Advanced Benefits	50%	6 years	In line	Advanced Benefits	30%	< 6 years
Good Practices	25%	5 years	Premium	Good Practices	-	-

To achieve this, the fund aims to invest a maximum of 67% into transformational projects at discount interest rates, where transformational significantly contributes to positive climate impacts. The fund considers projects “good practice” if they comply with current environmental best practices in China (e.g. green building codes) and provide loans at lower than market rates (see Figure 14).

The SGDF is a public (56%) - private (44%) fund with an overall ownership structure of 56% and 44%:

- 33%: Catalytic funds (ADB, AFD, KfW – and the GCF) through SDIHG (Public);
- 25%: Shandong Provincial Government and Local Governments (Public);
- 41%: PIC investors mobilized by SDIHG (under multiple close fundraising); and
- 1%: SGDF Fund Management Company as General Partner (consistent with market practice).

Figure 15: Shandong Green Development Fund (SGDF) funding structure



CCM = CICC Capital Management Co., Ltd.; EA = Executing Agency; FI = Financial Intermediation; FMC = Fund Management Company; GP = General Partner; IA = Implementing Agency; MoF = Ministry of Finance; PIC = Private, Institutional and Commercial; PRC = People’s Republic of China; QMG = Qingdao Municipal Government; SDIHG = Shangdong Development & Investment Holding Group; SPG = Shandong Provincial Government.

The fund will accommodate the timing difference between private, institutional and commercial (PIC) investors’ horizon (up to 10 years) and the ADB loan (20 years). The capital from International Financial Institutions (IFIs), public funding and PIC will be blended into a series of short-term funds (up to 10 years) to finance climate-positive projects. In order to ensure crowdfunding from the private sector, PIC investors will be guaranteed a return that is commensurate with market standards and higher than the return for the funding from public investors.

This structure allows the participation of the private sector at both the Facility and project level. It is anticipated that the fund achieves at least 2.5 million tCO2e of annual greenhouse gas emissions reduction while at least 2 million people (of which 50% are women) should benefit from strengthened climate and disaster resilience in the region.

Operation of the SDGF

The fund will consider projects “that contribute to climate change mitigation (measured through GHG/CO2eq emissions reduction) or climate change adaptation (measured through improvement of the beneficiaries’ resilience) that meet eligibility criteria in the Project Administration Manual (PAM)⁶⁵” All the subprojects will be constantly monitored and evaluated to prioritize financing to those subprojects that meet higher goals.

SDTF will balance its funds between mitigation (75%) and adaptation (25%) sectors. The key fields for mitigation projects are key sectors including but not limited to renewable energy, green building, and low carbon transportation, while for the adaptation sector priority will be given to agricultural infrastructure, city adaptation infrastructure, and coastal protection.

65 ADB, “Report and Recommendation of the President to the Board of Directors.”

Summary and scalability

The SDGF is an ambitious project that allows cities in the Shandong province to invest in transformative green and climate-friendly urban technologies and infrastructure. By providing both a facility and a fund, the SDGF ensures that projects can be invested in, even though regular investors might typically turn them away. By including private sector financial institutions, the SDGF also mobilizes private money and by blending finance, it allows for both concessionary financing terms and attractive returns for investors. The SDGF is a prime example of cooperation between multiple development finance institutions, private local investors, a provincial government, cities, and the national government to drive sustainable development on a subnational level.

Currently, EC-Link Project is cooperating with the SGDF in also developing a green building project in Qingdao (already in pipeline), and series of green projects in Weihai will be ready and in the pipeline by 2021.

4.2.1.2 Shenzhen International Low-Carbon City (ILCC)

The Shenzhen International Low-Carbon City (ILCC)⁶⁶ is a flagship demonstration project on Sustainable Urbanization located in the Longgang District of Shenzhen, at the border of Dongguan and Huizhou in the Guangdong province. It aims to display China’s achievements in low-carbon technology and has enjoyed considerable success since its launch in 2012⁶⁷. 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 a 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 km².⁶⁸ The

ILCC upgrades the existing built environment in Longgang District by retrofitting older industrial spaces which will eventually provide replicable examples of low-carbon development for future waves of Chinese urbanization⁶⁹.

Green financing for the ILCC

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; as a pioneer project, the ILCC was marked only in 2016 following the newly developed classification of bonds in China⁷⁰.

Shenzhen International Low Carbon City (ILCC) was also a demonstration project under C40 Cities that served as an intriguing example for understanding innovative forms of funding with the specific aim of doing it in environmentally in environmentally, socially and economically sustainable ways whilst also pursuing the new construction of cutting-edge, low-carbon buildings and urban infrastructure (see note n. 66).

The two LGFVs involved in partially financing the ILCC were the Shenzhen Special Zone Construction and Development Group Co., Ltd. (CDG) and the 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 Shenzhen⁷¹. 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 bonds⁷².

Table 4: Projects constructed by CDG and total investment⁷³

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

Summary and scalability

Although state-backed LGFVs would face more constraints when issuing corporate bonds today (due to the 2014 State Council’s Opinions on Strengthening Local Government Debt Management) and because CDG’s 2012-13 corporate bonds issuance to finance the ILCC is no longer possible in China, CDG could today issue bonds linked to different climate mitigation projects in the ILCC.

In its set-up, Shenzhen’s municipality ensured that the state-backed CDG operated as a commercialized LGFV by today’s standards. 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.

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 fact, LGFVs could be more widely used in China and elsewhere to become dedicated green investment platforms. Accordingly,

cities should create or re-purpose LGFVs dedicated to financing green projects⁷⁴, and put LGFVs in charge of retrofitting existing urban areas to become greener, particularly by focusing on specific green projects (as LGFVs would have to issue project-specific green bonds).

An example of this practices was an LGFV of the Chinese city of Wuhan: The Wuhan Metro Group Co., Ltd. set a milestone in November 2018 when its debut offshore green bonds sold for 400 million USD⁷⁵. 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 strategy⁷⁶. In such cases, LGFV-issued green bonds could solve maturity mismatches for infra-

66 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.

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

68 Elliot, “The Best Part Is What Shenzhen Didn’t Do.”

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

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

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

72 Zhan and de Jong, “Financing Eco Cities and Low Carbon Cities: The Case of Shenzhen International Low Carbon City,” April 2018.

73 Zhan and de Jong, “Financing Eco Cities and Low Carbon Cities: The Case of Shenzhen International Low Carbon City,” April 2018.

74 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.

75 Davis, “Wuhan Metro Seals Landmark Green Deal for LGFVs.”

76 “Moody’s Assigns Green Bond Assessment (GBA) of GB1 to Wuhan Metro’s Proposed Green Senior Perpetual Securities.”

structure 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)⁷⁷.

As a pioneer project, ILCC could be used as an example for many developing cities within BRI; it represents a clear example of how cities could develop urban climate mitigation projects with extensive private sector involvement in both the design and construction of individual projects. ILCC is environmentally sustainable by promoting the low carbon transition, socially sustainable through resident and villager involvement, and financially sustainable through the diversification of funding sources. The financing experience gained from ILCC provides practical lessons for other cities and has significant implications in adapting institutional and organizational arrangements to create enabling conditions for innovative financing activities.

4.3 Challenges for green urban finance in China

Chinese cities face a number of challenges in meeting their financing needs for green urban development in regard to policy and capacity, public finance and private finance mobilization.

4.3.1 Supporting policy and capacity

In regard to supporting policy and capacity for green urban finance in China, the following challenges need to be overcome to further accelerate mobilization of green finance.

- Green finance policies and responsibilities lie with multiple institutions across different regulatory bodies and a comprehensive and explicit policy framework of legislation addressing for example climate change is lacking.
- Policy coordination between different regulators (e.g. for urban transportation different ministries are responsible, particularly the Ministry of Transport for subway systems and the city planning bureau for bus

transport) and different administrative levels – from central government to provincial and municipal governments (e.g. for subsidies for e-mobility, different levels have set different targets) are complicated.

- Capacity, particularly of planning capacity at local levels is often insufficient, while at the same time central planning might be insufficient to deal with local specificities. For example, "In some cases, cities or developers may wish to adopt more walkable communities, with mixed usages and different densities than is required under the regulations. Often, national and local officials may be receptive to such changes, but experts and design institutes lack experience and confidence in alternatives⁷⁸."
- Often changing regulations increase political risks, such as changing levels of subsidies that increase risks for private investors by making the predictability of cash flows for current and potential future projects less certain. Accordingly, greater attention to long-term policy stability is required.
- Project preparation in terms of technical capabilities and finance is often insufficient. With large banks minimizing their risks, their willingness to finance pilots is often limited. Accordingly, pilots and project preparation need to be paid for by government funds (such as the eco-cities), or by development finance institutions, while, however, capacities for financial modelling and evaluation are often not sufficient at the administrative level.

4.3.2 Public finance

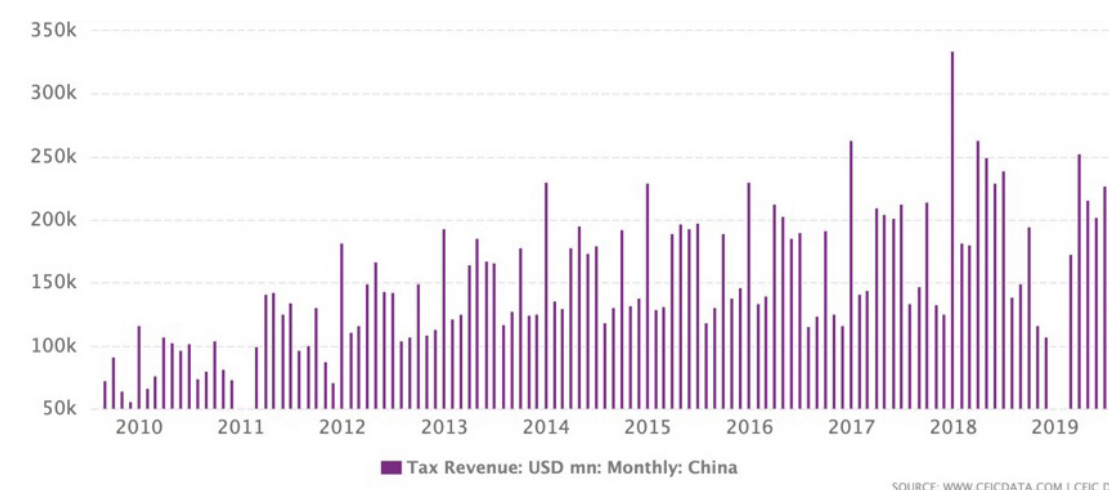
Despite much progress in accelerating public finance for urban green development in China, a number of challenges persist, such as:

- Chinese cities have high levels of debts that make any further borrowing from bond markets more difficult. S&P Global Ratings estimates that the off-balance-sheet borrowings of Chinese local governments could be as high as RMB 30-40 trillion, most of which is

earmarked for infrastructure development⁷⁹. While cities have resorted to new forms of legal structures to raise more funds through local government financing vehicles, local governments nevertheless guarantee these loans. Thus, more borrowing might either make governments or banks default (which has actually happened in a number of cases recently)⁸⁰. Given this background, cities with slower growth will increasingly face difficulties attracting financing.

- Other public financing instruments are often insufficient. Tax revenues have stagnated at best (see Figure 16), while an economic slowdown starting in 2019 has further derailed tax revenues. Tax revenues in January and February of 2020 were about RMB 3.5 trillion, down 9.9% from the previous year and the steepest drop since February 2009. Due to the coronavirus induced economic downturn, February 2020 fiscal incomes dropped by 21.4% compared to the already relatively weak 2019 comparison period⁸¹.
- The further sale of land by re-purposing of more agricultural to residential land to increase municipal revenues for further investment would further contribute to non-green urban development.

Figure 16: Chinese Tax Revenues 2010-2019 (Source: CEIT)⁸²



79 Reuters, "China Local Governments' Hidden Debt Could Total \$5.8 Trillion."

80 Wu and Shen, "PBOC to Become Bank of Jinzhou Biggest Shareholder in Latest Bailout - Caixin Global."

81 Cheng and Han, "Covid-19 Epidemic Slams China's Government Revenues."

82 CEIT, "China Tax Revenue [1995 - 2020] [Data & Charts]."

4.3.3 Private finance issues

Although the green finance market in China has grown steadily, many problems have yet to be overcome to drive a green development path and they include:

- Reluctance of private investors to commit capital to long-term local infrastructure projects, especially after new rules for cross-border pooling were included in tightened regulations for public private partnerships (PPP) in 2018⁸³.
- Inconsistent green bond standards where China and international green bond standards are not harmonized (e.g. through the inclusion of clean coal, through the non-inclusion of inter-city railways). This leads to a potential disconnect between global capital markets and Chinese projects⁸⁴.
- Disconnect between investors, project owners and

77 Hornby, "Greener Tint to China Project Finance."

78 GLZ - German cooperation, "Climate Finance for Low-Carbon Urban Infrastructure in China."

83 Baker McKenzie, "SAFE Issues New Rules on Cross Border Pooling," Baker McKenzie, 29 March 2019."

84 Teer and Larsen, "Sustainable Finance in Asia: Helping Asian Green Bond Issuers to Access International Capital Markets."

5 Green urban finance in Europe

beneficiaries, particularly in large infrastructure projects: often having long investment cycles investment cycles, sustainable infrastructure projects provide benefits for urban residents, who are possibly not willing to pay directly for the infrastructure's use. At the other end of the spectrum are small scale projects (such as distributed energy), which lack the interest of banks due to the comparatively high transaction cost of providing finance.

- Insufficient reporting capabilities of cities, for example on ESG data. As investors have to increasingly report on the ESG performance of their portfolio, better and consistent monitoring, reporting and validation of ESG variables is required for private investors.
- Insufficient data and experience of sustainable project finance due to its relative novelty. As investors often rely on standard templates and standard data to calculate risks and financing rates, financing innovative and sustainable technologies is harder on a large scale for commercial banks and policy banks.

The landscape of green urban finance in Europe is characterized by the interplay of the several different policy levels in the EU: public national funding meeting EU structural and investment funds and private funding. Member States, private actors and the EU all play a role in financing green urban development. The EU has a growing regulatory framework in place to increase investments in the green finance sector. This chapter gives an overview of recent developments, main actors and serves to create an understanding of how the policy framework enables cities to foster green urban development at the local level.

5.1 Recent developments in green urban finance in Europe

5.1.1 The European policy context for green urban finance

In November 2018, the European Commission published the Long-Term Strategy (LTS) for a prosperous, modern, competitive and climate neutral economy⁸⁵. The vision, named “A Clean Planet for All”, formulates the goal of “achieving net-zero greenhouse gas emissions by 2050⁸⁶.” The framework contributes to regulatory stability as a key element for public authorities and private actors to achieve the EU’s emission reduction targets. To complete the transition towards a net-zero greenhouse gas economy, the LTS states that “private business and households will be responsible for the vast majority of these investments. To foster such investment, it is crucial for the European Union and Member States to offer clear, long-term signals to guide investors, to avoid stranded assets, to raise sustainable finance and to direct it to clean innovation efforts most productively⁸⁷.” At the same time, the EU has designed and put in place several public structural and investment funds to boost green finance. They are administered by the European Commission in cooperation with the Member States.

A major development for green finance has been the announcement of the European Green Deal in December 2019⁸⁸. The Green Deal is the EU’s strategy for a sustainable economy, in which the EU formulates in more detail how to achieve the goal of net zero emissions of greenhouse gases by 2050. It describes the EU’s commitment to tackle climate-related challenges and the need for an economic transition towards a sustainable future. One of the key elements of the roadmap put forward in the European Green Deal is the financing of the measures and policies announced. There is a significant need for green finance and investments to achieve the ambition set by the Green Deal. Both public and private investment will have to be mobilized.

The EU budget, where “a 25% target for climate mainstreaming across all EU programs⁸⁹” could be put in place for the next EU Multiannual Financial Framework (2021-2027), will play a key role. Furthermore, new revenue streams will be adopted: the Commission has proposed to allocate 20% of the revenue from the auctioning of EU Emissions Trading System (ETS) to the EU budget. Following the publication of the European Green Deal, in January 2020, the EC presented the Sustainable Europe Investment Plan (or the European Green Deal Investment Plan) which serves as the investment pillar of the Green Deal. The Plan will mobilize public investment at the EU and Member States level and help to unlock private funds through a bundle of financial instruments.

Reactions of the Member States towards the ambitious new Green Deal have differed, even though there is consensus that a need for unlocking investments exists. Several members of the European Parliament raised concern that the social and economic impact of carbon neutrality in 2050 could be very high⁹⁰. One of the more skeptical countries is Poland, which is highly dependent on its coal industry and has refused to endorse the objective of being climate neutral EU by 2050. Recognizing the different scales of the challenge to undergo the nec-

85 European Commission, “A Clean Planet for All - A European Strategic Long-Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy.”

86 European Commission.

87 European Commission.

88 European Commission, “A European Green Deal.”

89 European Commission, 15.

90 European Parliament, “Green Deal for Europe: First Reactions from MEPs.”

essary economic and social transition in some territories, the Green Deal therefore entails the Just Transition Mechanism, which will provide “targeted support to generate the necessary investments in these territories⁹¹.” The tool should help bring on board Member States, that refuse to commit to carbon neutrality for now. With a first list of regions eligible for funding, it remains to be seen which regions and territories will finally be selected to benefit from the funds.

With the European Green Deal, the EU has made a strong commitment towards its climate goals. In the light of the current COVID-19 pandemic that has also stricken the European continent and its people and economies, it is all the more important to bring together the future pandemic recovery plan and the green transition. For instance, supporting the clean energy sector or boosting the renovation wave can help move forward the green transition and at the same time recover important economies. As been called for by the Europe Board of the Covenant of Mayors – an EU wide network of local and regional authorities – the European Green Deal should be at the core of the EU recovery efforts and should make cities better equipped to tackle the ongoing climate emergency.

5.1.2 Financial Instruments in the Green Urban Sectors in Europe

The greening of municipal financial instruments is an important first step towards achieving greener urban infrastructure. As cities have revenue sources that are tied to many aspects of all urban sectors, their design can stimulate or dissuade the development of greener and more sustainable cities (OECD 2012). According to OECD (2012) in some European countries (e.g. France, Netherlands, Norway and Sweden), capital expenditure in environmental protection is incurred almost entirely by the local government, in other countries (e.g. United Kingdom and Iceland), local government represents

less than a third of total government expenditures in this sector. In decentralised countries, such as Spain or Belgium, regional government expenditures in environmental protection account for nearly a third of total environmental expenditures. Some examples of how European local governments are putting in place financial instruments to achieve green urban infrastructure are shown in Table 5:

Table 5: Examples of Green Urban Finance in Europe

Instrument	Application	Details
Fees and Charges	Congestion charge to fund transport infrastructure	Transport fees discourage car use and encourage public transit and non-motorised travel. London’s congestion charge is a simple system: a daily charge for entering the 13-mile square congestion charging zone on weekdays. By law, all surpluses raised must be reinvested into London’s transport infrastructure ⁹² .
		Milan imposed a charge on vehicles with higher pollution levels as an incentive for motorists to buy less pollutant cars, and a few years later the number of cars with free access were the majority. Despite the fact that these vehicles have less polluting engines, the free access helped less with the congestion problem ⁹³ .
		All net earnings from the scheme are invested to promote sustainable mobility and policies to reduce air pollution, including the redevelopment, protection and development of public transport, “soft mobility” (pedestrians, cycling, Zone 30) and systems to rationalize the distribution of goods.
Grants	Area-specific development charge to finance transport infrastructure	A one-time levy on developers to finance the growth-related infrastructure investments needed to serve the new development. For example, the extension of the metro-line in Copenhagen was financed through fees from development of the Ørestad area of Copenhagen (OECD 2011.)
	Grants with environmental indicators stimulating private investments	Local government’s grants can take environmental indicators into account. Stimulating private investments, the Vienna Department for Environmental Protection promotes green roofs up to a maximum amount of 20,200 euros ⁹⁴ . The university town of Marburg in Germany has its own support programme for the purchase of climate-friendly building services for the generation of thermal energy. Solar thermal systems are subsidised with 500 and 1,000 euros respectively. Under certain conditions other heating systems are also subsidised, e.g. wood pellet systems or systems with combined heat and power generation ⁹⁵ .
PPPs	Energy Performance contracts	In energy-saving contracting (ESC), a building owner and an energy service company (ESCO) conclude an energy-saving contract. Both partners divide the savings profits according to previously negotiated terms. In Berlin, the Berlin Energy Agency has successfully introduced and accompanied 27 ESC projects with over 500 properties and approx. 1,400 public buildings under the name “Berliner Energiespartnerschaften” (Berlin Energy Partnerships) since 1996 on behalf of the Senate. The average energy cost savings in the building pools is 26 percent ⁹⁶ .
	Citizens Solar Parks	The city of Aachen in Germany leaves roofs to private individuals who want to invest in PV systems. The solar use of Aachen’s municipal roof areas has been promoted since 1996. The City of Aachen provides its suitable roof areas mainly to citizens of Aachen; some citizen participation systems have also been established. In autumn 2010 a cooperation with the local City owned energy provider was created with the aim of using larger roof areas as energy generation areas ⁹⁷ .

91 European Commission, “A Clean Planet for All - A European Strategic Long-Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy.”

PPPs	Bioenergy village (Bioenergiedörfer)	A bioenergy village is a village that covers a large part of its electricity and heat requirements itself by using biomass that is predominantly provided regionally. In the German Village of Jühnde, the Jühnde Energy Cooperative, in which the majority of households, all Jühnde farmers, the church and the community are represented, commissioned a biogas plant, a wood chip heating plant and a local heating network. Since then, the village has not only been supplying itself with renewable heat for the most part, but also feeding around five million kilowatt hours of green electricity into the public grid every year ⁹⁸ .
	Renewable Energy Cooperative	In 1994, in the small town of Schonau in Germany, the Electricity Elektrizitätswerke Schönau GmbH (EWS), a small company to promote the production of ecological electricity, was founded. The sole shareholder is Netzkauf Schönau GbR, in which more than 650 citizens participate. In 1995, the city council awarded the concession for the electricity network to EWS. Since December 2009, ElektrizitätsWerke Schönau has been a registered cooperative and today is one of the largest renewable energy suppliers in Germany with around 185,000 users ⁹⁹ .
	Green Finance Lab Private sector involvement to create a forum of skill and expertise	Green Finance Lab in Amsterdam: The Green Finance Lab is an initiative of the City of Amsterdam and the Dutch bank ABN AMRO, as part of the Amsterdam Sustainability Programme and a Green Deal between the City of Amsterdam and the Dutch national government. The Green Finance Lab aims to find new financing mechanisms for realising the transition towards a sustainable metropole (including ecosystem services, energy, water, raw materials and transportation) (OECD 2011) This programme creates a forum for stakeholders from the public, private, NGO and academic sectors to develop financial solutions for sustainable projects. Amsterdam has successfully managed to not only successfully engage as many stakeholders as possible, but to also create a forum of skills and expertise that can help the public authorities.
Bonds	Green City Bonds	Gothenburg in Sweden was the first city in the world to work with green bonds to finance climate-friendly expansion and has done so since 2013. The City of Gothenburg has established a framework pertaining to which projects will be allocated funds from green bonds. A few of the projects financed by green bonds in Gothenburg include Nya Solevi-Sweden ´s largest solar park , Selma Town hall, an ultrafilter in water treatment plant, the expansion of the Gas facility, tree planting in the city by the Parks and Nature Agency, Göteborg Energi's Celsius project, the city's electric vehicles, and local government's project focusing on sustainable buildings ¹⁰⁰ .

91 BBC London, "The Cost to You Where Has the Money Gone?"

93 Santucci, "Cede l'effetto-diga, 7 mila auto in più."

94 Stadt Wien, "Dachbegrünung - Förderungsantrag."

95 Marburg Universitätsstadt, "Förderprogramme."

96 Berliner Energieagentur, "Energy Performance Contracting".

97 Soest, "Solarpark Camp Astrid."

98 Rolink, "Bioenergiedörfer: 10 Jahre Jühnde und über 100 Nachfolger."

99 Elektrizitätswerke Schönau, "Die Geschichte der EWS."

100 Swedish Cleantech, "Green Bonds – Financing a Sustainable City".

Loans	Loans for the improvement of the energy efficiency	The European Investment Bank is providing the Madrid Region with a € 49 million loan to finance the construction of new affordable rental housing and improvement of the energy efficiency and accessibility of the existing social housing stock. The EIB is financing this project under the Smart Finance for Smart Buildings initiative, which it is promoting alongside the European Commission to provide the necessary financing to support investments in improving the energy efficiency of buildings ¹⁰¹ .
	Energy renovation loan	Private households in Flanders, Belgium, receive technical and financial support in improving their homes' energy performance by so called Energy Houses, granting them "Flemish Energy Loans". In order to increase this number of private home renovations and accelerate energy refurbishment, the H2020 project FALCO has proposed a new Energy Renovation Loan (ER 2.0) with higher maximum amounts to borrow, a longer maturity and a modular approach to advisory and support services to align assistance with needs.

In accordance with the examples from European cities illustrated above, the following Table 6 gives an overview on financial instruments in Green Urban Sectors, which have contributed to the greening of the urban financial landscape.

Table 6: Main financial instruments in the main green urban sectors Financing Green Urban Infrastructure (Source: OECD)¹⁰²

	Transportation	Buildings	Water / waste	Energy
Taxes		Property tax		
Fees and charges	Congestion charges Parking fees High Occupancy Toll lanes	Building permits	Tariffs and fees	Electricity user fees
Grants	General grants with environmental indicators, specific grants for environmental goods and services, matching grants			
PPPs	Concessions and Private Finance Initiatives (PFIs), energy performance contracts			
Land-based income		Development charges/impact fees Value capture tax Higher density building rights Tax increment financing		
Loans and bonds	Loans and green bonds			
Carbon finance	Clean Development Mechanism/Joint Implementation, voluntary carbon offsets			

101 European Investment Bank, "Spain: EIB Finances Expansion and Energy Efficiency Improvement of Madrid's Social Housing Stock."

102 European Commission, "A European Green Deal."

5.1.3 The public sector

A key actor of the public sector at the European level is the European Commission (EC), supported by its co-legislators, the European Parliament (EP) and the Council comprised of the heads of states of the Member States.

All 27 EU Member States have adopted different approaches to promote green urban finance and to enforce their financial strategies and guidelines. The main driver for green finance in many of the Member States, however, is the European Commission. The rapidly developing regulation for sustainable and green finance at the EU level therefore is one of the main drivers for the topic also at Member State level. The external pressure will have an effect on national policymakers to come up with solutions on how to bring together the financial sector with climate and environmental policies.

Additional public funding is available in and for municipalities and cities. Their role in financing green projects must not be underestimated as the municipal level is the closest policy level to citizens who represent an important target group as consumers and end-users of products and infrastructure. Municipalities can trigger private funding by setting incentives, applying for financial support at the national and EU level or working with their own budget.

In addition to those actors, the European Investment Bank (EIB), the public bank of the European Union, adopted its own Climate Strategy in 2015 with the goal to strengthen the impact of the EIB on climate financing, setting a target of 25% of their lending to climate action projects¹⁰³. As an EU body its mandate is to support EU policy objectives, which resulted in the EIB doubling its climate target to 50% by 2025¹⁰⁴. To attract funding, the Bank has put in place several advisory programs to support project preparation and implementation as well as capacity-building. One of the most essential programs in this area is ELENA (European Local Energy Assistance),

using EC funds to provide technical support to regions and municipalities to implement energy projects. The EIB's repertoire of financial instruments also comprises innovative tools to attract necessary private investment, such as equity funds and layered risk funds. Green bonds were first issued in 2007, making the EIB one of the first entities to adopt this rapidly growing instrument¹⁰⁵.

Meanwhile, the European Central Bank (ECB) is seeing a change in priorities, as its new director Christine Lagarde is pushing for climate change to be part of a strategic review of the Bank's purpose, which would make it a critical issue within the monetary policy framework¹⁰⁶.

5.1.4 The private sector

Attracting private funding is an essential prerequisite to meeting the European Union's 2030 and 2050 climate targets. Especially for the energy, buildings and transport sectors, an increase in investments is needed. The European Commission estimates that overall investment will need to grow to be between € 176 billion and € 290 billion per year higher than it would be under current policies (or € 520 to 575 billion per year without calculating with the baseline)¹⁰⁷. This translates to around 2.8% of Gross Domestic Product (GDP) invested annually. Currently around 2% of GDP is invested to decarbonize the EU's economy, as calculated by the Commission¹⁰⁸. This investment opportunity – or gap – calls for a significant increase in green finance, notably from the private sector. To enable private funding, policy certainty and de-risking private investments will be key issues in delivering on agreed EU targets.

105 European Investment Bank (EIB), "EIB Climate Strategy - Mobilising Finance for the Transition to a Low-Carbon and Climate-Resilient Economy."

106 Arnold, "Christine Lagarde Wants Key Role for Climate Change in ECB Review."

107 Carbon Disclosure Project, "Doubling down. Europe's Low-Carbon Investment Opportunity."

108 European Commission, "A Clean Planet for All - A European Strategic Long-Term Vision for a Prosperous, Modern, Competitive and Climate Neutral Economy."

On the Member State level, it has been visible that the topics of standardization of criteria and benchmarking are crucial in increasing the share of private investments in EU countries. Furthermore, there is a need to develop an understanding between the private finance sector and the public sector, as the lack of understanding of economic, social and environmental aspects at stake, has resulted in a reluctance to invest in the energy efficiency sector, for instance. This impedes the necessary flow of investments.

To give an understanding of European efforts to increase green private finance, a few selected examples of private sector financing are presented here. For instance, the European Banking Federation (EBF), bringing together national banking associations of EU countries, supports the regulatory framework on sustainable finance that the EC has brought forward and encourages the use of the EU taxonomy (see next chapter) as a common language inside the EU – and also at a later stage outside the EU, which would have an impact on the financial sector of many BRI countries as well. However, from the view of the banking sector, there is concern that EU financing tools and labels, such as the Ecolabel – a voluntary scheme for products, could create complexity regarding the allocation of money or entail costly operational challenges¹⁰⁹.

There are several banks which have included sustainable financing in their mission to promote green development – one prominent example is the GLS Bank from Germany that identifies as an 'ecological bank'. GLS Bank finances projects that fulfil sustainability criteria and their lending activities are strictly bound to social and ecological companies. Their criteria are oriented towards the SDGs which results in the bank investing in businesses like organic farms, nursing homes, communal housing projects and other sustainable companies. The banks clients may choose projects to support when opening an account, thereby choosing which sector to invest in. The replication of the GLS Bank model could promote significantly green urban finance, since bank

109 European Banking Federation, "EBF Views on the Ecolabel Report."

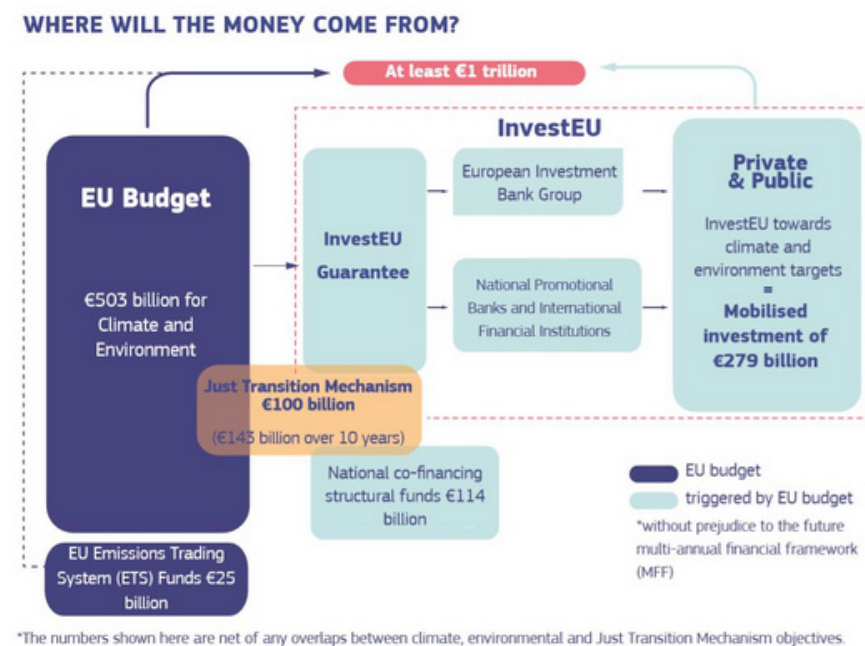
loans play an important role in financing. This being said, if reliable transparent regulatory frameworks are in place, banks will be more likely to expand green finance as a business segment. In addition to the policy framework, expanding knowledge on climate-related risks that banks face will lead to a better understanding of how incorporate them in decision-making within financial institutions¹¹⁰.

5.1.5 Investments

Currently 2% of the Union's GDP is invested in the energy system, its infrastructure and environmental protection. This will need to grow to 2.8% to achieve a net-zero greenhouse gas emissions economy. While private businesses and households will be responsible for meeting these investment needs, the EU's own budget acts as a catalyst to leverage green finance, both public and private. The European Green Deal Investment Plan foresees mobilizing at least € 1 trillion in sustainable investment over the next decade. Around € 503 billion of the EU's own budget are reserved for Climate and Environment. Coupled with the new investment instrument of the upcoming MFF, InvestEU, and revenue streams from the ETS, public and private investment will be triggered that shall amount to at least € 1 trillion¹¹¹.

110 Hakkarainen, "The Greening of the Financial Sector."

111 European Commission, "The European Green Deal Investment Plan and Just Transition Mechanism Explained."

Figure 17: Financing EU's Green Deal (Source: EU website)¹¹²


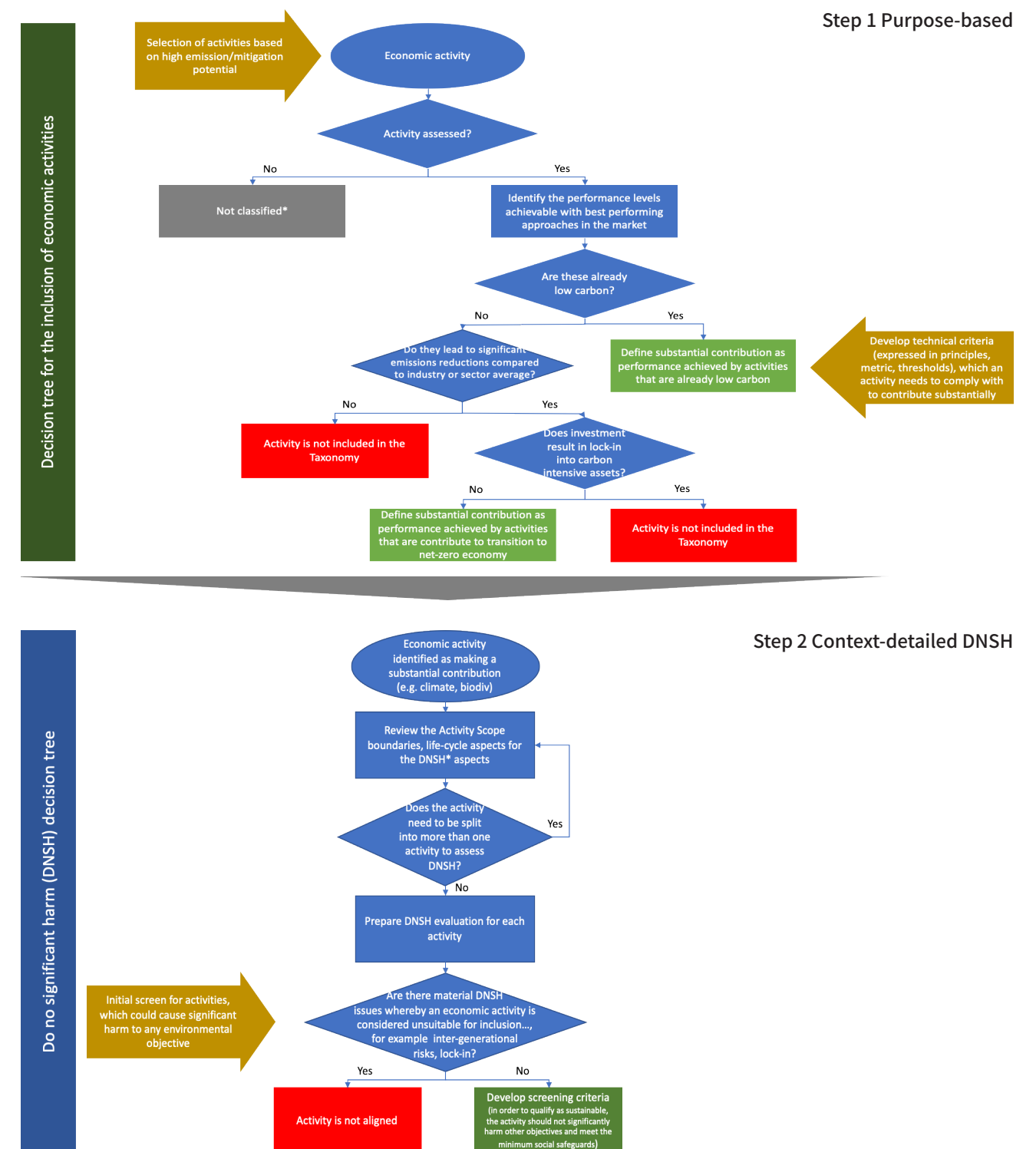
Funds of the EU budget will be spent via its structural funds and programmes, such as the European Regional Development Fund, Horizon Europe and Life funds. Many of these funds build on grant schemes, which aim at triggering additional investment of the private sector. Cities and regions belong to the beneficiaries of these programmes, as they are important multipliers of local financing solutions for clean energy, renovation of buildings and circular economy industries.

The EIB has played a crucial role in green urban finance in the past and will continue to do so over the next MFF. According to the Bank, since 2012, the EIB has “provided € 170 billion of finance supporting over € 600 billion of investment in projects that reduce emissions and help countries adapt to the impacts of climate change¹¹³,” making it one of the world’s largest multilateral providers of finance for projects supporting these objectives.” In 2019 then, the Bank declared a stop to financing fossil fuels from the end of 2021, thereby supporting its claim to be the EU’s climate bank.

¹¹² European Commission. European Commission.

¹¹³ European Investment Bank, “Climate Action.” EIB.org, “Climate Action”.

Further regulatory stability will be provided to the investment sector by the establishment of the proposed EU Taxonomy for Sustainable Activities (hereafter “EU Taxonomy”). It is the most advanced and granular framework for the inclusion and exclusion of projects depending on their environmental outcome. It provides a list of 67 economic activities with clear performance criteria for their contribution to six environmental objectives, including climate change, environmental protection and biodiversity. Technical screening criteria was set to determine “Substantial Contribution” to achieving green development and include intense safeguards through “Do No Significant Harm” to avoid violation of any other ecological aspects. In its first phase of implementation, the Taxonomy technical support document designs a two-step inclusion method (Figure 18), with which it first prioritizes the purpose-based screening that an investment must contribute substantially to address climate change, and then follows with context-detailed criteria to guide in-depth examination of how the investment does no significant harm to other environmental goals.

Figure 18: Inclusion and Do-no-significant harm (DNSH) process based on EU Taxonomy


Source: Based on EU Technical Expert Group on Sustainable Finance, “EU Taxonomy.”, 2019¹¹⁴.

5.2 Case studies for green urban finance in Europe

In this section, we look at two cases of green urban finance in Europe that can serve as a role model for international cooperation in the Belt and Road Initiative. The cases were selected based on their potential to be scaled-up to the context of cities of the Belt and Road Initiative. We therefore aimed to select cases that have relevance for both large and small scale applications.

5.2.1 Co-ownership Plans in Litoměřice (CZ) and Essen (DE)

Within its long-term transition to an ecologically sustainable and a climate-neutral economy, the EU sets a priority to secure the supply of clean, affordable and secure energy to all EU citizens and households. However, around 50 million¹¹⁵ people in the EU are currently affected by energy poverty, meaning they are not able to afford essential energy services. To this end, the ‘Renovation Wave’ is identified as a win-win solution to foster energy efficiency, promote green urban finance and ensure affordable energy to consumers affected by energy poverty. Furthermore, the EU is providing grants to cities and municipalities to tackle this complex challenge. The example below describes the financial model that two European cities, Litoměřice and Essen, are implementing to tackle energy via the H2020 grant. Energy poverty being a challenge in many countries of the BRI as well, the example may serve as inspiration for replication.

The city of Litoměřice lies at the junction of the rivers Elbe and Ohře in the northern part of the Czech Republic, approximately 64 km (40 mi) northwest of Prague. The town with about 26,000 inhabitants was one of the first Czech municipalities to introduce energy efficiency measures. Within the EU funded Horizon 2020 project

SCORE (Supporting Consumer Co-Ownership in Renewable Energies), Litoměřice set up a financing model for roof PV installations on residential and public buildings, with a total of 125 households benefitting from the electricity produced.

The financing scheme, the Consumer Stock Ownership Plan (CSOP) enables consumers, especially those without savings or access to capital credit, to acquire an ownership stake in a utility that supplies them and thus to become “prosumers”¹¹⁶. It is an investment model that puts consumers at the center, providing them with participation both financially and in decision-making. A CSOP is a highly flexible financing model and permits co-investments of municipalities, small and medium-sized enterprises and other local stakeholders, such as energy providers (see Figure 19). In Litoměřice, the municipality is an important part of the implemented model and provides part of the initial investment sum. To this end, the municipality will use parts of its established Energy Saving Fund to support energy related projects.

There are a few specific features to the CSOP that make it an attractive investment model to increase the share of renewable energies (RE) and to democratize the access to the financing market for private actors. Within a CSOP, the investments and voting rights of the consumers are pooled. The latter are represented by a trustee, who consults them and acts in their interest. The intermediary trustee ensures professionalism vis-à-vis the other co-investors and facilitates easier communication. In Litoměřice, the figure of the trustee is taken over by a representative of the tenants for each building. The pooling of individual investments and its matching with public funding or funding by other co-investors, makes it possible to access capital credit and reach significant investment sums. Investments by co-investors serve as leverage to scale up the investment and to receive bank loans. The projects therefore become profitable as production costs decrease.

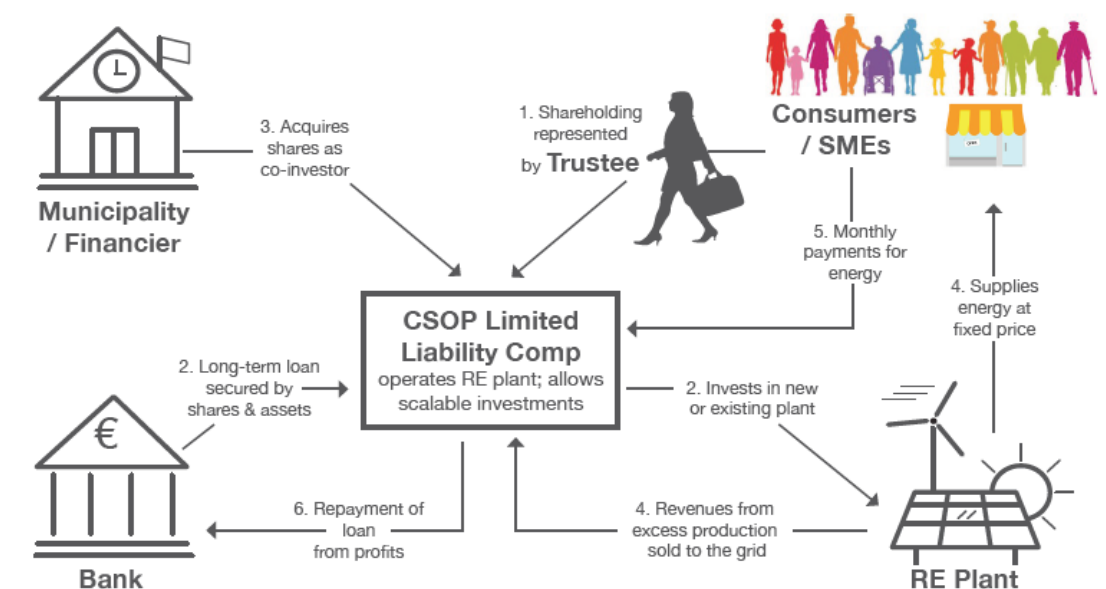
Once the RE plants installation is set up, it supplies the

consumer stakeholders with energy and sells all surplus production. The bank loan is repaid with revenues from the sale of surplus energy produced by the installation. After amortization, profits from the power plant are paid out to the shareholders as dividends. In Litoměřice this financing scheme is not only used to increase the share of Res, but also to involve atypical groups as investors of the energy transition. For example, low-income households are especially targeted to participate in the CSOP model with small monthly contributions of about 20 € while other households may invest 100 to 250 €. This way, the CSOP also contributes to alleviating energy poverty.

The city of Essen has identified two pilot areas where the CSOP financing method will play a key role in attracting private funding and increasing the share of renewable energy deployment. The Franz-Sales-Haus, a catholic institution supporting people with disabilities, consists of a small campus with over 40 buildings, with different load and consumption profiles. It envisaged building a renewable energy community with inhabitants and workers of the Franz-Sales-Haus becoming co-investors within the CSOP model. Moreover, the city of Essen is preparing a feasibility study, looking at the possibility of introducing the financing model in the district of Vogelheim. The district has a relatively high number of residents falling into the category of low-income households.

Figure 19: Consumer Stock Ownership Plan structure¹¹⁷

Consumer Stock Ownership Plan (CSOP): Financing structure & phasing



The Consumer Stock Ownership Plan is also being implemented in the city of Essen, Germany. Essen has a population of around half a million and is located in the northwest of Germany, an area characterized by industry and steel production. Becoming the European Green Capital in 2017, the city of Essen has begun its transition towards a sustainable city. Within SCORE, the city is also a beneficiary of the European funding line Horizon 2020.

Summary and scalability

In conclusion, the financing instrument at hand is not only highly qualified to attract private investment for the energy transition; it is also a tool to alleviate energy poverty and to enable participation of vulnerable consumers in the energy transition. For BRI countries and their cities, the CSOP therefore constitutes a major opportunity to

¹¹⁴ EU Technical Expert Group on Sustainable Finance, “EU Taxonomy.”

¹¹⁵ Eurostat, “European Union Statistics On Income and Living Conditions (EU-SILC)”.

¹¹⁶ Gauthier et al., “CSOP-Financing Introducing Consumer Stock Ownership Plans.”

¹¹⁷ Gauthier et al. Lowitzsch, “CSOP Financing”, H2020 SCORE website.

tackle both the lack of private investment for renewable energies and the challenge of energy poverty, which has been identified in several BRI countries and is best tackled on a local level. What is important to underline, is that acceptance for cooperative financing models such as the CSOP may differ from country to country according to historical developments and connotations of the term.

5.2.2 Paris Green Fund

Green funds, as a way to finance sustainable projects, have been established by several European cities, such as London, Paris and Hannover, Germany. This chapter explores one of them to give an understanding of how green funds are established, the kind of financing schemes that are in place and how they contribute to green urban financing. Since green funds can be established at the city level, they represent an opportunity to shape green infrastructure at the local level and could therefore be an interesting tool for larger cities of the BRI countries.

The city of Paris established its Green Fund in 2018, after preparatory work done in 2017. After having elaborated a first Climate and Energy Plan in 2007, and after having issued its first green bond in 2015 with an volume of € 300 million¹¹⁸, the city decided to commit itself to the promotion of green and sustainable financing by bringing to life the Paris Fonds Vert, the Paris Green Fund. It is to support the GHG emission reduction targets of the French capital: 50% reduction in 2030 and carbon-neutrality until 2050 which has been formulated in the renewed Climate Plan in 2018¹¹⁹. These ambitious targets required the mobilization of both public and private finance.

To this end, a law (Law n° 2017-257) was passed in 2017 that allowed the city of Paris to create a territorial investment fund. The fund is dedicated to financing innovative companies and their products and services, which can be used on a city-scale to enhance its sustainability. Eligibility criteria has been formulated for companies

which reflect the character of a green fund: SMEs may apply if their work is beneficial to the public interest, if they contribute to the acceleration of the ecological transition and if they are placed within the Parisian territory¹²⁰.

The funds given out by the Green Fund have both private and public origins: The city of Paris has invested a sum of € 15 million¹²¹. Furthermore, a number of institutional investors and a majority of private investors accumulated investments reaching a total of € 200 million funds¹²². The invested companies are all considered innovative, fast growing and profitable SMEs and receive a contribution of between € 5 million and € 15 million. Investments must represent a minority stake in the company's capital. The fund covers multiple sectors from buildings, mobility, energy, air, and waste to digital transformation. The first portfolio therefore targets about 15 to 20 investment lines with an investment period of 5 years. The first company to receive funding was Hesus, a cleantech company, with € 10 million of funding for innovative waste management solutions¹²³.

The Paris Fond Verts has received the TEEC label (Transition Énergique et Écologique pour le Climat) issued by the French Ministry of Ecology and Inclusive Transition¹²⁴ as a guarantee for the sustainability of financial products. The fund is managed by Demeter, an independent management company selected after a Call of Interest launched by the city.

Summary and scalability

Green funds are especially interesting for cities in BRI countries, as they represent a way to take over environmental responsibility and to provide catalytic finance to green projects and interventions. Some local gov-

ernments across the EU, and also globally, as seen with Toronto's Atmospheric Fund, have opted for this financing tool as it provides the means to combine urban development with climate targets by providing subsidies or low-cost financing for selected projects, often at an early stage. Since there is already a variety of existing green funds available across many countries and cities, transfer of best practices is facilitated. Local green funds also have the possibility to be scaled up or down, depending on the cities' size and resources. Therefore, it is possible to match an investment fund to the size of cities of the Belt and Road Initiative.

On the national level, South Africa has established a green fund to support the country's low-carbon transition including fiscal support for projects of sustainable transport, renewable energy and green buildings¹²⁵. Lessons learnt from setting up this investment fund will be important recommendations for future activities in the field and more importantly for municipalities actively involved in BRI.

5.3 Challenges for green urban finance in Europe

The EU, and with it the Member States and its municipalities, face a number of restraints to unlock the investment potential of green urban finance. While the achievement of energy efficiency targets, the reduction of GHG emissions and the promotion of sustainable transport are top priorities of the EU, several barriers exist hindering the facilitation of sustainable finance investment in the Member States.

For representatives of finance, building, industry and SME sectors as well as for municipalities, these constitute the main investment barriers:

- Lacking standardization among Member States, for example regarding buildings certification, energy performance or the sustainability of an economic activity, has led to a state of market fragmentation, making it costly and difficult for investors to under-

stand investment opportunities. This is where the EU Taxonomy comes into play.

- For municipalities and the cities one of the main challenges in triggering green urban finance starts with the complexity of accessing funds at the national and European level. Increasing access will contribute to maximizing the use of available public funding as leverage for private investment in green and sustainable projects.
- Local authorities in municipalities and cities often face the critical barrier of limited human resources and capacities for proper energy management and the development of 'bankable' sustainable projects and investment packages. Very often there is a missing link between the energy, mobility or building and the financial department as well as reluctance to invest in expertise and feasibility studies.
- Green investment still contains a large percentage of perceived risk for the private sector: De-risking green investment by making available real financial risks and benefits can contribute to scaling up necessary private finance. The De-risking Energy Efficiency Platform (DEEP) is an exemplary European initiative aimed at providing detailed analysis on the performance of energy efficiency investments to support the assessment of risks and benefits¹²⁶.
- For large investors, the project size can be a problem: Project aggregation can increase large scale projects and lead to the provision of packaged solutions for clients. The lack of experience with project bundling is also a significant barrier for municipalities, as transaction costs increase with several smaller projects. For project developers, municipalities, financiers or small and medium-sized enterprises, project development assistance can help to reduce this barrier.
- The lack of accessible data and advisory tools, such as one-stop shops for consumers and energy services, increases transaction costs for investors.

118 Paris.fr, "Investisseurs."

119 Mairie de Paris, "Plan Climat de Paris."

120 Mairie de Paris.

121 Mairie de Paris, "L'exposé de Motifs Paris Fonds Vert."

122 Mairie de Paris, Demeter, "Paris Fonds Vert: A Growth Fund for Sustainable Cities."

123 Dumas, "Avec Hesus, Paris Fonds Vert Investit Dans Sa Première Cleantech."

124 French Ministry of Ecology and Inclusive Transition, "Energy and Ecological Transition for the Climate Label."

125 Department: Environment, Forestry and Fisheries, Republic of South Africa, "Green Fund."

126 Fytrou-Moschopoulou, "De-Risking Energy Efficiency Platform (DEEP)." DEEP, "De-Risking Energy Efficiency Platform".

6 Green urban finance in the BRI

This chapter analyzes green urban finance developments in the BRI from two perspectives. The first perspective is about green finance for overseas direct investment (ODI), particularly from Chinese and multilateral investors. The second perspective is about green finance policies within BRI countries.

6.1 Green urban finance through overseas investments

Many BRI countries, as discussed in chapter 2.1 are emerging economies. They not only rely on foreign private investments to drive economic growth, but also investments from development finance institutions, such as multilateral or bilateral development banks. Particularly for Chinese overseas investment, however, the distinction between “private” capital and development capital is unclear, as for example China Development Bank does not necessarily follow international development finance standards (such as OECD DAC), while “private” financial institutions, such as ICBC are government owned.

So far, most BRI investments from China are derived from from these policy banks (China Exim Bank, China Development Bank) and selected state-owned banks (e.g. ICBC, Bank of China). The financing instruments used vary widely, from sovereign loans to project finance infrastructure infrastructure projects to more commercial loans to support local or Chinese engineering, procurement and construction companies (EPCs) in the development of infrastructure and also equity investments to take ownership or partial ownership in local assets. BRI countries and cities also benefit from a broad international investment community, both from private commercial institutions and different development finance institutions (e.g. EBRD, ADB, AIIB, IFC).

As there is no standard or harmonized way to measure green finance flows, measuring exactly how Chinese investors apply green finance in the BRI is difficult. As a milestone, ICBC issued its first multi-currency green BRI bond worth 2.2 billion USD in April 2019¹²⁷, after issuing

its first 2 billion USD multi-currency climate bond for the BRI on the Luxembourg Stock Exchange in 2017¹²⁸.

To finance development in the BRI countries, a plethora of financial instruments are applied. They include sovereign loans, debt financing, equity financing, guarantees, swaps, grants and capacity building.

The following chapters will elaborate on policies and initiatives that influence green overseas investments into the BRI.

6.1.1 Green Finance Initiatives in the BRI

6.1.1.1 Green BRI regulation emerging from China

The BRI has several guidelines that support green development. As there exists no ministry or international governance system that would be able to set rules and enforce them along the BRI, the implementation of and adherence to guidelines is voluntary. Important guidelines that affect green urban finance in the BRI include:

- Joint Communiqué of the Second Belt and Road Forum (BRF), April 2019. The document stresses the importance of green development and the necessity of protecting the climate and the environment and adhere to the Paris Accord.
- Green Investment Principles (GIP) for Belt and Road, signed by 26 financial institutions involved in the BRI, April 2019. The Principles emphasize the need for financial institutions to evaluate and incorporate environmental risks in their decision making and be transparent about activities.
- Guidance on Promoting Green Belt and Road, May 2017. The document published by the Ministry of Environmental Protection (now MEE) elaborates on the need to build an ecological civilization that includes international cooperation, efficient use of resources and the promotion of green transport.

On a legal and enforceable basis, China's BRI invest-

ments adhere to the host-country principle. That means that currently Chinese investors and EPCs are liable only for following local laws and regulations, while a failure to adhere to international standards is without consequences.

6.1.1.2 Green Investment Principles of the Belt and Road Initiative

The Green Investment Principles of the Belt and Road Initiative were developed by the Green Finance Committee of China Society for Finance and the Banking and the City of London Green Finance Initiative and published at the end of 2018. During the 2019 Belt and Road Forum 27 Chinese and international financial institutions signed the seven principles that aim to “ensure that environmental friendliness, climate resilience, and social inclusiveness are built into new investment projects in the Belt and Road, so that the goals of the United Nations 2030 Agenda for Sustainable Development and the Paris Agreement are met, and all countries in the region build a shared future for common prosperity”. The 7 principles are:

1. Embedding sustainability into corporate governance
2. Understanding environmental, social and governance risks
3. Disclosing environmental information
4. Enhancing communication with stakeholders
5. Utilizing green financial instruments
5. Adopting green supply chain management
7. Building capacity through collective action

The Green Investment Principles have no binding power and are at this time less ambitious than the similar Equator Principles with over 100 financial signatories (however, as of March 2020, no relevant Chinese financial institution with international project finance activity have signed up for the Equator Principles)¹²⁹.

6.1.1.3 Belt and Road Initiative Green Coalition (BRIGC)

The BRI International Green Development Coalition (BRIGC) of the Ministry of Ecology and Environment was launched after the second Belt and Road Forum in April 2019 with 10 working groups:

- Biodiversity and Ecosystem Management
- Renewable Energy and Energy Efficiency
- Green Finance and Investment
- Improvement of Environmental Quality and Green Cities
- South-South Environmental Cooperation and Capacity towards the SDGs
- Green Technology Innovation and CSR
- Environmental Information Sharing and Big Data
- Sustainable Transportation
- Global Climate Change Governance and Green Transformation
- Environmental laws, regulations and standards

Within the coalition, Chinese and international partners have organized themselves to provide guidelines and research on greening the Belt and Road Initiative.

The Green Finance and Investment group, for example, is led by Tsinghua University and the World Resources Institute (WRI) with a number of organizations supporting the work (e.g. International Institute of Green Finance, Client Earth, Oxford University). One of the tasks that was given to the BRIGC's green finance and investment group in January 2020 was to develop a green development guidance, also known as the “Green Light” System. The explicit goal is “to provide guidance on the assessment and classification of BRI projects from the perspective of preventing ecological and environmental risks, in order to support decision making on green development¹³⁰”.

127 Xinhua, “ICBC Issues First Green BRI Inter-Bank Regular Cooperation Bonds - Xinhua | English.News.Cn.”

128 Luxembourg Stock Exchange, “ICBC Lists Its Inaugural Belt and Road Climate Bond in Luxembourg.”

129 Equator Principles Association and International Finance Corporation, “Equator Principles July 2020.” publisher: International Finance Corporation (IFC)

130 Secretariat of BRI International Green Development Coalition and BRIGC, “Joint Research on Green Development Guidance for Belt and Road Initiative (BRI) Projects Was Launched.”

The first baseline study of the Green Light System was introduced in April 2020 to the international and Chinese partners and next steps are taken how to implement this system into investment decisions from a policy perspective.

6.1.2 Green Finance in the BRI in Practice

A number of finance institutions from Europe and China have emerged as providers of green and sustainable finance in the BRI. Among them are several Chinese banks, the European Bank for Reconstruction and Development (EBRD) and the Asian Infrastructure and Investment Bank (AIIB).

6.1.2.1 China’s policy banks and commercial banks engaged in the BRI

China’s development and policy banks are China Development Bank (CDB) and China Export Import Bank (China Exim Bank). While CDB is engaged both in China and in the BRI, China Exim Bank is mostly providing finance for overseas expansion of China’s economic interests. In addition, the Agricultural Development Bank of China, the Bank of China, China Construction Bank and the Industrial Commercial Bank of China (ICBC) as some of the largest “private” banks in the world are also involved in BRI investments coming from China.

Particularly the development banks, but also ICBC, have developed frameworks to improve green finance internationally. The CDB applies a review process to categorize environmental impacts of projects into four categories according to national and if applicable regional policies: environmentally friendly, compliant, requiring rectification and high risk¹³¹. The Export-Import Bank of China has set up a special department at its head office to provide low-carbon transition support for foreign governments and international institutions. As of November 2019, they set up a preliminary structure of new-energy lending for energy saving and environmental protection¹³².

131 China Development Bank and United Nations Development Programme, “Harmonizing Investment and Financing Standards towards Sustainable Development along the Belt and Road.”
132 China Development Bank and United Nations Development Programme.

Furthermore, the China Export-Import Bank (EximBank) signed a memorandum with the World Bank Group’s International Finance Corporation (IFC) to jointly support environmentally and socially sustainable Chinese investments in emerging markets. This memorandum targets the shortfall of China’s green finance system that is partly not applicable to overseas investment.

The Chinese ICBC also has installed a “green credit veto” system. Under this system, no loans should be issued to borrowers or projects that do not pass an environmental impact test to “ensure compliance, integrity and legitimacy in terms of energy saving and environmental protection¹³³.”

6.1.2.2 European Bank for Reconstruction and Development (EBRD)

The European Bank for Reconstruction and Development is a multilateral development bank with its headquarters in London, UK. The EBRD is works in about 40 countries in South-Eastern Europe, Central Europe and Baltic States, Eastern Europe and the Caucasus, Central Asia Southern and Eastern Mediterranean as well as in Russia and Turkey. Almost all the countries, EBRD works in are countries of the Belt and Road Initiative.

The EBRD is a leader in sustainable finance and is “committed to promoting environmentally sound and sustainable development’ in the full range of its investment and technical cooperation activities¹³⁴.” It works on environmental investments in urban areas, for example:

- Green buildings and mortgage financing in North Macedonia¹³⁵
- Green public transport in Sarajevo, Serbia¹³⁶
 - Green commerce in Ukraine¹³⁷

133 ICBC, “ICBC Drives Green Growth with Nearly 1,000 Billion Financing — Home — ICBC China.”
134 European Bank for Reconstruction and Development (EBRD), “Environmental and Social Policy.”
135 European Bank for Reconstruction and Development (EBRD), “EBRD to Boost Green Buildings and Mortgage Finance in North Macedonia.”
136 Reiserer, “EBRD Green Cities to Transform Public Transport in Sarajevo.”
137 Ahlemeyer, “EBRD, EU and GEF Help Novus’ Supermarkets to Invest in Energy Savings.”

EBRD also launched the EBRD Green Cities initiative with clear methodologies on how to measure the “greenness” of a city¹³⁸ (see Figure 20).

Figure 20: Excerpt of EBRD Green City Traffic Light System (Source: EBRD)¹³⁹

Pressure indicators							
Sector	Source of pressure	Indicator	Unit	Benchmarks			Source
	Energy efficiency and type of energy used	10 Average age of car fleet (total and by type)	years	< 6	6–12	> 12	IADB
		10.1 Percentage of diesel cars in total vehicle fleet	%	< 20	20–30	> 30	EEA
		10.2 Fuel standards for light passenger and commercial vehicles	n.a.	EURO 6	EURO 5	EURO 4 or below	OECD/ICLEI
		10.3 Share of total passenger car fleet run by electric, hybrid fuel cell, Liquefied Petroleum Gas (LPG) and Compressed Natural Gas (CNG) energy (total and by type)	%	> 3	1–3	< 1	EEA
Transport	Choice of transport mode	11 Transport modal share in commuting (cars, motorcycles, taxi, bus, metro, tram, bicycle, pedestrian)	%	Private transport < 30%	Private transport = 30–50%	Private transport > 50%	OECD/ICLEI
		11.1 Transport modal share in total trips	%	Private transport < 30%	Private transport = 30–50%	Private transport > 50%	OECD/ICLEI
		11.2 Motorisation rate (number of cars per resident)	Number of vehicles per capita	< 0.3	0.3–0.4	> 0.4	IADB
		11.3 Average number of vehicles (cars and motorbikes) per household	Number of vehicles per household	< 0.5	0.5–1	> 1	OECD/ICLEI
		11.4 Kilometres of road dedicated exclusively to public transit per 100,000 population	km	> 40	10–40	< 10	IADB
		11.5 Kilometres of bicycle path per 100,000 population	km	> 25	15–25	< 15	IADB
		11.6 Share of population having access to public transport within 15 minutes by foot	%	> 80	60–80	< 80	OECD/ICLEI
		11.7 Frequency of bus service	Average number of passengers at station per hour, in total bus network	> 30	30–6	< 6	OECD/ICLEI

138 European Bank for Reconstruction and Development (EBRD), “EBRD Green Cities - Green City Action Plan Methodology.”
139 European Bank for Reconstruction and Development (EBRD).
140 European Bank for Reconstruction and Development (EBRD), “The EBRD and the Belt and Road Initiative (BRI).”
141 Chakrabarti, “For Quality Investment across Continents - Opinion - Chinadaily.Com.Cn.”

EBRD also supports project facilities to prepare projects since 2014 with EUR 40 million¹⁴² to support the development of projects before they can be fully invested in.

6.1.2.3 Asia Infrastructure and Investment Bank (AIIB)

The Asia Infrastructure and Investment Bank (AIIB) is the multilateral development bank with its headquarters in Beijing, China, that aims to support many countries along the Belt and Road Initiative through infrastructure investments that support urban transport and the fourth industrial revolution. Among these investments, are also urban infrastructure investments, such as the Bus Rapid Transit (BRT) project in Karachi, Pakistan, the bypass road in Batumi, Georgia, or the fiber optic communications network in Cambodia¹⁴³.

In order to accelerate green investments, the AIIB issued the Directive on Environmental and Social Framework in February 2016 (amended in February 2019)¹⁴⁴. Its focus is on:

- Reducing environmental and social risks
- Ensuring environmental and social soundness and sustainability
- Supporting integration of environmental and social aspects in decision-making
- Providing mechanism for addressing environmental and social risks and impact along the project cycle

The AIIB also approved a special fund for project preparation that provides grants to support and facilitate the preparation of projects to be financed by AIIB. As of March 2020, USD 11.31 million was approved for 9 projects¹⁴⁵.

142 European Bank for Reconstruction and Development (EBRD), "The EBRD's Infrastructure Project Preparation Facility (IPPF)."
143 Asian Infrastructure and Investment Bank (AIIB), "Approved Projects Overview - AIIB."
144 Asian Infrastructure and Investment Bank (AIIB), "Environmental and Social Framework."
145 Asian Infrastructure and Investment Bank (AIIB), "Introduction - Project Preparation Special Fund - AIIB."

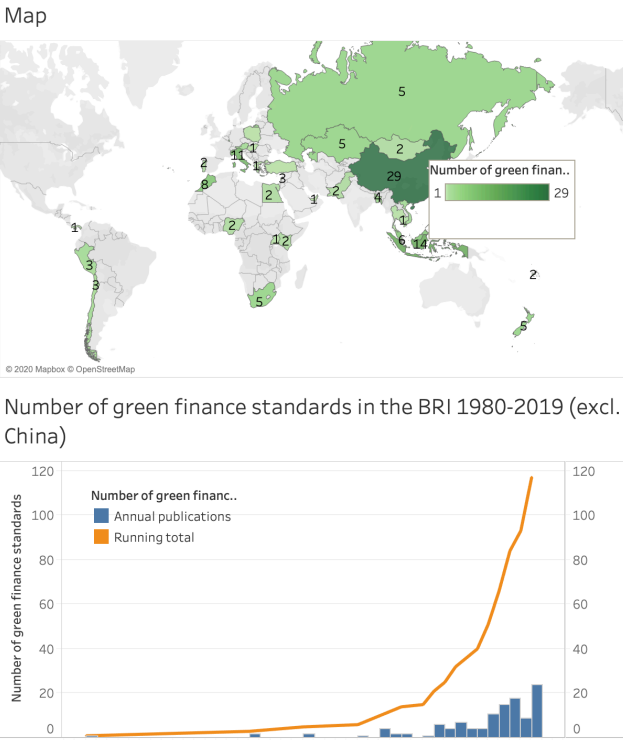
6.2 Green urban finance in BRI countries

Green finance is playing an ever-increasing role within the countries of the BRI, as seen by the number of green finance policies and green bond issuances.

6.2.1.1 Green finance policies within the BRI countries

Since its inception in 2013, the number of government-issued codes for green finance in BRI countries has grown from 36 to 117 in 2019¹⁴⁶. By 2019, more than 30 countries in the BRI have issued at least one green finance regulation, e.g. in regard to issuance of green finance instruments, reporting or use of proceeds. The leading country in regard to green finance regulations and instruments in the BRI is China, having issued about 30 guidelines over the past years.

Figure 21: Green finance development in the BRI (Source: own depiction; Data: Green Finance Platform)¹⁴⁷

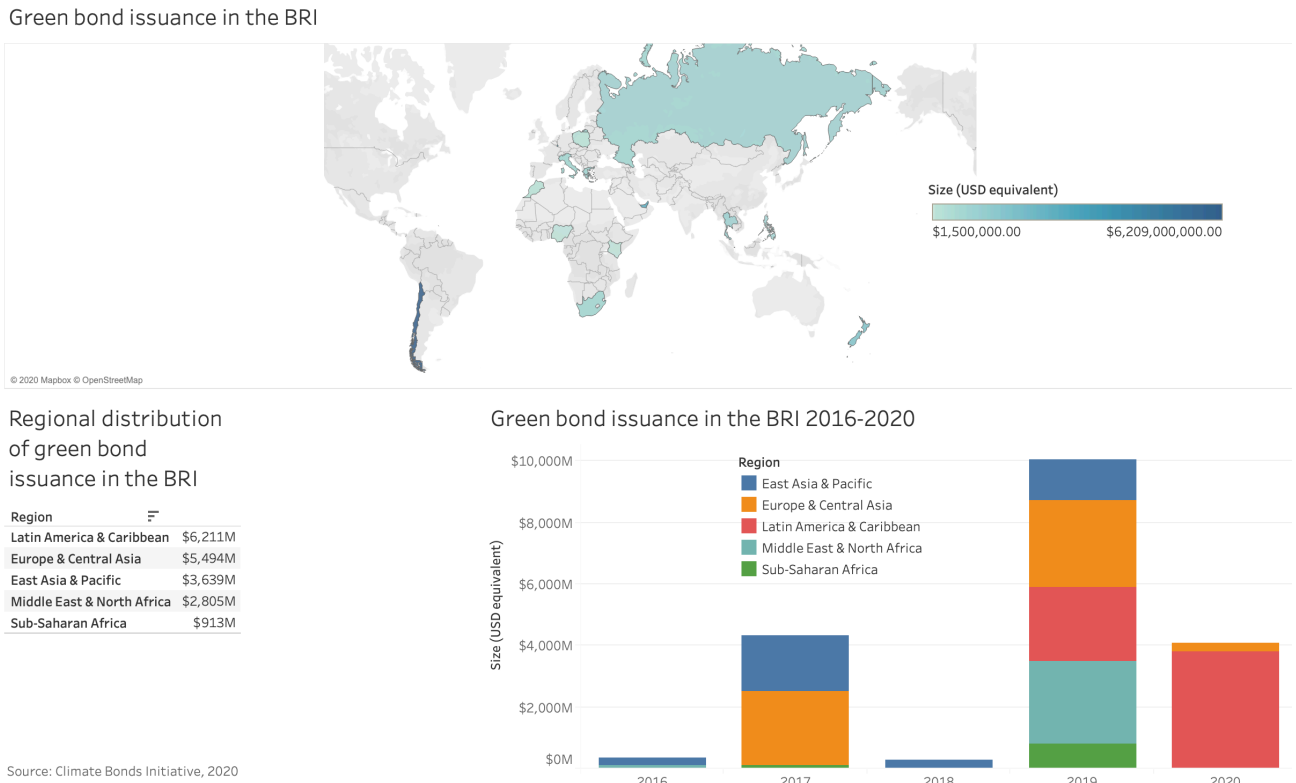


146 Green Finance Platform, "Browse Policies and Regulations."
147 Green Finance Platform.

6.2.1.2 Green bond issuances within the BRI

With the growth of green financial instruments, the number of green finance deals has also been increasing in the BRI. Over the past couple of years, green bond issuances have grown to 10 billion dollars (as of 2019). Particularly issuers from Chile in Latin America have taken to the capital markets to raise green bonds, closely followed by issuers from European BRI countries (e.g. Italy, Poland) (see Figure 22)¹⁴⁸.

Figure 22: Green bond issuance in the BRI (ex China, until March 2020) (Source: own depiction, Data: CBI)



When comparing the green bond market with the global green bond market developments, BRI countries (excluding China) accounted for about 20% of global green bond issuances. Similarly, BRI countries also accounted for 30% of global green finance regulations issued in 2019.

148 Climate Bonds Initiative, "Certified Bonds."

The use of green bonds, according to the prospects, is mostly for green transport, green buildings, as well as for solar and water infrastructure, while particularly in the Southern BRI countries important issuers tend to be sovereign issuers (such as in the case of Chile).

6.3 The gap and challenges of green finance in the BRI

Green urban finance in the BRI and countries investing in the BRI, such as China and European countries, is gaining momentum with stakeholders from regulators, financial institutions and non-governmental organiza-

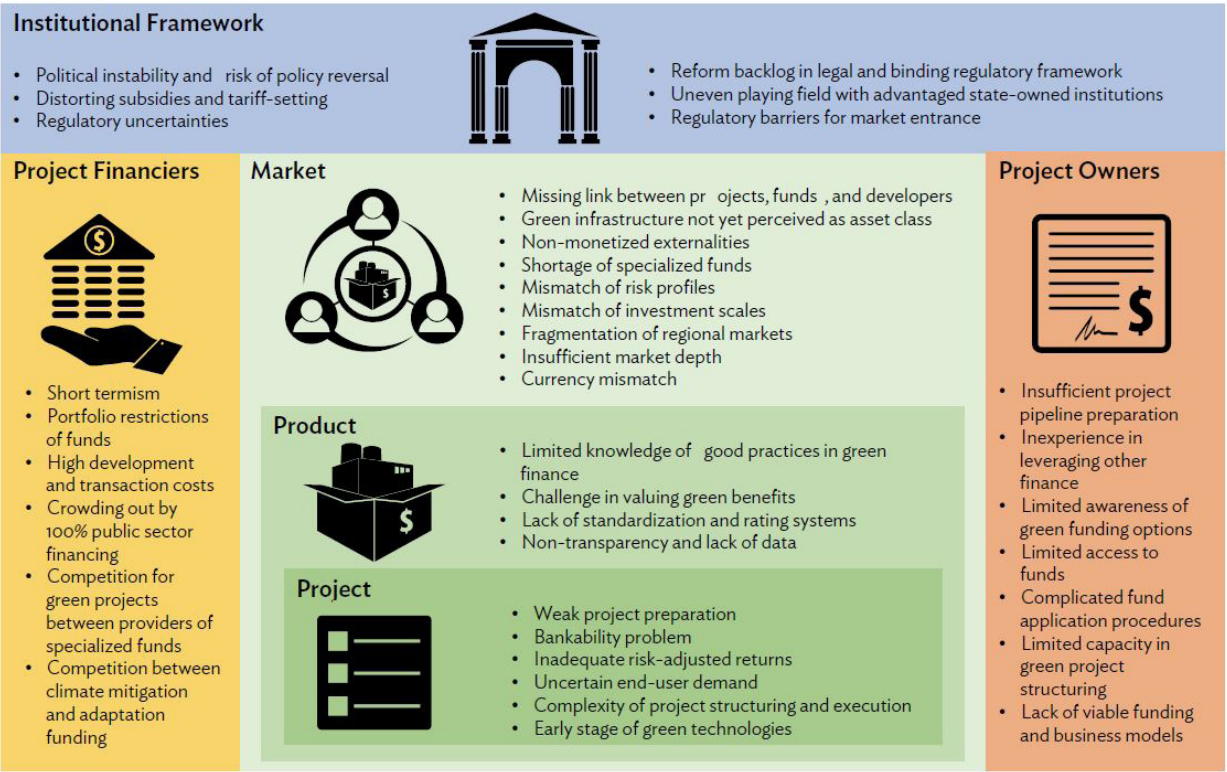
are currently still able to sufficiently issue green finance instruments in most BRI countries. While some international private investors have tried to deal with this problem by issuing green BRI bonds (e.g. the Chinese ICBC in April 2019 issued its first green BRI bond worth approximately 2.2 billion USD in Singapore¹⁴⁹), green finance in practice in the BRI countries has more potential to develop.

While the current status of urban finance in the BRI is both insufficient in terms of providing sufficient liquidity and providing capacity to focus on green development, several initiatives (such as the BRIGC) are enabling investors, developers and local authorities to learn how to

apply green urban finance and ideally scale it to other cities and sectors as well. The capacities that particularly development finance institutions are applying, should be harnessed more to provide local capacity, while “green” regulatory processes (e.g. for project planning and approval) in both the host country and the investor country should help steer finance into green projects.

Yet, challenges for green urban finance that are relevant for Europe and China, are equally if not more relevant in the BRI. Figure 23 illustrates major categories of constraints for green finance that are relevant in Europe, China and the BRI.

Figure 23: Green Finance Challenges and Constraints¹⁵⁰



In summary, the challenges are:

- Insufficient Institutional Framework, such as political instability and the risk of policy reversals (e.g. for subsidies);
- Insufficient project financiers with short-term financial goals compared to long-term investment needs and high transaction cost;
- Insufficient markets with missing links between projects, funds and developers;
- Insufficient product developers with lacking knowledge of good practices in green finance;
- Insufficient project development capacity and project bankability;
- Insufficient capacity of project owners, for example for applying leveraged or blended finance.

In addition to green finance market challenges, there are particular challenges that cities are facing:

- Development finance institutions are often working with national governments and not with cities. This makes the connection between the cities and the development finance institutions more difficult;
- Cities and national governments often speak “different” technical languages, making communication more difficult (e.g. many cities don’t have sufficient capacity; regarding environmental and green development). At the same time, cities only have a limited budget for consultants to prepare green projects in accordance with national or even international requirements;
- City governments are often elected (or appointed) for a period of 3-5 years, while green investments in urban infrastructure have a longer pay-off time and thus would have a different success period;
- Different time horizons from different investors requires particular financial structuring skills and good treasury management skills to structure financing according to financing availability, risks and returns.

While many of the challenges in regard to green urban finance that are relevant in China and Europe are also relevant in the BRI, additional challenges for green urban finance need to be dealt with in many of the BRI countries. These risks are more pronounced in smaller BRI countries, but are applicable to most emerging economies in the BRI:

- BRI countries often have less developed financial markets to raise green funds through the capital markets. This is particularly true for smaller BRI countries;
- BRI countries often have lower capacity to support technical reporting on green indicators relevant for green investors (e.g. environmental outcomes such as emissions);
- BRI countries often have insufficient tax base for the public financing of larger green infrastructure projects (e.g. public urban transport);
- Several BRI countries are already struggling to service current debt making further fund raising for green projects particularly challenging¹⁵¹;
- BRI countries often have insufficient planning and appraisal capacity to deal with the complexities of green urban planning for transport, urbanization and industry 4.0.¹⁵²;
- There are high currency risks for many BRI countries making investment in local currencies often difficult for investors, while raising funds in international currencies risk that issuers/borrowers (either governments or private institutions) are exposed to currency risks.

Insufficient liquidity in the secondary market to increase investment potential into green projects or de-risking of investor portfolios.

149 Xinhua, “ICBC Issues First Green BRI Inter-Bank Regular Cooperation Bonds - Xinhua | English.News.Cn.”

150 Asian Development Bank (ADB), “Catalyzing Green Finance.”

151 Bandiera and Tsiropoulos, “A Framework to Assess Debt Sustainability and Financial Risks under the Belt and Road Initiative”; Chen, “Ethiopia and Kenya Are Struggling to Manage Debt for Their Chinese-Built Railways.”

152 Kress and Deacon, “Belt and Road Initiative & Industry 4.0”; Nedopil Wang, “Belt and Road Initiative & Sustainable Transport”; Kraubitz, “Belt and Road Initiative & Sustainable Urbanization.”

7 Recommendations to unlock green urban finance for the BRI through Sino-European cooperation

Urbanization is set to continue with more people moving to cities particularly in the fast-emerging countries of the BRI. Yet, building green (and livable) cities to accommodate more people is by no means guaranteed. Rather, the current development path and the current flow of investment often seems to exacerbate existing problems of pollution, emissions, and further loss of biodiversity. In the short term, this might ensure economic growth. But in the medium and long-term, this development path puts predictably high risk on people and economies due to extreme weathers, climate change and other environmental impacts.

Yet, while sustainable and green city development has been on the political agenda for decades, a number of barriers have made sustainable development actions piecemeal rather than the norm.

In this paper, we particularly look at the possibility to use “green finance” as a tool to invest in green urban development such as for green transport, green urbanization and industry 4.0. Yet, finance is but one tool of a broad toolbox that societies should use to build green cities.

As such, societies in Europe and China over the past years have been using “green finance” tools to steer investments into green urban development. While both regions are still experimenting and learning how to be much more comprehensive in their green finance approaches, many experiences are pointing in the right direction and can be scaled up – at home, and in the emerging cities of the BRI.

The following 11 recommendations should help decision-makers in cities, decision-makers in finance and decision-makers on other political levels to address one of the biggest challenges of green urban development: how to finance them. They address the main challenges of availability of funding for green urban projects, steering of funding into the right projects and transparency to avoid green washing. They are targeted at both private and public financial institutions, as well as regulators.

7.1 Provide Green Urban Project Preparation Facilities

Expand existing green urban project preparation facilities, such as the ones by ADB, AIIB, EBRD to boost finance into innovative solutions in BRI cities. Differentiated facilities should be set up for different sectors, e.g. green industry 4.0, green transport, green urbanization. The facilities should mobilize money from public investors (e.g. national and international development finance institutions) in the BRI countries as well as private investors in the respective countries, for example through private equity participation. The facilities should invest in green early stage projects with the potential to be transformative and that currently lack the data or bankability to attract later-stage and bigger investments of larger financial institutions.

The management of the facility should be given to an experienced fund management company. The facility should also provide grants for capacity building.

7.2 Harmonize Green Finance Standards

As Chinese and Western standards of green finance (e.g. green bond frameworks) continue to differ and as one global standard of green finance is unlikely to emerge, harmonization of standards should be the goal. Harmonization would mean to build a “rosetta stone” tool to align and compare existing standards for investors¹⁵³. A harmonized green finance standard will have three advantages:

1. It allows investors to pool money more easily as access to international capital markets is harmonized with lower transaction and control cost;
2. It will allow investors to invest in countries with lower local environmental legal standards as project owners need to report according to harmonized standards;

¹⁵³ European Investment Bank (EIB) and Green Finance Committee of China Society for Finance and Banking, “The Need for A Common Language in Green Finance.”

3. It will provide a green project finance eligibility list (e.g. similar to the Chinese green bond catalogue) that allows easier selection of projects for project developers.

Alternatively, in response to international climate finance requirements, a special BRI green finance sub-framework could be established.

7.3 Improve capacity of integrated planning for green urban development to lower financing cost

In order to overcome shortages of local project planning capacity, e.g. for integrated transport planning, integrated energy planning etc., the Sino-European cooperation should improve coordination and cooperation for capacity building activities in BRI cities. It should support BRI cities’ different agencies to improve their integrated urban planning capacity.

One framework could be that the capacity building is implemented by existing bilateral and multilateral institutions (e.g. GIZ, DFID, CIDCA, IFC). They could provide a standardized capacity building program, as many of these institutions have established a strong presence in many BRI countries. Yet, in order for these institutions to contribute within the framework of Sino-European cooperation, a challenge that needs to be overcome is the lack of a common funding mechanism for capacity building¹⁵⁴. A potentially good and scalable example is the Sino-German Center for Sustainable Development¹⁵⁵ which is concerned with “jointly putting into practice the strengths of official development assistant, south-south cooperation and business involvement for sustainable development worldwide” between China and Germany.

Another possibility is to give local institutions better capacity framework by inviting them to train-the-trainer programs at different training facilities (e.g. in Beijing,

¹⁵⁴ In addition, many bilateral cooperation institutions, such as GIZ or DFID also have administrative hurdles to work for funding other than their home-countries’.

¹⁵⁵ GIZ, “Sino-German Center for Sustainable Development – Sino-German Center for Sustainable Development.”

Brussels) with the clear mandate to install local capacity building programs.

7.4 Build a Sino-European green city fund

To accelerate global investments into green urban development, a Sino-European green city fund should be set up. This fund should pool private and public money, provide tradeable securities and localized expertise (see Figure 24). A role model could be the Green Climate Fund (GCF) or the Shandong Green Development Fund (see case study in chapter 3.2.1.1).

Appreciated the connection to the SGDF, still it is risky as SGDF is just starting to work only in Shandong Province.

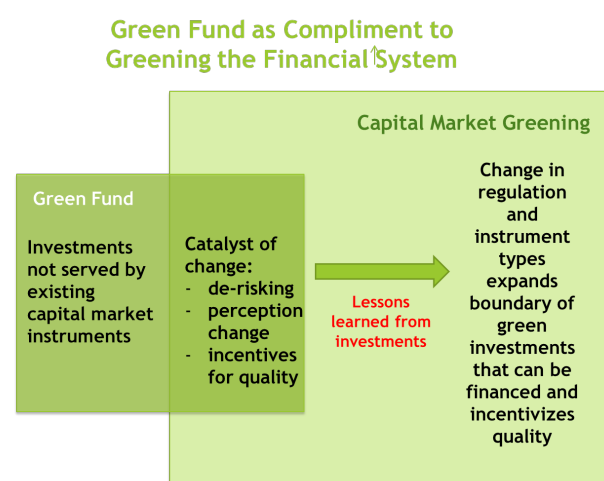
The green fund should take over the work of scoping, evaluating, managing and reporting on projects for larger financial institutions by having local representation and offices, while minimizing transaction costs for the involved investors. Furthermore, the fund should make sure that projects are implemented under consideration of social goals (e.g. local employment) and through international cooperation.

The Fund can act as catalyst for existing institutions to move into the space by de-risking and changing perceptions of risks. The Fund can also address investments that are not currently able to be funded by existing institutions, as well as pilot approaches that can provide the basis for regulatory reforms.

The fund would therefore have two major advantages:

- Private funders, who have short-term return goals and are not interested in investing in projects with only long-term return, could invest in the fund due to the trade-ability of its securities;
- Multilateral development banks and big financial institutions, who are not interested in small-scale projects due to the high transaction cost, could invest in the fund due to the localized expertise of the fund.

Figure 23: Green Fund as Compliment to Greening the Financial System¹⁵⁶



7.5 Increase use of Blended finance

To allow the funding of green urban projects that have low or even negative returns and the inclusion of inclusion of private capital, the Sino-European cooperation should increase the use of blended finance (see Figure 13) under agreed and standardized terms.

This could be done within the Sino-European Green Fund (see above) or within existing development finance institutions (e.g. AIIB, EIB). Existing financial institutions should be given a clear mandate by their boards through the representation of the board directors from EU and China. This would allow and encourage these banks to use specific tranches of finance for concessionary financing and/or grants if the projects that they are investing in are contributing to transformative green urban development. These tranches of money should be used in conjunction with private capital to actually increase the application of blended finance.

7.6 Establish open platform for green urban projects

To overcome the problem of a shortage of a steady project pipeline, an open platform for green urban projects should be established for cities to share their development ideas and for investors to be able to quickly scope possible investments and contributions. A possible role model could be the SDG Impact platform by UNDP.

The two prerequisites for its success is that a) the platform must be built together with cities and investors (rather than by technical development institutions) in order to ensure actual needs of the relevant stakeholders are met, and b) that the platform is promoted broadly to actually get both investors and cities on board and have an active participation.

7.7 Apply digital technologies for MRV

To overcome the problem of measurability of environmental (and social) impacts of investments, digital technologies should be more broadly applied for monitoring, reporting and validation (MRV). This could include the use of better sensing technologies for the monitoring of emissions, big data for the monitoring of the uptake of technologies and infrastructure (e.g. user numbers of public transport at different stops, routes).

A prerequisite for a broadly applicable MRV platform is monitoring and reporting standards (the establishment of reporting standards continues to be a legal and partly technical challenge). However, while the elaborate agreements on reporting might not (yet) be in place, monitoring and reporting of raw data can nevertheless help to find consensus on standards and the possible identification of pathways for the reduction of environmental harm.

7.8 Establish better platform for MRV data sharing

To increase transparency of environmental (and social) impacts to a broader and concerned public, the collected data should be shared and made public as widely as possible. This would provide improvements in research and for urban planning – which in turn improves targeted investment impacts.

Good examples of global data sharing include the Global Biodiversity Information Facility (GBIF) or the Environmental Data Initiative (formerly known as LTER Network Information System Data Portal)

A prerequisite for data collection must be at minimum localized, yet better an internationally agreed framework of data privacy and protection.

7.9 Create and apply standards for reporting

To further increase transparency and comparability of reporting on environmental impacts and outcomes of investments, standards for environmental-related financial reporting are a prerequisite. Investors and project developers in BRI cities should at minimum apply existing standards:

- Taskforce for climate-related financial reporting (TCFD)¹⁵⁷, which has provided a globally standardized and accepted reporting tool for climate-related impacts of financial investments
- Global Reporting Initiative's framework on reporting that also includes some social aspects of projects¹⁵⁸

However, currently no sufficient financial reporting mechanisms on the impacts on biodiversity exists. This could be developed in cooperation between the EU and China, together with global NGOs.

For all Sino-EU cooperation projects, at least existing global reporting standards should be applied.

7.10 Provide open learning platform for best practice exchanges of policy and project design and implementation

To increase learning and information sharing between BRI cities, a BRI green city platform should be supported by EU and China (e.g. within the BRIGC) providing updates on projects, lessons learnt of policies and a possibility for exchange between cities of the BRI in regard to their green projects. The Platform should have different sections for different stakeholders (e.g. project developers, policy makers, investors) to learn and exchange knowledge. It should be available not only in different languages but should use AI to provide automatic translation of information in local languages to avoid unnecessary language barriers while accessing information from different countries.

This platform thus accelerates sharing of knowledge and therefore reduces the learning cost of different cities and investors, while improving impacts of investments.

7.11 Improve green investment incentives in China and the EU for green overseas investment in BRI cities

To accelerate green investments and reduce brown investments in BRI cities, Chinese regulators (e.g. CBIRC, MEE, MoFCOM, MoF), European regulators (e.g. ECB) as well as relevant other semi-regulatory institutions (e.g. OECD) should provide better financial incentives.

A good framework might be the Traffic Light System that the BRIGC is proposing. It will provide a clear framework for aligned and non-aligned projects, as well as further administrative incentives for green-minded investors. The EU should support this initiative and provide aligned incentives for its overseas investors.

The governments should further explore “feebates” and other incentives for revenue-neutral low-carbon finance. Feebates are fees paid by actors engaging in high-car-

¹⁵⁶ Jenny and Asian Development Bank (ADB), “Shandong Green Development Fund (SDGF).”

¹⁵⁷ Task Force on Climate-Related Financial Disclosures (TCFD), “Recommendations of the Task Force on Climate-Related Financial Disclosure.”

¹⁵⁸ GRI Index, “Global Reporting Initiative (GRI) Index.”

bon activities to those engaging in low-carbon activities. Feebates work best in sectors where revenue collection or other administrative mechanisms already exist to enable implementation by cities or provincial authorities. A commonly cited example of feebates relates to vehicle fuel efficiency: City governments collect an annual or one-time fee from owners of high-emissions vehicles and pay a rebate to those who buy cleaner vehicles and thus support both the reduction of high-polluting vehicles and the promotion of low-carbon transport. The advantage of feebates is that they are revenue neutral for governments and that payments scale down automatically as the technology in question becomes widespread¹⁵⁹.

The establishment of an effective international carbon market in line with Article 6 of the Paris Climate Accord should be a further goal. Establishing a carbon taxation mechanism can simultaneously increase the government funding available for addressing particularly low-carbon development and increase the investment cost for non-aligned projects. The international carbon market will further increase incentives for cities to develop in a low-carbon fashion as it would allow them to sell carbon-credits internationally.

159 GIZ - German cooperation, "Climate Finance for Low-Carbon Urban Infrastructure in China."

8 Conclusion

The application of green urban finance instruments and the development of accompanying policies to invest in green transport, green urbanization and green industrialization has been developing significantly in Europe, in China and in the BRI countries.

In this paper, we analyzed these developments from different perspectives to draw conclusions on how to accelerate green urban finance in a cooperative and inclusive way for BRI cities. We looked at China's green (urban) finance development and how China has developed its public finance, commercial finance and mixed finance to allow for rapid urbanization over the past decades – possibly the greatest migration from rural to urban areas in human history. This development brought rapid economic growth, but also massive environmental pains, such as pollution of air, water and soils and GHG emissions. In its next chapter of "high-quality" and green growth, China is pushing green investments for greener city development. It is applying a mix of fiscal, regulatory and monetary policies to move to a low-carbon and low-polluting development. We used remove case studies to highlight that development – the Shandong Green Development Fund as an international cooperation example and the Shenzhen International Low Carbon City.

We also looked at European green urbanization. Compared to Chinese cities which are newly built, much of Europe's urban infrastructure is older and requires updating. Over the past years, an ambitious green agenda has been promoted – with highlights in 2018 with the Long Term Strategy titles "A Clean Planet for all," formulates the goal of "achieving net-zero greenhouse gas emissions by 2050." In 2019, the European Commission pushed the "Green New Deal" which further outlined the ambition to build an innovative green Europe, which was supported by the publication of the ambitious and comprehensive EU Taxonomy on green finance in 2020. With the nCovid-19 pandemic, Europe is evaluating how use the stimulus to further accelerate a net-zero greenhouse gas emission economy (e.g. move the 2030 target from minus 40% to minus 55%)¹⁶⁰. European cities are also moving on with individualized programs to accel-

160 Reuters, "EU Presses on with Tighter 2030 Climate Target despite Pandemic."

ate green finance for green urban development. In this paper, we analyze three case studies from Czech Republic, Germany and France.

Green finance also plays an increasingly important role in the BRI cities. Over the past years, 30 BRI countries have published green finance codes and regulation, while China is offering a number of initiatives to accelerate green finance in the BRI. Among the most important initiatives are the Green Investment Principles, the Belt and Road Initiative Green Coalition (BRIGC) and its Green Light System for the Evaluation of BRI investments. Also development finance institutions play an important role in accelerating both green finance and green finance capacity in BRI countries.

Despite much progress in green urban finance, however, investments for urban development continue to be both insufficient and too often used for non-green development. While this lack of funding has been noted for years, the recent nCovid-19 pandemic has exacerbated that problem. To overcome the shortage and provide an accelerated deployment of green finance for green urbanization in the BRI, we have developed 11 recommendations.

1. Provide Green Urban Project Preparation Facilities
2. Harmonize Green Finance Standards
3. Improve Capacity of integrated planning for green urban development to lower financing cost
4. Build a Sino-European green city fund
5. Increase use of Blended finance
6. Establish open platform for green urban projects
7. Apply digital technologies for MRV
8. Establish better platform for MRV data sharing
9. Create and apply standards for reporting
10. Provide open learning platform for best practice exchanges of policy and project design and implementation
11. Improve green investment incentives in China and the EU for green overseas investment in BRI cities

Cooperating and political willingness to support green urban development in the BRI and elsewhere continues to be major accelerator for success. With current economic developments at the time of this writing in the first half of 2020 being challenging, green development continues to be not only a major necessity, but also a solid platform for negotiation, communication and cooperation.

The European Union and China as strong partners with shared interest in green development and the development of their green finance systems, can support the transition to a green Belt and Road for cities. They can build on both EU-China agreements on South-South cooperation, third party cooperation agreements or accelerate the application of the common frameworks and agreements on sustainable development and development finance (e.g. UN SDG, Paris Accord, Addis Ababa Action Agenda for Financing Development) to coordinate and build a more multilateral framework to address green urban development.

9 Appendices

Appendix 1: Selected Chinese policies to support green urban development

Topic	Issuer	Content
Energy efficient building	Ministry of Housing and Urban-Rural Development (MoHURD)	In 2006, China established a system of green building standards known as Three Star. An updated version was approved by China’s Ministry of Housing and Urban-Rural Development (MoHURD) in March 2019 and be implemented from August 2019 ¹⁶¹ . Different grades of buildings have different energy efficiency requirements and receive different financial subsidies. In addition, China has developed official standards for near-zero energy buildings, which could form the basis for low-carbon urban districts ¹⁶² .
Heating and cooling	Ministry of Finance	In 2007, the China Ministry of Finance (MoF) established a fund for residential heating metering and energy-saving retrofit, offering 55 RMB/m ² in severe cold areas and 45 RMB/m ² in cold areas ¹⁶³ . In 2012, a fund was created for energy-saving retrofit for residential buildings in hot summer/cold winter regions, offering 15-25 RMB/m ² depending on region ¹⁶⁴ . Subsidy funds were allocated by MoF to provincial financial departments, and provincial and municipal government arranged corresponding supporting funds. More than 1.3 billion m ² of existing residential buildings have been retrofitted in urban areas. These subsidy policies ceased at the end of 2015.
Clean heating pilots	Ministry of Finance, Ministry of Housing and Urban-Rural Development, Ministry of Ecology and Environment	China subsequently launched clean heating pilots in the northern region starting in 2017. Funding levels from the central government are determined according to the size of the city: Pilots in central municipalities receive RMB 1 billion annually, provincial-level cities receive RMB 700 million annually, and prefecture-level pilot cities receive RMB 500 million annually ¹⁶⁵ .
Energy saving companies (ESCOs) and energy management companies (EMCOs)		Beginning in 2010 and ending in 2015, the central government paid ESCOs RMB 240 per tce saved and required provincial governments to match these payments with at least RMB 60 per tce. Many provinces adopted policies with higher matching amounts. The Shanghai municipal government, for example, provided RMB 360 per tce in addition to the national subsidy.
Preferential lending rates for energy saving and renewable energy	People’s Bank of China	National policies have encouraged state-owned banks to promote energy savings projects via lower loan rates. China has also promoted clean energy, particularly wind and solar, and has become the leading country for the installation of these technologies. While most renewable energy is located outside of cities, distributed energy such as solar and wind in urban areas is the focus of some policies.
Provision of land by local governments at reduced prices for clean energy production		The policy is mostly dedicated to solar PV and wind turbine manufacturing, as well as lower lending rates for PV and wind turbine manufacturers.

Promotion of wind and solar with fixed feed-in tariffs	NDRC, Ministry of Finance, National Energy Administration	Distributed solar and rooftop solar benefit from higher feed-in tariffs. In recent years, China has sought to move away from subsidized feed-in tariffs, due to their high cost, but rooftop solar continues to benefit from promotion policies. As of mid-2019, the NDRC set the feed-in tariff subsidy for household rooftop solar PV at RMB 0.18/kWh ¹⁶⁶ .
Increasing reliance on markets and administrative targets	NDRC, National Energy Administration	In 2019, China adopted a renewable consumption obligation that will require provinces to obtain increasing shares of non-hydro renewable electricity ¹⁶⁷ . Marketing and trading of renewable energy has also been promoted as part of electricity market reforms. This could help improve the economics of distributed energy in cities.
Clean air policies promoting a transition away from coal heating	City and provincial governments	Northern Chinese cities such as in Beijing and Tianjin, as well as in Hebei Province have converted central coal heating to natural gas and banned coal heating across large areas. Suburban areas have shifted away from using low-quality coal briquettes to other distributed heating technologies, including electric heating, gas heating, and ground-source heat pumps ¹⁶⁸ . Funding for these initiatives has come from special government air pollution funds, direct state-owned energy companies such as the State Grid Corporation of China, and international institutions such as the World Bank.
Low-carbon transport	e.g. Ministry of Transport	Key policies include subsidies for manufacturing electric vehicles (EVs), license plate and traffic restrictions for conventional-fuel vehicles, and quotas for EVs sales ¹⁶⁹ .

161 China Ministry of Housing and Urban-Rural Development (MoHURD), “‘ 住房城乡建设部关于发布国家标准 绿色建筑评价标准 的公告 ’ [Announcement of the Ministry of Housing and Urban-Rural Development on the Issuance of the National Standard-Assessment Standard for Green Building].”

162 Ministry of Housing and Urban-Rural Development (MoHURD), “‘ 住房城乡建设部办公厅关于国家标准 近零能耗建筑技术标准 公开征求意见的通知 ’ [Notice of the General Office of the Ministry of Housing and Urban-Rural Development on the Public Consultation on the National Technical Standard for Nearly Zero Energy Building].”

163 Ministry of Finance of People's Republic of China, “‘ 财政部关于印发北方采暖区既有居住建筑供热计量及节能改造奖励资金管理暂行办法的通知 ’ [Notice on Interim Measures of Incentive Funds on Heating Metering and Energy Consumption Renovation of Existing Residential Buildings in Northern Heating Areas].”

164 Ministry of Finance of People's Republic of China, “‘ 财政部关于印发 夏热冬冷地区既有居住建筑节能改造补助资金管理暂行办法 的通知 ’ [Notice on Measures of Subsidy on Energy Consumption Renovation of Existing Residential Buildings in Hot Summer and Cold Winter Areas].”

165 Ministry of Finance of People's Republic of China, Ministry of Housing and Urban-Rural Development (MoHURD), and Ministry of Ecology and Environment of the People's Republic of China (MEE), “‘ 中央财政支持清洁取暖试点 ’ [The Central Government Support Pilots of Clean Heating].”

166 National Development and Reform Commission (NDRC), Ministry of Finance of People's Republic of China, and National Energy Administration, “ 国家发展改革委 财政部 国家能源局关于 2018 年光伏发电有关事项的通知 发改能源 2018 823 号 ,,”

167 National Development and Reform Commission (NDRC) and National Energy Administration, “‘ 国家发展改革委 国家能源局关于建立健全可再生能源电力消纳保障机制的通知 ,发改能源 2019 807 号 ,,”

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