DECARBONISTICATION DECARBONISTICATION DECARBONISTICATIONS AND DELICY RECOMMENDATIONS AND THE ROLE OF SUSTAINABLE FINANCE











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Founded in September 2018, the Hong Kong Green Finance Association (HKGFA) is a platform that offers channels and opportunities to facilitate the development of green finance and sustainable investments in Hong Kong and beyond. It aims to mobilise public- and privatesector resources and talents in developing green finance policies, to promote business and product innovation within financial institutions. HKGFA's main goal is to position Hong Kong as a leading international green finance hub by providing greater access and opportunities for Hong Kong's financial institutions to participate in green financing transactions locally, in mainland China, and in markets along the Belt & Road Initiative. This is in line with the global trend of implementing the UN sustainable development goals and the Paris Agreement. Currently, the Association has members of over 100 financial institutions, companies, service providers and other key stakeholders.

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The Greater Bay Area Green Finance Alliance (GBA-GFA) is a collaboration between the Hong Kong Green Finance Association (HKGFA), the Green Finance Committee of the Guangdong Society for Finance and Banking (GDGFC), the Green Finance Committee of the Financial Society of the Shenzhen Special Economic Zone (SZGFC), and the Macau Association of Banks. The Alliance aims to promote research and to incubate green investments that will benefit the GBA by leveraging the vast green investment demand in Guangdong and green finance capacities in Hong Kong and Macau.

ABOUT HONG KONG 2050 IS NOW

Hong Kong 2050 is Now galvanises collective action in science, media, business and policy, in efforts towards a carbon-neutral Hong Kong by 2050. This initiative by Civic Exchange, the World Resources Institute, and the ADM Capital Foundation aims to build a broad-based collective platform for driving action in Hong Kong in response to the 2018 Intergovernmental Panel on Climate Change (IPCC) report on "Global Warming of 1.5°C". According to that report, without urgent, large-scale action, global warming is likely to reach 1.5 degrees Celsius above pre-industrial levels, with potentially significant and dangerous consequences for the world. We believe that a decarbonised city is people-centric, more liveable, healthier and successful. That's what we want for Hong Kong.

ABOUT THE BUILDING ENERGY RESEARCH CENTER OF TSINGHUA UNIVERSITY

The Building Energy Research Center (BERC) of Tsinghua University was founded in 2005 by Professor Yi Jiang and his colleagues. BERC is devoted to aid the development of energy-efficient and environmentally responsible buildings in China in accordance with national and international energy and environmental targets. Principal research activities within BERC include assessments of the current buildings status in China and the provision of strategic outlooks on buildings energy consumption and efficiency, occupant behavior and building simulation research, research and development (R&D) of innovative high-efficiency buildings technology and systems, and energy efficiency application research on building subsectors.

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EXECUTIVE SUMMARY

Introduction

In September 2020, China made an ambitious pledge to achieve carbon neutrality before 2060. Hong Kong announced its target of reaching net-zero by 2050 soon after. These decisions were made in the context of the Paris Agreement, a framework which aims to limit global warming ideally to 1.5 degrees Celsius above preindustrial levels. Under the global movement and the national and local targets, trillions of dollars' worth of green and sustainable finance investment opportunities lay ahead.

The Green Building Project is a collaboration between Hong Kong 2050 is Now and the Greater Bay Area Green Finance Alliance (GBA-GFA), and is led by the Hong Kong Green Finance Association (HKGFA). The project aims to assess the current state of green building-related policies and explore means to decarbonize the building sector in the Guangdong-Hong Kong-Macau Greater Bay Area (GBA). It also seeks ways to leverage green and sustainable finance (GSF) to accelerate the decarbonisation process and to maximise its opportunities in the building industry. Our research begins with Hong Kong as a pilot and then expands the scope of our work to the GBA. The entire project adopts a multi-pronged approach that touches on green building certification energy benchmarking, policy research, policy gap analysis and development of finance solutions.

About the report

This study is an extension of the reports "Green Building Rating Systems: Energy Benchmarking Study" and "Decarbonising Hong Kong Buildings: Policy Recommendations and Next Steps" that were published in December 2020. This study has worked to expand the scope of the research from Hong Kong to the GBA and examines building policies that offer GSF opportunities. Case studies for policy analysis and decarbonisation pathway forecasts have also been developed for four GBA cities - namely Shenzhen, Guangzhou,



Zhuhai and Foshan. This study also analyses the challenges and opportunities in decarbonizing the building sector in the GBA and how GSF can accelerate the process. Lastly, the study puts forward corresponding policy suggestions to further help the building industry in the GBA reach carbon neutrality.

Background

China' s climate goals include reaching a peak in carbon emissions by 2030 and achieving carbon neutrality by 2060 (the "30/60 targets"). The building sector serves as one of the three key areas for achieving the 30/60 targets, along with the industry and transport sectors.

As China works toward its goal of high-quality and people-centered development, total area

under construction in China covered 66 billion square metres in 2020, and is expected to continue to expand. In the same year, the energy consumption of construction and operation stages in the building sector accounted for 48% of the country' s total. This was equivalent to 6.18 billion tons of carbon dioxide, making up 51% of China' s emissions profile.

Guangdong province's carbon emissions accounted for 5.2% of the national total¹. Buildings operation stage energy consumption was the second-largest source of emissions after the industrial sector and constituted one-fifth of the province's total carbon emissions. The graph below shows a rising trend in carbon emissions from buildings operation in four GBA cities, Guangzhou, Shenzhen, Foshan and Zhuhai.

^{1 2019} data, based on WRI working calculation



Figure ES-1. 2015-2020 Buildings operation stage carbon emissions for four case study cities

Source: Working paper calculation

The increasing trends in emissions shown above beg the question as to whether decarbonisation can be accomplished alongside China's fastpaced development. Green development in the GBA is a significant part of regional co-ordination in carbon peaking. As such, the 14th Five-Year-Plan (FYP) of Guangdong Province further emphasizes working with Hong Kong and Macao to ensure that the GBA takes the lead in carbon peaking and carbon neutrality by establishing financial standards and developing green financial products.

Despite already having one of the highest concentrations of green structures when compared to the rest China, the GBA still requires considerable financial investment to achieve carbon neutrality in the building sector. Currently, there is a disconnect between the efforts made to decarbonise the building sector (e.g. building new green and low-carbon buildings and retrofitting existing buildings) and the flow of capital to finance these projects. There is also a lack of research on how to leverage GSF to promote lower energy use and lower carbon emissions.

There are two key factors driving decarbonisation in the building sector in the GBA.

 Building policy: Policies on green building in China have been strengthened progressively since 2011 (the 12th FYP period). According to the latest "14th FYP Development Plan for Energy Saving and Green Buildings", by 2025, all new urban buildings are required to be "green", which means they must comply with the national "green building" design standards.

Specifically, there is a minimum requirement that at least 45% of all new green buildings in nine GBA cities are certified with at least one star under the China Green Building Label (CGBL). Other targets for 2025 include conducting energy efficiency retrofitting for over 30 million square metres of existing structures and constructing at least 2 million square metres of ultra-low and nearly-zero energy buildings.

The upward trend shown above indicates that national and provincial policies have driven strong growth in green building development

Table ES-1. Selected targets from "Guangdong Province 14th FYP Buildings Energy Efficiency and Green Building Development Plan"

KEY INDICATOR	14 th FYP TARGET
Proportion of new buildings in the Guangdong province that are CGBL certified one-star or above	30%
Proportion of new buildings in the nine GBA cities that are CGBL certified one-star or above	45%
Conduct energy efficiency retrofitting for existing buildings (million square metres)	30
Construct ultra-low and nearly-zero energy buildings (million square metres)	2



Figure ES-2. Actual and target percentage for newly constructed "green" buildings² in Guangdong

Source: Guangdong Province Green Building Creation Action Implementation Plan (2021-2023)

over the past few years and presents a clear trajectory for the future. In order to achieve their aggressive green building targets, local governments must explore different strategies to drive developers to build green buildings. Some local governments have set terms in government land lease programs that ensure new developments contain a certain proportion of premises with green building certification. This strong building policy has also created a huge demand for financing among developers, who are urged to build increasingly greener and lower carbon buildings in the GBA. 2. Green and sustainable finance (GSF) opportunities for green and low-carbon buildings: The appetite for investment in GSF has grown significantly in recent years, particularly in the commercial real estate segment.

The World Bank IFC estimates a potential USD18 trillion investment in green buildings between 2018 to 2030 in emerging market cities in Asia. Bloomberg New Energy Finance also found that sustainable financing in the real estate industry close to tripled from 2020 to 2021, with 22% of the overall volume coming from

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² Green buildings refer to buildings designed according to the national green building design standard.

Asia. Furthermore, according to Climate Bonds Initiative (CBI), 44% of the use of proceeds among the USD3.1 billion green bonds issued by GBAdomiciled issuers in 2020 was earmarked for low carbon building projects in the GBA, largely driven by the issuance of green buildings-related issuance in Hong Kong.

Implications of policy and market drivers:

Clearly, with strong green building policy support, together with growing investment demand in green commercial real estate, it is essential to have a common standard (i.e. green building certification) that is recognised by both domestic and international investors as well as effective policies and financing tools to unlock the capital necessary to close the huge funding gap.

Key Findings

• Ineffective government subsidy programs for green buildings: During the 12th FYP, national and local governments launched incentive plans to encourage developers to build green buildings. A per square-metre financial reward was given to certified green building projects based on the certification level achieved³. While green building incentives were welcome, the incentive plans on national, provincial, and city-levels never fully took off due to a number of issues: 1) difficulties in verifying the designed and actual performance of the buildings; 2) upfront costs that greatly exceeded green building incentive subsidies; 3) incentives limited to selected projects; 4) exploitation of the program due to poor governance.

- 1) Difficulties in verifying designed and actual performance of the buildings: Completed building projects had to undergo rigorous performance verification before subsidies were awarded. However, due to difficulties in verifying whether green buildings that had achieved design targets still met requirements during actual operation meant that subsidies were rarely actually disbursed.
- 2) Upfront costs for green buildings outweigh incentives: The cost of green buildings is more costly than traditional methods. This is due to higher upfront construction costs and additional costs for certification and verification. Guangdong Province offers

	PUBLIC/COMMERCIAL BUILDINGS				RESIDENTIAL BUILDINGS			
RATING LEVEL	Incremental cost	Subsidy (Guangdong)	Subsidy (Shenzhen)	Subsidy coverage (%)	Incremental cost	Subsidy (Guangdong)	Subsidy (Shenzhen)	Subsidy coverage (%)
	USD/m ²			USD/m ²				
1-star	4.4	0	0	None	3.5	0	0	None
2-star	12.9	3.7	3.0	23-29%	10.5	3.7	3.0	29-35%
3-star	32.0	6.7	5.9	18-21%	19.5	6.7	5.9	30-34%

Table ES-2. Comparison of incremental costs and subsidies for certified green public/commercial and residential buildings

Source: https://chinacace.org/news/view?id=12659, http://news.dichan.sina.com.cn/2013/06/24/769631_all.html, Measures for the Administration of Special Funds for the Development of Building Energy Conservation in Shenzhen

³ The national incentive program awards buildings of two stars 45 yuan/m² and buildings of three stars 80 yuan/m².

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subsidies of 25 yuan/m² and 45 yuan/m² for green buildings that attain 2-star and 3-star certification respectively, while Shenzhen' s subsidies are 20 yuan/m² and 40 yuan/m² for 2-star and 3-star green buildings. However, these subsidies only cover around 20-35% of the incremental cost of the construction for certified public and residential green buildings.

- 3) Incentives limited to selected projects: According to relevant policies in Guangdong and Shenzhen, subsidies are only granted to "demonstration projects" that have been assessed and selected by local governments. This implies that not all green building projects are guaranteed subsidies, which weakens the attractiveness of the incentives.
- 4) Exploitation of the subsidy program due to poor governance: Poor governance of city-level subsidy programs led to some consultants and developers exploiting the system by building low-cost, low-quality green buildings to maximize profits from the government subsidies they received.

In the larger picture, public funds are insufficient to support the growing demand for green building. Therefore, finding new financing channels, specifically the mobilization and investment of private capital, is imperative.

Mandatory policy driving the number and quality of green buildings in Guangzhou, Zhuhai and Foshan should be part of a comprehensive policy system to stimulate green building development: When comparing policies issued by the provincial and municipal governments of Guangdong, Shenzhen, Guangzhou, Zhuhai and Foshan, it is clear that Shenzhen is the only municipality with its own local green building ordinance, which has been in place since 2006, while others tend to issue notices instead of regulations. Shenzhen has the most comprehensive policies regarding building energy-saving and green buildings. The fact that Shenzhen has performed the best out of the four case cities in terms of number and quality of certified green buildings shows the importance of policy guidance.

POLICY TYPE (IN ASCENDING ORDER OF Enforcement Power)	GUANGDONG	SHENZHEN	GUANGZHOU	ZHUHAI	FOSHAN
Ordinance	3	4	0	0	0
Regulation	2	8	3	2	3
Standard	4	8	1	0	0
Guidance	3	4	1	3	0
Action/Implementation Plan	6	4	3	3	2
Notice	1	5	3	5	3

Table ES-3. Types and number of energy-efficient and green building related policies in Guangdong Province and case study cities⁴

⁴ This table shows the number of building energy-efficiency and green building related policies issued in Guangdong and the four case cities since 2003. The tabulation includes revisions of ordinances.

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СІТҮ	NUMBER OF TOTAL LEED CERTIFIED PROJECTS	NUMBER OF LEED PLATINUM-LEVEL CERTIFIED PROJECTS
Shenzhen	243	27
Guangzhou	178	18
Foshan	56	5
Zhuhai	20	1

Table ES-4. Number of total LEED certified and LEED Platinum-level certified projects in each case city⁵

Source: LEED project database (as of 22 September 2022)

 Green building certifications do not necessarily drive decarbonisation in the building sector: Most score-based green building rating systems (GBRSs) cover multiple aspects of a building including water, waste, material, site and transport, indoor environments, building management and more. Although energy is always one critical aspect of this assessment and green buildings generally have better energy performance than non-green buildings, the overall multiaspect assessment draws attention away from the goal of decarbonisation (i.e. to lower energy use during the construction and operation stages of a building project). To illustrate this point, we can use the example of a building that may have the highest green building rating level, but at the same time may also use a great deal of energy, which is not conducive to decarbonisation. The value of green building certifications is then questionable since the final operating performance of a building often differs from its designed performance rating, especially as time passes and regular performance monitoring and sharing is not required or carried out.

Moreover, most green building certifications do not link building performance with financial

returns. Buildings with regionally, nationally, internationally recognized certifications are eligible for green financing, making green building certifications touch points for green finance. Yet due to the nature of score-based certifications and the lack of verification through continued monitoring, the actual energy savings achieved by green buildings remains unclear. It is therefore difficult for investors to have confidence in the future performance and financial return of certified green buildings, making them hesitant to invest in green and low-carbon buildings.

Decision making difficult for building owners/managers, policymakers, investors and financial providers due to lack of data on building energy use: The GBA lacks the infrastructure and mechanisms for collecting and reporting data on building energy consumption. The resulting lack of data makes it impossible for building owners and managers to assess their current energy profile, conduct benchmarking and make improvements to their buildings. The data gap also makes it difficult for policymakers to assess the current situation and draft suitable policies. Lastly, the absence of data not only creates barriers for investors who wish to understand building performance

⁵ LEED (Leadership in Energy and Environmental Design) is an international and widely used green building rating system.

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for a specific property, it also hinders financial products, which require historical or performance-based data to develop Key Performance Indicator (KPIs) targets.

- Property developers spend more than they save, lowering their desire to build and maintain green buildings: The argument for green buildings is that increased costs can be offset by long-term operational savings through lower electricity and water bills. However, developers have found that the higher cost of maintaining the various elements of green buildings (e.g. renewable energy installations and water reclamation facilities) outweigh operational cost savings, which are more likely to be enjoyed by tenants after construction is finished.
- New building policies create data, the foundation for financing decisions, thus driving green and sustainable finance: The designed performance of green buildings, including factors such as expected energy use and carbon emissions, is highly important for investors in assessing the investment value of a project. There are new building-related policies that facilitate the creation of such data, which serves as the basis for financing decisions. China's newest national mandatory building code, the "General Specifications for Building Energy Conservation and Renewable *Energy Utilization*" (GB 55015-2021), mandates the calculation of projected building energy use and carbon emissions.

The revised *"Evaluation Standards for Green Buildings"* (GB/T 50378-2019, which is the basis of the China Green Building Label, CGBL) also requires projects to submit a report outlining the project's energy-saving and water-saving measures, as well as the building's expected energy consumption and carbon emissions levels, in order to be eligible for green financing.

These regulations grow the data pool and increase transparency of projected building performance, thus driving GSF in two key ways: first, by enhancing the confidence of investors looking to invest in green and lowcarbon buildings, and second by also lowering the barrier to leveraging GSF tools that can finance the decarbonisation of buildings.

- GBA cities should expand beyond green bonds/loans to financial products like sustainability-linked structures, green mortgages and green insurance: Green bonds and green loans have been the bedrock of financing tools for green and low-carbon building in the GBA. In China's "Green Bond Endorsed Project Catalogue", at least six out of the total 204 project categories are directly related to green and low-carbon buildings. However, as sustainability-linked products quickly scale up, continued innovation in buildingrelated financing tools is crucial in the GBA. Many banks in Hong Kong now offer green mortgages to attract retail consumers to purchase green property. Beijing and Qingdao have also successfully carried out green building insurance pilot programs, which serve as proofs of concept to close the information gap between securing capital pre-construction and verifying performance post-construction, while also offering a strong solution for future policy and investment strategies.
- The GBA must coordinate building standards, certifications, and policy incentives: The Guangdong-Hong Kong-Macau GBA consists of three jurisdictions with different currencies, market structures, building codes, green building standards, assessments, and methodologies. Highlevel cross-border coordination is necessary to expedite cross-border investment and the use of international green building certification systems.

Key Recommendations

Key recommendations in this report include: i) expanding the variety of GSF products offered; ii) adopting dual recognition of local and international green building certifications (i.e. CGBL and EDGE); iii) improving the subsidy incentive system; iv) recognising international green building certifications locally; and v) improving building-related energy usage and carbon emissions data management.

Expanding the variety of GSF products used in decarbonising buildings, particularly sustainability-linked structures: Sustainability-linked structures tie borrower performance on the interest margin according to a set of pre-determined sustainability performance targets (SPTs), which can be linked to reductions in carbon emissions, improvements in energy efficiency, water use efficiency, etc. These are one of the more efficient and transparent tools used to help to decarbonize the building sector because borrowers are incentivised to deliver more ambitious targets over the financing term.

Within the onshore market, sustainabilitylinked products are still limited. In the offshore market, sustainability-linked loans are gaining popularity, but the use of sustainability-linked bonds is still nascent. In addition to traditional green use-of-proceeds financing, real estate developers should further explore options like issuing SLBs or borrowing SLLs to secure financing for their building decarbonisation efforts.

• Enact dual recognition of CGBL and EDGE to attract international investment in green projects in China and the GBA: CGBL, China's domestic green building certification program, is well supported by local policy, while EDGE is an international green building certification standard established by the International Finance Corporation (IFC) and is recognised by international financial markets. Dual recognition of local and international standards would greatly benefit local green real estate development by leveraging both domestic policy support and access to international capital. Aside from the financial benefits, EDGE brings technical advantages as well. EDGE is a performance-based assessment with a higher focus on energy and carbon. Compared to the local score-based CGBL, EDGE is relatively more attuned to accelerating decarbonisation in building design.

- Improving incentive systems by subsidising certification costs and making financial subsidies eligible for all projects: Local governments should subsidize the costs for obtaining green building certifications and make the subsidy eligible for all projects, rather than pre-selected "demonstration projects". This will lower the upfront costs for developers and encourage them to build and certify green buildings.
- Integrating and adopting international green building certifications in local policy: Local governments should extend policy support to international green building certifications and encourage developers to applying for international certifications that provide them with access to broader financing opportunities. For example, certification cost subsidies and plot ratio calculation rewards should be given to projects that obtain either local or international green building certification.
- Compiling high-quality data to measure and manage energy use and carbon emissions: High-quality data on energy use and carbon emissions in the building sector is necessary to effectively achieve decarbonisation. This data must be measurable, reportable and verifiable to make building performance more transparent. Accurate and transparent data has a plethora of benefits from helping building owners improve performance to helping policymakers to assess the energy

landscape and draft appropriate policies, promoting trust among consumers and investors in the benefits of green building, and helping financial service providers to develop green financing products. Key actions include:

- Using standards that capture operational performance
- Mandating public disclosure of energy use and emissions data
- Setting up data monitoring systems and platforms throughout the building stock

Conclusion

Progressive developments in building policy as well as strong growth in green and sustainable finance (GSF) present mammoth opportunities for GSF to play a key role in driving decarbonisation in the building sector as government financing for green and low-carbon buildings and energy efficiency retrofits will not be sufficient and will require private capital investment.

Local municipal governments in the GBA must improve the management of energyrelated data in the building sector, integrate international green building certifications in local policy, encourage net-zero carbon buildings and subsidize the certification costs of highperformance buildings. Property developers and investors in the GBA market should expand their use of GSF products and utilize internationally endorsed performance-based building standards. Prioritising the use of internationally recognized and stricter green building standards can drive the decarbonisation of local buildings, provide broader access to financing opportunities for local real estate development projects, cultivate local green and low-carbon building-related supply chains, and boost local economic development, all the while moving closer to achieving a low-carbon future.

