

A report from the Economist Intelligence Unit

# Achieving scale in energy-efficient buildings in China

## A view from the construction and real estate sectors



Commissioned by

A study commissioned by the Global Buildings Performance Network (GBPN) in collaboration with its China Partner, The China Sustainable Energy Program (CSEP).



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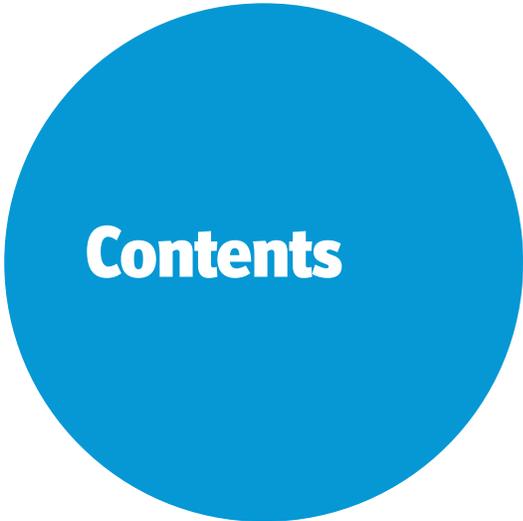


In partnership with The China Sustainable Energy Program (CSEP) in Beijing, the GBPN Chinese programme provides a common platform to identify and translate Chinese best practices for global dissemination, facilitates Chinese and international knowledge exchange and capacity building and supports Chinese institutions to identify and achieve the abatement potential of the building sector in China. [www.efchina.org](http://www.efchina.org)

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## Executive summary

China is the largest consumer of energy in the world, with economic growth and rapid urbanization pushing energy consumption even higher. According to the Chinese government, approximately 28% of China's carbon dioxide emissions now originate in buildings, up from 10% three decades ago. Energy demand in buildings is rising along with economic expansion and affluence. While the Chinese economy has cooled somewhat, GDP is expected to grow by a yearly average of 7.5% over the next five years; the World Bank projects a tripling of energy demand from buildings over the next two decades.

CO<sub>2</sub> emissions are rising with energy consumption. China emits roughly 6bn tonnes of greenhouse gases a year—about 20% of total estimated global emissions of 36bn tonnes, according to PBL Netherlands Environmental Assessment Agency (the US is responsible for about 16%). Levels of pollution have become worrisome: they are suffocating China's urban populace and alerting government and businesses to the urgent need to curb emissions.

Incentives for and demand for energy-efficient buildings remain low, but the Chinese government is now developing plans and programmes to promote green buildings. Although occurring mostly at the national level, demand is increasing

at the state and local levels as well. If these efforts lead to greater awareness of cost savings, stronger legislation and greater access to capital and investment incentives, private companies along with state-owned enterprises (SOEs) could lead the charge to achieve scale in energy-efficient buildings.

The Chinese private sector is particularly open to change. Some 83% of executives from China's building sector accept reduction of carbon emissions as a corporate responsibility, compared with 60% of US executives, according to the Economist Intelligence Unit (EIU) June 2012 survey of global building executives, commissioned by the Global Buildings Performance Network (GBPN).

Key findings from the report include:

- **Low awareness of the potential cost savings restricts demand for energy-efficient building in China.** Chinese buyers are price-sensitive and don't yet understand the savings associated with energy-efficient buildings. Suffocating pollution in big cities, however, is starting to raise awareness about the need to reduce emissions and may increase consumer demand for energy efficiency.

- **Until recently, developers have had little incentive to spend extra for energy-efficient construction, but new government programmes are helping build a better business case.** While green building legislation oversight at the local level remains spotty, concrete government plans to promote green buildings are now in place. Last year, \$8.5m in government subsidies was made available to each “ecological” district that meets green building standards.
- **The private sector is helping fuel demand for energy-efficient buildings.** Companies are increasingly drawn to buildings that meet national and international green certification standards; they are also looking to meet their corporate social responsibility (CSR) objectives.
- **Increasing government subsidies and international funding compensate for scant sums provided by Chinese banks.** China’s commercial banks are wary of lending for construction of energy-efficient buildings as such loans are roughly 10% larger than those for traditional buildings. Foreign architects, foreign developers and foreign capital are helping fill some of the financing gap, while government subsidies and tax breaks in some regions are giving an opportunity to smaller domestic companies to ramp up investments in energy-efficient buildings. ■

## About our research

*Achieving scale in energy-efficient buildings in China: A view from the construction and real estate sectors* is an Economist Intelligence Unit (EIU) report commissioned by the Global Buildings Performance Network (GBPN). It is a follow-up briefing to our 2012 report, *Energy efficiency and energy savings—a view from the building sector*, which drew on findings from a survey of 423 senior executives in the buildings sector.

This paper focuses on the current state of affairs in China's green buildings market while highlighting issues that are helping or hindering investments in energy-efficient buildings. Lack of consumer awareness, a challenging regulatory environment and limited financing are major obstacles today, but the government—with carbon reduction as its aim—is now making progress with plans and programmes to overcome them. And, some companies are making strides in energy-efficient building despite policy imperfections and inadequate financing.

The EIU bears sole responsibility for the content of this report. Findings do not necessarily reflect the views of GBPN. The paper was written by Ralph Jennings and edited by Janie Hulse.

The report is based on three principal sources:

- Desk research drawing on the latest data and reports on the subject.
- A June 2012 survey of 423 global executives including 107 China-based executives in the

building sector. Thirty-two percent of the China-based respondents were C-level, 52% reported company earnings greater than \$500m, 78% were in the real estate sector (commercial, residential and industrial) and 22% came from the building construction industry.

- Eight in-depth interviews with experts and high-level executives involved in energy efficiency in China's buildings sector.

We would like to thank the following individuals for sharing their time and insights:

- Dan Winey, managing director —Asia Pacific, Gensler
- Xie Dan, consultant and former innovation centre manager, Vantone Real Estate Group
- William Beloe, program manager, the International Finance Corporation's (IFC) Utility-Based Energy Efficiency Finance Program, China
- Wang Xiaodong, senior energy specialist, World Bank Energy Efficiency Project
- Hisaka Kimura, principal investment specialist, Asian Development Bank
- Joe Carter, architect and planner, Towns Consultants, Beijing
- China Vanke, Chinese developer
- Lang Chuanfeng, strategy director, Building Technologies, Siemens China
- Borong Lin, professor, Tsinghua University

## 1

## Building awareness and demand

Compared with developed countries in Europe and North America, China's green building efforts began relatively late but they are ramping up quickly now, according to Dr Borong Lin of Tsinghua University. The upward trend is attributable to increased government will, sky-high demand for new builds and the Chinese population's yearning for cleaner air.

"What started as an international emphasis on sustainability is becoming a significant part of Chinese culture, due primarily to pollution problems," says Dan Winey, managing director, Asia-Pacific for Gensler, a San Francisco-based architecture firm designing energy-efficient buildings in China.

Government measures to improve energy efficiency in buildings—if better enforced at local levels—could help contain pollution and control fuel use considerably. According to the China Greentech Initiative Partner Program, China could save 292,000 tonnes of standard coal, cut 766,000 tonnes of carbon dioxide emissions and save 30m tonnes of water by adding 100 energy-efficient buildings in each year of the 2011-2015 Five-Year Plan, which sets social and economic measures affecting business.

While mandating energy-efficient buildings in the public sector by 2014, the government aims to exceed 1bn square metres of area covered by green buildings and 400m square metres of retrofits by 2015. Toward this end, in May 2012, China's State Council published the "Dedicated Plan for Energy-

saving Construction" that promotes energy-efficient building and scalability. And, in January 2013, the State Council issued the "National Green Building Action Program" promoting similar objectives and setting the aforementioned targets. To date, the Chinese government has certified more than 75m square metres of green buildings through its "Three Star System", not counting more than 80m square metres certified by the US Green Building Council's Leadership in Energy and Environmental Design (LEED) programme. (See Part 3.)

While energy-efficient buildings are now part of the government's agenda, implementation—especially at the local level—remains a challenge. Rules tend to be better enforced in state-owned companies or government offices; enforcement is spottier in the private sector. Private-sector designers and experts with international financial institutions say enforcement of regulations can be stringent for high-visibility projects in big cities but more uneven for other buildings.

Despite policy imperfections, self-imposed sustainability guidelines are helping to boost energy efficiency in buildings commissioned by the private sector. These include some foreign firms' Corporate Social Responsibility (CSR) policies, which require every property in their global portfolio to meet energy-efficiency standards. Mr Winey with Gensler says roughly 90% of their foreign and 40% of their local clients in China want their buildings to be energy efficient. Some clients cite reasons of conscience; others hope to raise

property values.

Yet, a lack of financing has constrained use of energy-efficient water, heating, air conditioning and solar equipment. Executives in China polled in our June 2012 survey listed technical assistance (37%), grants (34%) and subsidized lending (30%) as the primary forms of energy-efficiency financing. Government subsidies help meet set sustainability targets, but banks avoid granting low-interest loans for more expensive private sector energy-efficiency projects because they lack payback guarantees. Exacerbating this problem is a government-directed tightening of real estate lending since 2010 to keep housing prices in check. This is somewhat offset by special government funds allocated to support renewable energy and energy-efficient construction projects.

Existing government subsidies, however, don't seem to be enough. "Developers must come up with their own capital," says Xie Dan, a green buildings consultant and former Innovation Centre Manager with Vantone Real Estate Group, a Beijing-based developer that won a Chinese Three Star System energy-efficiency award for a 170,000-square-metre, 16-floor housing project in the port city of Tianjin. "Covering costs is the developer's problem. They can't charge higher prices for green units," he says.

Owing to financing constraints, developers rarely spend the additional 10% over average

construction costs for green building features. Per-square-metre costs of Three Star System green buildings in China are roughly 320 yuan (\$54) for public buildings and 219 yuan (\$35) for residential buildings, calculates Lang Chuanfeng, strategy director for building technologies with Siemens China, which supplies building automation and HVAC (heating, ventilation and air conditioning) systems for energy-efficient construction.

Consumers lack awareness about potential cost-savings. According to the International Finance Corporation's Utility-Based Energy Efficiency Finance Program in China, prospective buyers misunderstand the economic benefits of energy efficiency.

Higher demand could help engender more financing options. Roughly 29% of respondents—the highest share among ten response categories—believe lack of market demand is China's single biggest obstacle to scaling up energy efficiency in buildings. If it's a matter of market maturation, Chinese consumers of the future may be willing to pay a premium to ensure longer-term savings. Chinese consumer awareness about prospects for lowering electricity bills through energy efficiency is rising, albeit from a low base. "Awareness will grow among consumers as China considers raising heavily subsidized electricity rates," notes Alan Beebe, managing director of the China Greentech Initiative. ■

## 2

## Paving the way: Pioneer initiatives

Some established developers are adopting green technologies to stand out in a crowded market. Buyers, however, may be drawn less by energy savings and more by big-name foreign architects like Stephen Holl. Mr Holl's firm was behind the Vanke Center in Shenzhen, an office-hotel-residential building. China Vanke has completed 20 Three Star System award projects totalling a combined 1.67m square metres. Towns Consultants has designed more than 500,000 square metres of China's energy-efficient projects. Gensler is another global firm involved in green buildings in China; it has designed 3.25m square metres of energy-efficient space now under construction in China. The government-owned and-promoted Shanghai Tower—a 632-metre-high skyscraper with an exterior that reduces wind loads and glass panels that cut internal energy use—represents one-seventh of Gensler's green portfolio in China.

Large global companies often have the necessary capital to invest in green buildings and need not rely on external financing or loans. Small-to-mid-tier companies with an interest in building green have a harder time. "China needs a banking and investor community that understands the business case of green buildings," says IFC's William Beloe. He claims that this would complement growing public awareness and increased government focus.

To help China's pioneering developers overcome existing financing barriers, international lenders have offered concessional loans and technical

expertise in China since 2008. Among these is the World Bank's Energy Efficiency Project. It offers concessional loans and matching expertise to make existing buildings energy efficient. "Small enterprises face new rules but find it hard to get money for the necessary investments," says the World Bank's Beijing energy specialist Wang Xiaodong.

The World Bank's flagship China project is a five-year, \$400m deal with the Bank of Shanghai and the Shanghai Pudong Development Bank for low-carbon urban development. The World Bank provided \$100m, the two Chinese banks put in \$250m and developers added \$50m. At least seven city governments—Chongqing, Guangzhou, Qingdao, Shanghai, Tianjin, Wuhan and Xi'an—offer tax breaks or subsidies for energy-efficient building projects. These programs fill gaps left by local commercial banks.

In 2007, the Asian Development Bank unveiled an 800m yuan, nine-year guarantee program to spur investment in energy-efficient buildings by supplementing the collateral requirements of commercial loans. In early 2012, it also selected the Shanghai Pudong Development Bank as its first local program partner bank. Partner banks select small retrofits such as replacing boilers, air conditioners and lighting. "We hope after the program that they will still finance energy-efficient buildings themselves," says the ADB's Principal Investment Specialist Hisaka Kimura. ■

# 3 Putting energy-efficient buildings on the agenda

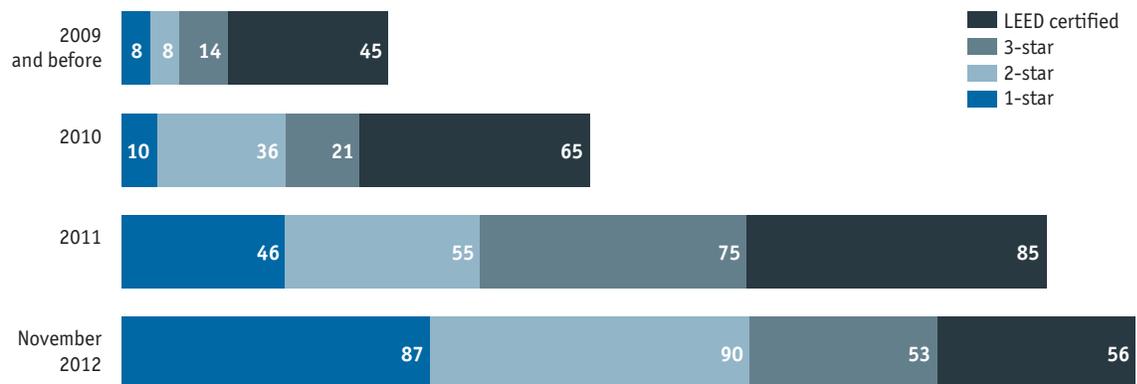
The Chinese government now considers energy efficiency a priority for buildings as well as industry and motor vehicles. China's 12th Five-Year Plan, covering 2011-2015, promotes balancing economic growth with environmental protection. The plan calls for tightened efficiency standards for buildings and appliances and for a 65% cut in energy consumption in new versus existing buildings over the next five years compared with 2010 levels.

Among government efforts to reduce energy use in buildings is a certificate programme run by China's Ministry of Housing and Urban Affairs (MOHURD). The "Three Star System" programme draws inspiration from the U.S. Green Building Council's LEED certification, but focuses less on high-end commercial and luxury residential and more on government buildings and less expensive

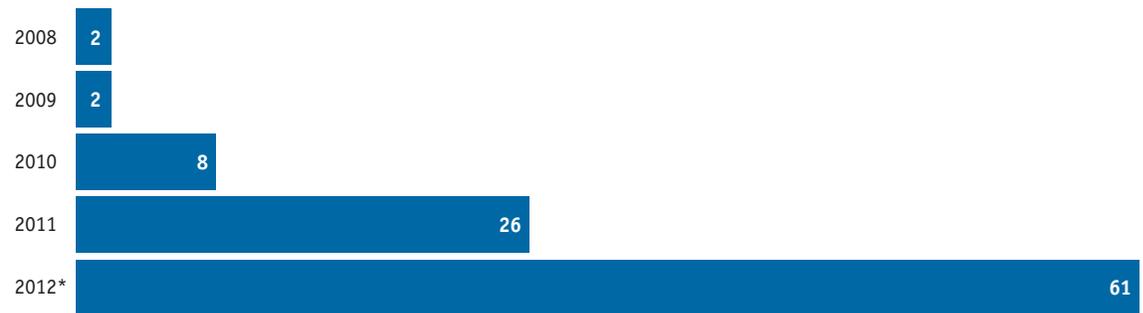
housing projects. The government-sponsored programme has gained significant traction since its launch in 2006 and boasted 230 new projects as of November 2012 (see Chart 1).

Under the Three Star System, a project can receive a "design" certification before construction begins. This starts with a programme called the Green Building Design Label, which grants developers the right to expand floor area by 1% for each star in the certification system. Star-level is assessed by the number of measures in place to improve the building's external and internal environment, energy usage, water savings and operating management. However, a project is not actually certified until one year post-occupancy, after a full year's energy measurement and an on-site assessment. Every three years, assessments are required for renewal of the Three Star System certification.

**Figure 1. Number of certified energy-efficient buildings in China**



Source: China Greentech Initiative

**Figure 2. Floor area of energy-efficient buildings in China**(Million m<sup>2</sup>)

\* Estimate Source: China Greentech Initiative

China's Housing Ministry is also working with the Ministry of Finance to develop subsidies to encourage energy efficiency in select public buildings, helping to cut consumption by 10-15% by 2015. China's recent Green Building Action Plan—action-oriented legislation tied to the 12th Five-Year Plan—will provide subsidies to developers who achieve a Three Star System certification at any level. The intent is to cover the 30% differential in cost typically incurred to design an energy-efficient building. At least 4m square metres worth of energy efficiency retrofits are eligible for subsidies in 40 Chinese cities, according to the China Greentech Initiative.

These government initiatives, however, are imperfect. From a building industry perspective, central government guidelines, including the Five-Year Plan, are too vague to be effective. And, while local governments are beginning to mandate and to enforce energy-efficient construction and retrofits, results are mixed. "Rules change, knowledge is patchy and so is the capacity to enforce," Mr Beloe observes. China lacks a "detailed guideline for green buildings development" and alignment between regional and central government rules, says Lang Chuanfeng with Siemens. Some 29% of global respondents to our 2012 survey perceive standards in China to be significantly more lax compared with countries/regions like the United States (4%); European Union (7%) and India (23%).

China's Ministry of Housing and Urban-Rural Development, for example, oversees energy-efficient building rules across the nation but leaves

enforcement to local governments, whose implementation is spotty. Certifying green building materials to prove a project's energy efficiency is also a challenge because of inconsistent legal standards across China. This lack of enforcement topped a list of policy barriers to green building in our survey (it was cited by 34% of China-based respondents). Among other major roadblocks to the adoption of green building measures in China were insufficient government incentives and insufficient emphasis on energy-efficiency policies (both cited by 31% of China respondents).

A lack of consistency and flexibility in China's green building rules frustrates much of the industry, but some companies pursue green initiatives despite policy imperfections and limited demand. China Vanke and Vantone Real Estate say their ability to scale up energy-efficient investments hinges on significant growth in demand and their own energy savings track records. Nonetheless, Vanke plans to construct 2.7m square metres of Three Star System award buildings in 2013.

The government has made some efforts to spur demand for energy-efficient equipment. China, which manufactures 70% of the world's light bulbs, now has very large subsidies in place to promote the adoption of energy-efficient bulbs domestically, according to a March 2010 McKinsey report. In 2011, the central government began subsidizing solar power projects, making the renewable energy technology cheaper—with a focus on large, utility-scale solar projects. ■

## 4

## Conclusion

The Chinese government is on the right track in embracing energy efficiency in buildings, but clearer rules and easier access to domestic financing are necessary to achieve scale and mitigate carbon emissions. Demand growth will also depend on greater awareness of the issues and potential cost savings. Prospective green building users—from homebuyers to corporations—must see the value in energy-efficient buildings to motivate developers to build them.

Consumers are beginning to become more aware of the value of these projects. They are influenced, in large part, by suffocating air pollution but also by rising costs. For now, however, energy-efficient building is expanding piecemeal at the behest of

capital-rich developers, international financial organizations, and the Chinese government with its growing subsidies.

More investment, however, is needed to achieve scale. Government targets and rating systems help, but, in the words of the IFC's Mr Beloe, green building scalability lies in "greater flexibility and simplicity in regulations", plus clearer government incentives for the private sector.

Current private sector efforts—if reinforced by strong legislation, attractive incentives and growing demand—could trigger a multiplier effect, turning buildings green, ensuring better air quality for China's urban dwellers and curbing a significant portion of CO<sub>2</sub> emissions. ■

Whilst every effort has been taken to verify the accuracy of this information, neither The Economist Intelligence Unit Ltd. nor the sponsor of this report can accept any responsibility or liability for reliance by any person on this white paper or any of the information, opinions or conclusions set out in the white paper.

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