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# Green Building Industry in China



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## **Executive Summary**

Green building is the practice of creating structures that provide a healthy, applicable and effective environment, and at the same time, conserve resources (energy, land, water and materials), protect the environment and reduce pollution as much as possible.<sup>1</sup> In China, consistent with improved government incentives, practitioner's knowledge, as well as acceptance of sustainability among the public, a growing number of construction projects are incorporating sustainability principles.<sup>2</sup> The rapidly emerging green building industry in China is both an opportunity and challenge for the country. On one hand, it brings a huge potential market for stakeholders, such as green building related designers, construction companies and building materials suppliers ; on the other hand, the sustainable development of this industry calls for regulation from the government, and inputs from experts or scholars within this field of study.

This research paper will focus on addressing the question of what can be ICMA's role in the green building industry in China through cooperating with Chinese local governments. We will begin by studying the evolving process of Chinese green policies and regulations through reviewing literature. Based on that, we will discuss the progress of green building sector in China and discover the driving factors behind the development. Afterwards, we will turn to the other side of the story and see what obstacles the green building industry is encountering, and what measures the country is taking to deal with them. In the end, we come to the conclusion that it is the right time for ICMA to integrate into the booming market of green building in China. Taking into account the complex administrative environment and the fact that ICMA is an overseas organization, the key to success is to find the right entry point. Cooperating with existing entities, such as universities, think tanks, or NGOs with similar goals and functions can help initiate the process. Along with the trial period, ICMA can move ahead to operate more independently to work together with local governments by making full use of their expertise in city management and establishing international liaisons for cities to exchange experiences.

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<sup>1</sup> "The Chinese Green Building Evaluation System (GB/T 50378-2006)." MOC, Beijing. Web. 13 Aug. 2014.

<sup>2</sup> Rahman, F. and Sadeghpour, F. (2010), "Canadian industry practitioners' perception on LEED credits", Construction Research Congress, University of Alberta and the Construction Institute of the American Society of Civil Engineers, Alberta, pp. 1547-56.

## **1. Introduction**

As defined in The Chinese Green Building Evaluation System by China's Ministry of Construction (MOC), green building is the practice of creating structures to provide a healthy, applicable and effective environment, and at the same time to conserve resources (energy, land, water and materials), protect the environment and reduce pollutions as much as possible.<sup>3</sup> Efforts on green building have generally focused on improving energy efficiency, conserving natural resources, using new environmentally friendly building materials and also making revolutionary changes in the concept of design and in procurement and management processes in order to reduce the impact of buildings on the overall environment.<sup>4</sup>

In recent years, societal pressure, government incentives, as well as practitioner's knowledge and acceptance of sustainability, have led many construction projects to pursue sustainable practices.<sup>5</sup> The development of the green building industry in China is both an opportunity and challenge for the country. It brings a huge potential market, while at the same time calls for more regulation and strategy for sustainable development.

This research paper will focus on addressing the question of how ICMA can establish a role in impacting the green building industry in China through cooperating with Chinese local governments. The paper will begin with a primary and secondary literature review to analyze the evolving process of Chinese green policies and regulations. Based on that information, we will talk about the progress of the green building sector in China and discover the driving factors behind the development. Afterwards, we will explore the other side of the story and see what obstacles the green building industry is encountering and what measures can address resolving them. In the end, the prospects of the green building market will be discussed.

## **2. Literature Review – Primary and Secondary**

A primary and secondary literature review was conducted for the paper. In order to grasp a rather comprehensive picture of China's regulation for the green building industry, we

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<sup>3</sup> "The Chinese Green Building Evaluation System (GB/T 50378-2006)." MOC, Beijing. Web. 13 Aug. 2014.

<sup>4</sup> Chau, C.K., Tse, M.S. and Chung, K.Y. (2010), "A choice experiment to estimate the effect of green experience on preferences and willingness-to-pay for green building attributes", *Building and Environment*, Vol. 45 No. 11, pp. 2553-61.

<sup>5</sup> Rahman, F. and Sadeghpour, F. (2010), "Canadian industry practitioners' perception on LEED credits", *Construction Research Congress*, University of Alberta and the Construction Institute of the American Society of Civil Engineers, Alberta, pp. 1547-56.

conducted an interview with President Lu from the Beijing Green Building Alliance (BGBA), and will review it through three different layers: regional, national and international. For the secondary literature review, we selected three articles that focused on regulations and policies in order to fully understand the political and legal environment of the industry in China. *Green Practices in the Chinese Building Industry: drivers and impediment* studied the evolving process and influence of the national policies within the green building industry. The Institute for Building Efficiency took another angle and researched more on the local policy in different parts of China in their report of *Green Building in China: Conception, Codes and Certification*. EU SME Center also published a related report on *The Green Building Sector in China*, which paid more attention on the international rating system adopted by China.

### ***3.1 Interview with Lu Yiming from Beijing Green Building Alliance (BGBA)<sup>6</sup>***

The President of BGBA, Lu Yiming visited the ICMA DC office in September #, 2014, during which he was also interviewed by our colleagues. In the interview, he mainly spoke about the development of the green building industry and the evolving policies within the industry. As one of the practitioners and experts for green building in China, Mr. Lu's opinion offers us first-hand information on the emerging Chinese market for green building.

When asked why he switched from traditional building industry to green building industry, Lu gave two main reasons: for one thing, there is a sense of responsibility for them to help the government carry on the mission of saving energy and protecting the environment; from another standpoint, it is also a business opportunity in the market economy. China is a country with a huge population, but the resources available is very limited. The 1.4 billion populations in China are consuming a tremendous amount of energy. In fact, from very early on, some Chinese experts already noticed these problems. They found that modern buildings are one of the main consumers of energy, taking up to 40% of the total national energy consumption. Thus, Lu has paid special attention to this area of study. Previously, the government placed too much importance in developing the economy at the expense of saving energy. Later on, as the economy improved, China's leaders realized that the country could not continue developing according to the traditional way of development. Consistent with this growing awareness, the

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<sup>6</sup> The interview with President Lu was translated to English from the original recording of the interview that was conducted in Mandarin Chinese.

academic field unyieldingly raised attention on the need to be energy and environmentally friendly, as well as develop the green building industry, by bringing it up at every academic conference. In 2006, the government enacted China's first Green Building Evaluation Standards, regulating that construction in China must meet the demand of "four savings and one protection." The "four savings" refer to saving energy, water, land and money. The "one protection" refers to protecting the environment.

Lu also listed several regulations, laws or regulation standards published in China. In January 1, 2013, when new Chinese leaders came onto the state, they published a document named the "Green Building Action Plan," which can be regarded as a compulsory regulation. It was drafted jointly by the Department of Building and Housing and the National Development and Reform Commission, and later forwarded by the State Council. The Action Plan details the goals for the industry and the plan to realize the new developmental mode. The Action Plan has played a vital role in guiding the green building industry. As for local regulations, since China is big in terms of land coverage, Lu said that there are differences between east and west, as well as the northern and southern part of China. When the central government published these documents, they especially promoted the idea of "adjusting measures to local conditions." To be more specific, different areas were encouraged to use suitable methods to promote environmental protection, energy saving, as well the adopting of new technology that matched their local circumstances. Thus, although the national level has set standards, there are also local regulations. Lu also mentioned that for NGOs like BGBA, they are also underway to draft some standards. Previously, as they did not get the permission of the government, they were not authorized to publish such standards.

In the end of the interview, Lu shared his opinion in the possible role that ICMA could play in the development of green building industry in China. He mentioned that "According to my own understanding, if ICMA wants to dig into the Chinese market, it has to cooperate with its professional counterpart in China. Hence, I think there are three main aspects that ICMA can offer help to BGBA. The first aspect is related to concept. Although there has been such idea of sustainability in 1980s in China, the scope of influence of the concept is far from satisfaction. Secondly, technological support will also be much appreciated. The technology, especially the designing skill that we have now is not as systematic or professional as what the western world

has. Thus, ICMA can provide us with some successful cases or introduce us to some study tour to foreign countries. Thirdly, I think we can also support each other in the talent training programs. From another standpoint, China could also turn out to be a huge market for ICMA. We will try our best to cooperate with ICMA in the approaching Annual Conference. Hence, it is impossible for us to rely on the assistance of ICMA in establishing relationships with local governments in China. It is our own strength. However, when it comes to the relationship with other foreign governments internationally, I believe ICMA can help.”

### ***3.2 Green Practices in the Chinese Building Industry: drivers and impediments***

In the article named *Green Practices in the Chinese Building Industry: drivers and impediments*, two Chinese professors coauthored with a professor from the Department of Building in the National University of Singapore in learning the development of green building in China. According to their observation, drivers for the green building industry are investment from the central Chinese government, the establishment of eco-assessment framework, implementation of national standards, as well as the application of evaluation system. As for impediments, they pinpointed that the under-developed technology and funding, and the lack of legal enforcing.

The professors traced the Chinese government’s green policy to the 1980s, but explained in the Worldwatch Institute saying that “this effort was impeded due to the then under-developed technology and lack of funding.<sup>7</sup>” Prior to 2005, there was official standard for sustainability in China. However, related documents could still be found as the guidance books during that time. Authors of this article listed and commented on two of them: *Appraisal Handbook for Eco-housing in China* was published in 2001, which provided the first eco-assessment framework; *Construction Guidance for Green Olympic Buildings* in 2003, which helped buildings associated with the Beijing Olympic Games to achieve the goal of a “green Olympics” in 2008. It was not until the year of 2005, informal instructions on these guidance books finally turned to be binding national standards. In 2005, *Design Standard for Energy Efficiency of Public Buildings* (GB50189-2005) was published. This standard covers both indoor and building envelope design

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<sup>7</sup> Worldwatch Institute (2006), *State of the World 2007: Our Urban Future*, W.W. Norton and Company, Washington, DC.

parameters, including the mandatory provisions.<sup>8</sup> Ever since, there have been a couple of follow-up national standards being published to regulate the green building industry in China. Additionally, policy makers also made efforts in establishing an evaluation system for green practices in the building industry. *The Chinese Green Building Evaluation System* was issued by the Ministry of Construction (MOC) in 2006 as the first green building evaluation system in China. This standard first provides a definition, the technical specifications and then the assessment framework for green buildings. In 2007, the MOC released its Detailed Technical Rules for Green Building Evaluation and Administrative Measures for the Green Building Evaluation System.<sup>9</sup> Using Leadership in Energy and Environmental Design (LEED) as a reference point, China's green building evaluation system was based on six major subsystem: space savings and outdoor environment; energy savings and energy utilization; water savings and water resource utilization; material savings and material resource utilization; indoor environmental quality; and operations management.<sup>10</sup> Despite this evaluation system does not serve the role of enforcing the green standards, it influences the authority of certification. In the "11th Five-year Plan (2005-2010)" and the government's "2010-20 percent" energy efficiency goal, savings from the energy used in the building industry accounts a large proportion of deduction. On July 1<sup>st</sup>, 2010, *Policies and Plans of Integrated Utilization Techniques of Resources in China* announcement NO.14 was issued. This document, containing 257 sustainable techniques in ten industries, including the building industry, aims to stimulate the adoption of the technical framework and innovations stipulated therein.<sup>11</sup> Apart from publishing national standards for the green building industry, investment from the central government also makes up a major part of the policy. For instance, a program for the renovation and retrofit of heating systems in northern China has been in progress, and the incentive handed out in 2008 alone was up to 642 million RMB. In 2008, the central government expended 1.37 billion RMB to support demonstration projects, which adopted technologies pertaining to renewable resources.<sup>12</sup>

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<sup>8</sup> Jung Ying Liu Sui Pheng Low Xi He, (2012), "Green practices in the Chinese building industry: drivers and impediments", *Journal of Technology Management in China*, Vol. 7 Iss 1 pp. 50 - 63

<sup>9</sup> Ibid.

<sup>10</sup> Ibid.

<sup>11</sup> Ibid.

<sup>12</sup> Qiu, B.X. (2010), Speech on the 6th Green Building Conference, Ministry of Housing and Urban-Rural Development (MOC), Beijing.



### ***3.3 Green Building in China: Conception, Codes and Certification***

The three authors of the above article offered us a clue to how China developed a system of regulation for the green building industry at the national level. Nonetheless, they overlooked the significance of adjusting the national standard to local needs. In the report published by the Institute for Building Efficiency, an initiative of Johnson Controls, researchers realized the necessity to have local flexibility in implementing the national standards. The report begins by introducing the Three-Star certification program. This program is an integral part of the national Green Building Evaluation Standard (GBES), which defines green buildings as “building that save a maximum amount of resources (including energy, land, water, and materials), protect the environment, reduce pollution, provide healthy, comfortable and efficient space for people, and exist harmoniously with nature” throughout their lifecycle. After defining the concept at the national level, the research went further in saying that the China three-Star program is a national standard but offers provincial flexibility. The national China Institute for Building Sciences is the only agency authorized to grant Three-Star status to buildings, whereas provincial-level Institutes for Building Sciences are authorized to certify One-and Two-Star buildings.<sup>13</sup> According to the GBES, when certain items in the standard are not compatible with the geographic or climate conditions of the local area, local assessment and certification authorities can choose to eliminate those items in the evaluation process. As a result, practices for green building certification vary across provinces. In addition, the rigidity in measurement differs from province to province.<sup>14</sup> Some provincial-level authorities, such as those in Zhejiang, Chongqing, Shanghai and Shandong, have enacted provincial GBES as adapted versions of the national GBES. Many other provinces are developing their own versions. In addition, several city-level authorities have developed an extra layer of standard. For example, the city of Taiyuan in Shanxi Province enacted its local GBES in 2008, three years before similar legislation at the Shanxi provincial level. The Taiyuan standard is much more stringent than its provincial counterpart. For example, the Taiyuan GBES mandates that for green public buildings, the total area of glass curtain wall must not exceed 10 percent of the total exterior window area, a requirement not found elsewhere.

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<sup>13</sup> Currie, Julia, and Yifei Li. "Green Building in China: Conception, Codes and Certification." *Institute for Building Efficiency* (2011). Print.

<sup>14</sup> Ibid.

According to Taiyuan officials, the standard is made stringent to align with the city's strategic transition to green growth.<sup>15</sup>

Apart from guaranteeing local specification, this approach also creates different standards and definition of green building. Although local areas agree on the conceptual definition of green buildings defined by the China GBES, variations in the operational definition are still significant enough to make green buildings in one locality unable to qualify in another. For instance, the GBES in Jiangsu Province requires all green buildings to have at least 10 percent of hot water heated by renewable sources of energy, which is not required in other areas in China. Likewise, Jiangsu Province has 39 “regular assessment indicators” for public buildings, while its neighbor, Fujian Province, has 71 of them. Aside from varying definitions at different levels of the government, different standards operate at the same level of government. For example, the city of Shanghai has both a GBES (voluntary) and a Building Energy Efficiency Standard (mandatory). The Building Energy Efficiency Standard is much more technical than the GBES, but it does not cover aspects of green buildings other than energy efficiency. Several other cities in China have the same dualism.<sup>16</sup>

### ***3.4 The Green Building Sector in China***

Both of the two literatures are helpful in documenting the developing process of regulations and policies on green building industry in China. They let us know the progress of national standards and the local specification in different parts of China. Besides all these, international rating systems are also relevant if we would like to get a full picture of the ongoing regulations for the green building industry in China. Not only did the researcher in the Institute for Building Efficiency mentioned about the international rating system of Leadership in Energy and Environmental Design (LEED) and Japan's Comprehensive Assessment System for Built Environment Efficiency (CASBEE), but studies conducted by the EU SME Centre offered a more detailed comparative study on LEED and China's 3-star standard.

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<sup>15</sup> [http://www.qh.xinhuanet.com/xnfdc/2007-11/23/content\\_11750646.htm](http://www.qh.xinhuanet.com/xnfdc/2007-11/23/content_11750646.htm), accessed August 20, 2011.  
[in Chinese]

<sup>16</sup> Ibid.

The study began by talking about LEED in China. It says that the LEED standard was introduced in China in 2003 and had an initial small uptake, especially in showcase real estate projects in A-class offices and industrial buildings run by foreign companies.

Figure 1: LEED Certified GB Projects in China (No. per year)\*



\*the number of project for the year 2012 is estimated number

Although introduced in 2004, it was not until 2007 that the standard started to develop in China, showing strong, stable growth since.<sup>17</sup>

The study then did a comparative study between LEED as the international rating system and 3-star standard as the national evaluation system. Based on the observers form EU SME Centre, the government’s push towards green buildings (and its own standard) has led to a greater application of the Chinese 3-Star standard over the past few years. As LEED carries a stronger brand name, especially in high-class private residential buildings, it is expected to remain a strong player in the “specification war” between the two standards in China.<sup>18</sup>

Figure 2: LEED vs 3-Star



<sup>17</sup> "The Green Building Sector in China 2013." *EU SME Centre* Oct. 2013. Print.

<sup>18</sup> *Ibid.*



Source: USGBC

More detailed comparison is shown as the following chart.

		
<b>History</b>	USGBC (United States Green Building Council), 2000	MOHURD (Ministry of Housing and Urban-Rural Development), 2006
<b>Organisation type</b>	Non-governmental	Governmental
<b>Evaluation target</b>	New construction, existing buildings, commercial interior, core & shell, schools, retail, healthcare, homes, neighbourhood development	Public (including commercial, hotel and government-owned buildings) and residential
<b>Application</b>	Worldwide	China
<b>Certification cost</b>	CNY 50,000	CNY 87,000 for registration 0.04 – 0.045 USD / sq. ft for evaluation 0.01 – 0.015 USD / sq. ft for construction evaluation
<b>Level of certification</b>	Certified (40 – 49 points) Silver (50 – 59 points) Gold (60 – 79 points) Platinum (80 points or above)	1 star 2 stars 3 stars
<b>Credit categories</b>	<ul style="list-style-type: none"> <li>• Site planning</li> <li>• Water management</li> <li>• Energy management</li> <li>• Materials used</li> <li>• Indoor air quality</li> <li>• Innovation &amp; design process</li> </ul>	<ul style="list-style-type: none"> <li>• Land savings and outdoor environment</li> <li>• Energy savings</li> <li>• Water savings</li> <li>• Materials savings</li> <li>• Indoor environmental quality</li> <li>• Operations and management</li> </ul>

To conclude, after nearly one decade's exploration, China has gradually developed its mechanism for regulating and managing the green building industry. This mechanism includes mainly three different layer—the national standard, the provincial standard with local specification, and the international rating standards. They are not fully separate from each other, but have some intersections and overlaps. Thanks to these building standards and evaluation systems, the green building industry has since rapidly developed. In the following parts of this paper, we will look into the contemporary situation, ongoing challenges and the future prospects of this booming industry.

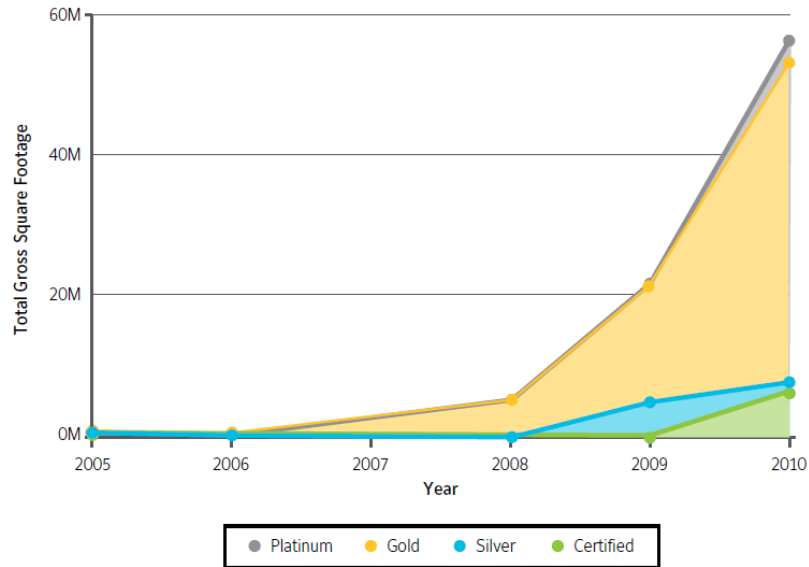
#### **4. Progress and current practice**

After signing the climate change agreement in Copenhagen in December 2009, China has consistently pushed for the green building market to grow and expand. The first building in China to receive the internationally recognized US LEED certification was the eight-store office of the Ministry of Science and Technology in Beijing, completed in 2004. Up to date, there have been 213 certified projects in China, including one platinum, 23 gold and 17 silver awards. On the other hand, more than 100 buildings have been certified under The Chinese Green Building Evaluation System at the end of 2010. The construction costs of green buildings in China averaged 100-150 RMB (US\$13-\$19) per square meter higher than a standard building. At an estimated 100 RMB (US\$15) per square meter cost increase, the market potential of green buildings would amount to 1.5 trillion RMB (US\$220 billion). A major business opportunity can clearly be seen in the green building sector from the entire green supply chain. Participation by banks and financiers, as well as domestic and foreign companies in key areas was encouraged to help eliminate risks, help overcome the technology, skills and financing gaps that the green sector still faces.

According to United States Green Building Council (USGBC), China now has more than 80 million square feet of LEED-certified buildings, many of which were certified in 2011 (Figure 3). Similarly, the Chinese Three-Star Green Building Certification program, which started in 2006, has seen significant growth. Information about the total number of buildings certified under that program is not available, but experts estimate that China now has roughly 200 buildings certified at the Three-Star (highest) level of that program. Most of these are government buildings.

**Figure 3: Gross square feet of LEED- certified buildings in China by level and by year (2005-2010)**

*Gross square feet of LEED-certified buildings in China by level and by year (2005-2010)*



Because of rapid urbanization in China, the building market is booming. By 2020, builders are expected to construct 215 billion square feet (20 billion square meters) of new construction in the country. Even though the green building certification market is still small compared to overall annual building construction rates, it appears interest in learning about green buildings is also growing rapidly. According to Baidu, the most popular online search engine in the Mandarin language, the volume of searches with “green building” as a keyword has increased substantially in the last few years (Figure 4).

**Figure 4: Internet search engine trends of “green building” keyword in Baidu in recent years.**

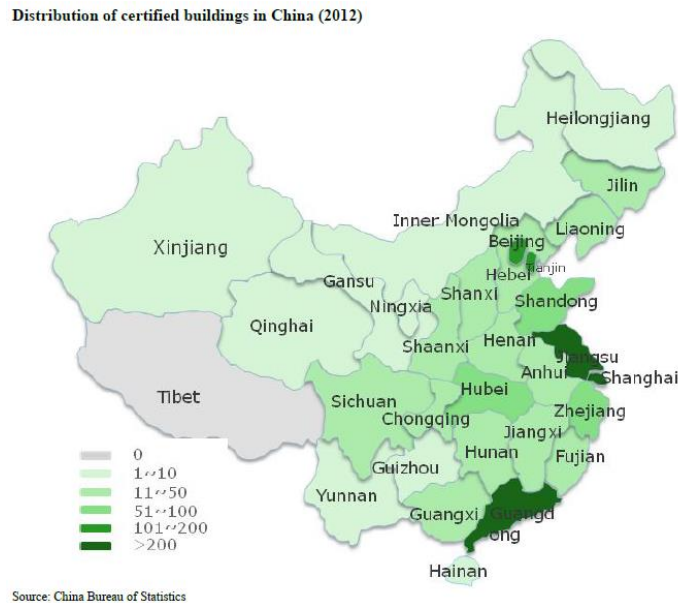
*Internet search engine trends of “green building” keyword in Baidu in recent years.*



Source: Baidu Index

As with many markets in China, the green building market also follows an east-to-west movement, with the eastern first-tier cities (Beijing, Shanghai, and Guangzhou) leading the way, followed by the second and third-tier cities.

Figure 5: Distribution of certified buildings in China (2012)



China’s green building demand is mainly driven by multinational companies. In order to achieve the country's energy saving targets, local companies need to commit to green building standards too. While the government seems to be driving energy efficiency initiatives in public buildings, local developers and companies are lagging behind. However, multinational companies have taken the lead to promote green buildings in China by pursuing more stringent LEED certification. The trend was started by Plantronics, a California-based electronics company, when it obtained LEED gold certification for its new manufacturing and design center in Suzhou. Then Nokia received its first LEED gold certification globally for the Nokia China Campus in Beijing. Other big names include Siemens and BHP Billiton. In fact, multinational companies, driven by their global corporate responsibility policies, have built eight of the total 15 LEED certified buildings in China so far. The US-based developer Tishman Speyer is constructing three projects in China aiming LEED certification to meet growing demand from multinational companies. Other multinational companies which have registered with the USGBC to construct their own LEED-rated buildings in China include Boeing, Carrefour, Coca Cola, Carrier, Otis, Rockwell

Automation, Siemens, Caterpillar, CB Richard Ellis, DOW, ExxonMobil, GE, GM, and Johnson Controls. “At this point, the Chinese companies don’t feel the same sort of pressure to demonstrate corporate social responsibility that the multinational companies feel,” says Geoffrey Lewis, a Fulbright Fellow at Tsinghua University’s Department of Building Sciences who closely monitors China’s green building progress. Speaking with ClimateChangeCorp.com, Lewis points to one of China’s top companies Petro China, which recently built an energy efficient building in Beijing for its headquarters but did not bother to get it certified. “If a multinational company builds an energy efficient building, it will also get it certified as a green building.” Lewis says that for the Chinese companies and developers, the economics of green building have to match up as corporate social responsibility is less of a driver. “And at present, the perceived economics of green building are not necessarily there. That is why green buildings are not as widespread in China as they should be.”

## **5. Green Cities**

While the Chinese government implements energy labeling programs, provides subsidies for energy efficient technologies, and releases policies to support carbon and energy reduction goals, China’s push to develop more sustainable communities, or “eco-cities,” may also influence green building’s future in the country.

According to the Asian Development Bank, the Chinese government began encouraging development of sustainable communities as early as the mid-1990s. Dozens of eco-cities are currently being developed, according to some estimates, but arguably the most high profile is the Sino-Singapore Tianjin Eco-City. The project is a collaboration between the governments of Singapore and Tianjin and promotes water and energy conservation, mixed-use development, and comprehensive public transport for the city’s expected 350,000 residents. The city’s first residents began moving into apartments in mid-February, and the entire project is expected to be complete by 2020.

The Chinese government’s eco-cities initiative may be one reason China has the largest number of LEED for neighborhood development projects outside the United States, says USGBC’s Kwan. These projects help local governments and developers design “communities that are a little more human scale, that are linked better to the outside environment, and that provide that type of safe and healthy environment for all the people who live there,” says Kwan.



Like LEED for buildings, the LEED for neighborhood development rating system evaluates an entire community. The rating system looks at whether the community has walkable streets and reduces residents' dependence on cars, and whether buildings and infrastructure are energy efficient, use renewable energy sources, and reduce water use.

Compared to the United States or other developed countries, mixed-use development is already common in China, where many neighborhoods feature all the services most people need within walking distance. The government's role in urban planning also makes it easier to create sustainable communities, Kwan says. "China is one of the few places in the world that actually decides where a city is going to happen. They actually build the city."

### ***5.1 Case Study: Tianjin ecocity***

The best-known ecocity is being built in Tianjin in partnership with a Singapore sovereign wealth fund. The project will transform a former uninhabitable swamp into a residential area for more than a million people, as a satellite city of Tianjin. Although the project has been widely publicized and promoted, new inhabitants have been slow to arrive, and the project has suffered spending overruns and delays.

Figure 6: Tianjin Ecocity



Source: Tianjin Ecocity

More than 100 such eco-projects are scattered throughout China, mainly aimed at establishing new cities of 250,000 to 500,000 people. While some have had a relative success, others have been an utter failure, leading to unnerving reports on western television channels. Although the term "eco" should be not be interpreted as "revolutionary city of the future" but rather as a "city development with some interesting ecological experiments", these cities do

create interesting showcases and opportunities for western technologies. Companies that want to showcase a certain technology have the opportunity – mostly at reduced rates – to do so by building a reference project using their products or solutions at these sites.

**5.2 Ecocities and foreign real estate developers**

Normal real estate development in China is well protected against foreign entry. This is done by legal means – obtaining a license is an extremely long process – but also practically: competition for prime land strongly favors Chinese companies. Only a handful of western companies have succeeded in successfully developing their own projects. Financial investors in collaboration with Chinese real estate developers have succeeded in acquiring a number of projects, but this has been limited. Within ecocities, foreign participation is appreciated and sought after. This is partly because Chinese companies have less know-how in green building and development, but also because of a marketing approach: foreign developers are appreciated for their higher quality and innovative buildings. Entering the Chinese market through showcasing their latest technologies in these ecocities therefore makes sense for western developers.

**6. Driving Factors**

We see both positive and negative drivers influencing the growth of green building in China, as summarized in the table below:

Positive drivers	Negative drivers
<ul style="list-style-type: none"> <li>• Environmental pollution</li> <li>• Energy efficiency drive</li> <li>• Changing energy economics</li> <li>• Transformation of real estate industry</li> <li>• Rising public awareness and disposable incomes</li> <li>• Policies and subsidies</li> </ul>	<ul style="list-style-type: none"> <li>• Higher upfront costs</li> <li>• Non-guaranteed quality of green building materials</li> <li>• Lack of experienced designers, engineers, and architects</li> <li>• Government targets</li> <li>• Conflicts of interest between builders and owners</li> </ul>

**6.1 Environmental pollution**

Chinese society is quickly transforming from a rural to an urbanized society. The rapid growth in buildings and traffic has caused a series of problems, ranging from traffic jams to smog. In the context of continued urbanization, these problems will continue to grow.

Figure 7: China Urbanization vs. Europe Urbanization



Although smog is primarily caused by traffic and industry, coal heating (being replaced by gas) and coal power plants (to be closed near large cities) do have a significant impact. Better performing buildings should reduce this consumption and, hence, air pollution.

**6.2 Energy efficiency drive**

The continued drive to bring people into cities (hence the need for more living space) is accompanied by inadequate insulation practices and poor design, which are creating an increasingly energy-consuming building stock.

Buildings consume an ever-greater amount of the total energy needs of China. Whereas they consumed just 10% of total energy consumption in the 1970s, it is estimated that heating and cooling of buildings will use 35% of the total by 2020.

**Proportion of building energy consumption in national total energy consumption**

Year	1970s	2006	2012	2020 (E)
Proportion	10%	20%	26%	35%

In the context of international dependence, pollution, and CO<sub>2</sub>-reduction commitments, this area is too important to neglect. In its 12th five-year plan, the central government proposed two challenging energy targets:

- 15% renewable energy (currently 5%);
- 45% reduction in CO<sub>2</sub>/unit of GDP.

These goals are not achievable without a considerable upgrade in the energy efficiency of the building stock. The present regulation is on track to increase standards for new buildings. However, real progress can be made only if the existing building stock is upgraded.

### ***6.3 Changing energy economics***

The increasing cost of buildings and land is starting to have a significant impact on “green” economics. As land becomes scarce, especially in city centers, the value of the land (location value) on which the building is constructed is becoming an ever-larger proportion of the overall costs, causing additional expenses to become less significant. The increasing energy cost – coal is twice as expensive as in 2006 – is adding an “energy savings” interest to the picture. Other elements (e.g., increased labor costs, increased demands on noise and dust levels, and quality checks by the government) are transforming building practices towards more prefabricated, high-quality building elements and systems.

### ***6.4 Real estate industry transformation***

Some of the leading real estate companies in China (including market leader Vancke) are investing heavily in green building to distinguish themselves and justify a quality premium. Healthy, high-quality buildings require less maintenance and green labels are therefore starting to become a selling argument. Although foreign real estate developers are scarce in China because of legal and practical hurdles, there are several projects in which foreign companies are investing or developing, especially in and around “ecocities.” As these companies want to differentiate themselves with their know-how and innovation, there is a strong tendency to apply for (and even go beyond) the certification and use the latest in green technologies.

### ***6.5 Increasing public awareness***

The public is demanding higher quality and healthier buildings. Confronted with ever-increasing housing prices and negative experiences with first-generation buildings (quality issues causing decay and value loss), the consumer is looking for higher quality buildings and “value for money”. Green buildings are marketed for their high-quality and healthy aspects, qualities that are appreciated more than environmental friendliness. This awareness is reinforced by real estate developers’ drive towards green building. It also has an effect on government regulations and land availability: local governments prefer green builders to boost their own image and are more willing to grant land to such developers.

### ***6.6 Policies and subsidies***

All the issues above have a positive effect on local and national policymaking: land grants, subsidies, energy standards, etc. As a consequence, all regulations and incentives are being strengthened and geared towards green building.

### ***6.7 Higher upfront costs***

Higher upfront costs are still working against green building. The extra costs of “greening” a building are significantly above the profit margins of real estate developers. The present credit squeeze by banks is not helping in this respect. As a result, green building may become confined to the higher-level spectrum, where customers are able and more willing to pay the necessary premiums.

### ***6.8 Non-guaranteed quality***

As is the case with many sectors in China, products of poor quality are still pervasive on the market. New materials and products are sold as “green” and “high-quality”, but real-life testing can take years. Common brands in China are young and undeveloped; testing laboratories are scarce and may be partial. As a result, many builders and developers do not trust what is on offer. As indicated in this document, this creates an opportunity for Western (proven) products and concepts to enter this newly opening market.

### ***6.9 Lack of experience***

The short history of green building in China means that builders, engineers, designers, and architects are unfamiliar with many of the concepts and designs; therefore, they are reluctant to use them. For many products, their introduction on the market can be time-consuming or subject to local business practices not acceptable to western companies.

### ***6.10 Government targets***

Although standards and norms are in place and increasingly efficient control systems are being set up, local governments tend to have strong economic incentives to increase the quantity (number of buildings and square meters) rather than increase the quality of the output. Current practices often favor cheaper materials over higher quality products.

### ***6.11 Conflict of interest***

In many cases, the person paying for the building does not pay for its maintenance or energy consumption. Increased investments in energy-efficiency are therefore not in the interest of the builder, unless he is obliged by government policies or market forces. In western countries, energy service companies (ESCOs) play a vital role in funding some of these investments in exchange for part of the energy savings. The weak legal environment in China and the fact that investors cannot be sure that contracts are honored is prohibiting many of these business models in China.

## **7. Trends**

Yingchu Qian, the East China general manager of Environmental Market Solutions Inc, a US based green building consulting firm which has several high profile projects in China, agrees that the local companies are not focusing so much on environmental sustainability. But he says this could soon change as the government is pushing for higher standards and awareness about the green building concept is increasing in China. Over 200 demonstration projects being built- some of them are already complete- were intended to showcase how green technologies and products improve building's energy efficiency. But skeptical developers want to see if the demo-techniques and products also work in large scale commercial projects.

Another significant trend in Green Building Industry in China is that local developers are warming up. Sensing the growing demand from foreign tenants, a small group of local

developers have started green projects. If their projects succeed, more developers would want to participate. Prosper Centre in Beijing and LeSang Shopping Mall in Herbin, both LEED certified buildings built by local developers, are early examples. Both buildings are primarily occupied by multinational tenants. Parkview Green, a Hong Kong-based developer, is aiming to construct China's first LEED Platinum-rated building in Beijing to attract international tenants. It has helped that multinational tenants are willing to pay a premium for green buildings. Shenzhen Fountain Corporation, a local developer, has tied-up with US-based green building design consulting firm Environment Market Solutions Inc (EMSI) to develop two residential projects. Link Hybrid, a LEED Gold certified green project in Beijing built by the Modern Group, is an example of wide scale use of geo-thermal technology to power the heating and cooling system of the building. Shui On Land has several upcoming green projects throughout the country including the Knowledge Innovation Centre in Shanghai which is supposed to be completed in a few months and will be a LEED certified building.

China is also moving toward a more regulated legal environment for the green building industry to develop. In 2010, a fairly comprehensive law called Energy Law was passed. China Green Building Council, a public-private initiative launched last year by the Ministry of Construction, will be managing the green labelling system announced in 2006 and help create awareness about green buildings. The labelling system will be based on China's national Evaluation Standard for Green Building. A local certification system is likely to be less expensive and may attract more local developers. Other plans announced by the ministry of construction include large scale application of renewable energy in building projects by tapping into solar energy and by using methane, straw and other alternative energy sources as an energy solution for rural areas. The government has also indicated that it is considering tax rebates and financial incentives to encourage construction of green buildings. It is likely that the government will set more aggressive green building targets in the 12<sup>th</sup> Five Year Plan (2011-2015) which is already being drafted. The government's current plans focus more on energy and as a result other green aspects such as water use have been neglected. China, which has a large agricultural economy and water is crucial for the sector, is now feeling the urgency to dramatically improve water efficiency. The 12th Plan may include stringent water conservation goals for green buildings.

## **8. Challenges**

Chinese policymakers will face several challenges to accelerating green building in China. These challenges are highlighted below.

### ***8.1 Lack of Transparency in the Three Star Rating System***

Twenty-one Green Building Label Management Offices are authorized to review projects across China for 1 or 2 star certification; a 3 star rating must be evaluated by the Ministry of Housing and Rural Development's Building Energy Efficiency and Technology Division. China's Three Star system is consultative and subjective and has more qualitative than quantitative indicators. Local Green Building Label Management Offices may eliminate specific items if they are not compatible with geographic or climate conditions of the local area. The impact is that green building certification practices vary, and the rigidity in measurement differs from province to province. As green building expands, the challenge will be to ensure consistent and objective evaluators across the certification levels. A lack of uniformity limits the reach and market impact of China's green building activities. The application for government subsidies for the new green building incentives is also currently unclear at both the central and local levels, so ensuring this process is streamlined for developers will be another policy challenge.

### ***8.2 Absence of Market Demand for Green Buildings***

There is limited public awareness of the economic and health benefits of green buildings in China. As a result, there is little demand from the market to construct green buildings. The impact may be that developers are unable to capture the benefits of building green in marketing to future tenants.

### ***8.3 Lack of Technical Capacity***

China has a shortage of professionals who are qualified to execute integrated building design and perform operations and maintenance for green buildings. Capacity building to improve green building knowledge and activities do not target construction workers. Relevant training materials may not have been developed to address their education level or the difficulties they frequently encounter during their work.

### ***8.4 Lack of a Robust Green Building Materials Supply Chain***



Green building materials represent only 5% of the total building materials market. Green materials are difficult to source and often not available in China, making products very expensive. Furthermore, because building code enforcement is inconsistent across locales, developers may have little incentive to use legitimate green building materials. Suppliers may certify materials without complying with requirements.

### ***8.5 Developers' Perceptions of Cost-Benefit Analysis***

Chinese developers have hesitated to construct green buildings because of higher upfront costs in investments, commissioning, building intelligence systems, and monitoring. Chinese decision makers expect a 3.2 year payback on building efficiency measures. Costs include green materials and technologies, cost of installation to the design specifications, and higher skilled labor. Developers are accustomed to building quickly and cheaply and want investment to be returned in a much shorter period of time.

## **9. Future prospects**

As of now, the green building industry is in its infancy in China. But it is commonly believed that China plans to become a leader in the global green building industry, which promises to be worth hundreds of billions of dollars in a few years given the rising concerns over global warming. Qiu Baoxing, China's vice minister for the ministry of construction and a strong green building advocate, estimates the domestic green building market is already worth \$213 billion.

“There could be a real green building revolution in China when green projects start spreading from tier-1 cities to tier-2 and 3 cities,” says Lewis. “That will also prompt the cement industry and other building material suppliers in China to get on the green bandwagon. And then it will become cheaper for the entire world to make green buildings as China is the supplier of the world.” Though China's medium term outlook looks strong, in the near term it needs to focus on building green credentials before it can hope to build green buildings for the world.

An analysis by the U.S. Department of Energy's Lawrence Berkeley National Laboratory (LBNL) researchers shows that China made the largest energy efficiency improvements in new construction and hit targets in energy management in government and large-scale public buildings during the 11th FYP (2006– 10) period. However, China has not been as successful

during the first year of the 12th FYP, says LBNL's Zhou, and she expects the PRC government to continue including energy and carbon reduction goals in future five-year plans. "This period will be very challenging because the first year has already ended and they did not meet the first year milestone," she says.

Whether green building will play a large role in meeting these goals remains to be seen, but advocates remain optimistic that the green building market will continue to grow in China. Still, some think the PRC government will have to implement stronger policies before mainstream developers build green projects on a larger scale. "The only way that can happen is from the top down," says Bisagni. "The government has to give direction about what green building has to be."

## **10. Conclusion**

Although the future of the green building sector in China is promising with the support of government's policies and regulations, this industry still faces major hurdles. China lacks the expertise in the "hard" technologies like design, production and manufacturing as well as in the "soft" skills relating to regulations, management, standards and monitoring. However, it is important to first establish public awareness for them to achieve a better understanding of the merits of green building and better usage of green technologies.

The limitation of this study mainly lies in the survey sample. Although the total number of respondents in the sample is large enough to provide reliable results of the current status of green practices, the number of each practitioner group was not enough for a meaningful comparison to be made between groups. Future research is therefore recommended to enlarge the research scope to include more practitioners of different groups for comparisons to be made in various aspects such as those relating to the green educational level. Many commonalities and differences that exist in groups are very possible to be established.

A green building is likely to involve more participants, more techniques and more requirements, bringing changes to traditional project management practices. Future research may look at what these changes are, for instance, whether an early integrated green building team and better communication help, and to what extent. The financial benefits of green building are always important. Do the conclusions relating to financial benefits in other countries apply to the

situation in China? Future research can focus on seeking a balance between environmental and financial benefits to achieve economic efficiency. Further research on the incentive mechanism in the green building market is also recommended. Collectively, these studies can help the Chinese Government design an incentive plan for the green building sector, within the context of an optimal incentive policy portfolio.

#### **11. Points of suggestion for ICMA:**

- Initiate the process by cooperating with existing entities, such as universities, think tanks, or NGOs with similar goals and functions;
- When we get more familiar with the industry in China and related policies, ICMA can move forward to operate more independently to work together with local governments;
- Make full use of ICMA's expertise in city management and establishing city links. The organization's international background and connection with members will become valuable resources for green building industry in China.

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