

Accelerating the World's Largest Green Building Market: China

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As urbanization sweeps the globe, the growth of healthy, sustainable cities is essential to the well-being of humankind.

Green building is fundamental to this imperative. China has emerged as the world's largest green building nation with 320 million square meters of certified green building space, eclipsing the United States at 310 million square meters. What took the U.S. more than 20 years to accomplish, China has achieved in a decade. And, with the Chinese government's pledge in 2015 to ensure that 50 percent of all new urban buildings will meet China's green building standards by 2020, China is poised to have 50 percent of the world's green building floor space by then.¹

China is urbanizing at an historic pace. By accelerating adoption of both its national Green Building Evaluation Standard, and international standards such as Leadership in Energy and Environmental Design®, or LEED®, China can become a model for other nations, help to shape the green building revolution, and ensure a future that is both economically robust and environmentally secure.

Chinese leaders are committed to balancing economic growth and sustainability. In a September 2016 agreement with the United States to embrace the Paris climate change agreement, Chinese President Xi Jinping said, "We will unwaveringly pursue sustainable development and stay committed to green, low-carbon, and circular development, and to China's fundamental policy of conserving resources and protecting the environment. In promoting green development," he added, "we also aim to address climate change and overcapacity."²

The recent World Green Building Trends 2016 Study describes the rapid advance of green building practices throughout the global construction industry. It also highlights the unparalleled opportunities available to the construction community in China. A review of some of China's outstanding green building projects suggests great promise for the future of the global green building movement, and for the transformational power of sustainable cities.

A World of Cities

Global urbanization is a twenty-first century megatrend producing wealth and well-being unlike anything in human history.

Today, 54 percent of humankind lives in cities, a percentage expected to reach 66 percent by 2050 when urban populations will top 6 billion people. Nearly 90 percent of this increase will take place before 2030, and will be concentrated in Asia and Africa.³

Each week around the globe, 1 million people, or twice the population of Lisbon, Portugal, move to cities.⁴

While these numbers seem daunting—including the likelihood of some 41 mega-cities with 10 million inhabitants or more by 2030⁵—history tells us that rapid global urbanization could be a very good thing.

Cities have long been the source of wealth and of humanity's best ideas and most vibrant culture. Financial capital and commercial markets are made accessible, while human capital is valued and optimized. "The strength that comes from human collaboration," economist Edward Glaeser believes, "is the central truth behind civilization's success and the primary reason why cities exist."⁶

In fact, healthy cities are such extraordinary growth vehicles that researchers have struggled for adequate descriptions. They are, physicist Luis Bettencourt of the Santa Fe Institute says, a "special kind of social reactor" that is not so much a collection of people but a collection of "connections between people."⁷ When cities have strong mobility, infrastructure, and social services, increasing their density makes people more productive and inventive, leading to something called "superlinear scaling."⁸ One study found that by simply doubling the population of an urban area, each inhabitant becomes, on average, 15 percent wealthier and 15 percent more productive.⁹ Studies have also found, on average, that as a country's urban population rises by 10 percent, the country's per capita output increases by 30 percent.¹⁰

These results speak to the outsized impact of urbanization. Few forces can lift people from poverty to prosperity faster than a healthy city. The World Bank estimates that urbanization has helped to reduce the number of people living in extreme poverty from 1.9 billion (42%) in 1981 to 702 million (9.6%) in 2015.¹¹ “No country has reached high-income status,” the World Bank notes, “without undergoing a successful urbanization process.”¹²

A rising tide of healthy urbanization can continue to power the global economy. The Arthur D. Little Urban Mobility Lab forecasts that by 2025, the world’s cities will produce 86% of global GDP.¹³ And the infrastructure required to support urban growth through 2050—including a steady creation of new jobs—is estimated at more than \$350 trillion, some \$169 trillion of which will go to private and commercial real estate development needed to support this growing population.¹⁴ This pace of building is unprecedented, with the volume of urban construction for housing, office space, and transport services over the next four decades roughly equal to all such construction to date in world history.¹⁵

There is another positive if counterintuitive factor in the rapid growth of healthy urban areas. Greater density actually improves sustainability by reducing encroachment on surrounding land, energy and travel costs, and by curbing carbon emissions. “When it comes to greenness, size matters,” writes Citylab’s Richard Florida. “As urban regions grow their populations, the rate of growth in their emissions actually declines.”¹⁶

To be clear, it is not urbanization per se that creates wealth and well-being, but healthy urbanization. Where investment for infrastructure, housing, and services is minimal, cities become congested, polluted and poor.¹⁷ Countries around the world must address enormous challenges in the coming decades to ensure their growing cities have adequate housing, infrastructure, transportation, energy, education and healthcare.

The United Nations is focused on this imperative. In September 2016, representatives from governments around the world agreed on a draft of what is called the New Urban Agenda, set to be formally adopted at the UN’s Habitat III Conference in Quito, Ecuador, in October. “We share a vision of cities,” the document says, that seeks to “promote inclusivity and ensure that all inhabitants, of present and future generations, without discrimination of any kind, are able to inhabit and produce just, safe, healthy, accessible, affordable, resilient, and sustainable cities and human settlements”¹⁸ Sometimes referred to a “right to the city,” this vision will help guide urbanization efforts around the world over the next generation.

The nation of China is uniquely positioned, both by its size and capabilities, to make the promise of this agenda a reality.

Bending the Learning Curve

China is the global face of urbanization.

In 2000, just over a third of China’s population lived in urban areas, growing to more than 56 percent in 2015. That number is forecast to increase to 60 percent by 2020.¹⁹ The nation’s cities have increased by 390 million people—larger than the entire United States—over the last two decades, and by more than 100 million people in the last five years alone.²⁰ Fifteen Chinese cities now have populations of more than 10 million. McKinsey, an American consulting firm, envisions the possibility of 15 Chinese cities with populations of at least 25 million by 2030.²¹

Urbanization in China over the coming generation will be transformative in nature. By 2030, eight European cities will drop out of the global top 50 cities while nine new Chinese cities will join that group—meaning 17 Chinese cities will be among the top 50 worldwide. “China’s lesser-known mega cities such as Chengdu, Hangzhou and Wuhan will become as prominent in 2030, in economic terms, as Dallas and Seoul are today,” Oxford Economics predicts.²²

Fortunately, China long ago grasped the fundamental relationship between urbanization, economic growth, and the well-being of its people. Between 1978 and 2012, urbanization increased real per capita income in China by 16 times, lifting a half billion people out of poverty. The country has become “an upper-middle-income country,” the World Bank concludes, “well positioned to become a high-income country.”²³

China has supported its growing cities with massive, targeted investment. Over the past 20 years, 8.5 percent of China’s annual GDP has gone to infrastructure, creating some 70 new airports, 43,000 kilometers of new expressways and 22,000 kilometers of additional rail.²⁴ As much as half of the world’s new construction may have occurred in China between 2007 and 2015.²⁵ Because of this, China’s cities are larger and better connected, and have avoided large-scale poverty and unemployment.²⁶

But urbanization in China has not come without cost. The country burns 47 percent of the world’s coal.²⁷ Deforestation and urban sprawl are national issues. The water supply is insufficient in 420 of China’s cities, with 110 of them facing severe water shortages.²⁸ Air pollution is an ongoing and life-threatening for many urban residents.

Chinese Premier Li Keqiang believes that urbanizing China remains at the heart of the country’s ability to continue its economic growth. “The huge potential that urbanization presents is the most powerful and lasting internal driving force for economic growth in this country,”²⁹ he said. But he also emphasized the need to avoid “urban slums” and “other social problems.”³⁰

China’s goals for urban growth remain unparalleled. The country anticipates housing an additional 300 million people in cities over the next generation, roughly equivalent to building from scratch all of the cities and towns in the United States. The cost of this development is estimated to be \$160 trillion, more than 10 times the U.S. Gross Domestic Product.³¹

China’s construction industry is now equipped to play a pivotal role in striking a balance between the need for growth and the need for sustainability. Studies have shown that building construction and maintenance in Chinese cities consumes nearly 47 percent of total energy and accounts for 60 percent of carbon emissions.³² The power of green buildings—structures that provide healthy and productive space, save resources like water and energy, reduce carbon emissions, enhance human connectedness and health, and exist in harmony with the environment—can have a meaningful impact on the Chinese economy and the global environment.

The Chinese landscape is especially conducive to the green building movement, with some of the country’s largest cities still less dense than comparable cities elsewhere. If, for example, Guangzhou were as dense as Seoul, South Korea, it would have another 4 million people. Shenzhen would have another 5 million.³³ This suggests that Chinese urbanization, focused on green building practices, can occur inward and upward, reducing sprawl and reaping the “superlinear” economic benefits of greater density.

Perhaps most encouraging, China in the twenty-first century has an opportunity to urbanize in a way that improves upon the experience of the rest of the world by employing cutting edge technology and processes, all while accelerating adoption. Professor Yu Zhou has written that China is in a position to “bend the learning curve of greening the built environment.”³⁴

In other words, China is poised to lead a revolution.

The Green Building Revolution

The green building revolution is sweeping the world.

The World Green Building Trends 2016 Study, released earlier this year, painted a picture of a dynamic, widespread, green building movement. More than 1,000 respondents reported using 19 different rating systems across 69 countries. “A key takeaway,” the study reported, “is that global green building continues to double every three years.” In some markets this growth will be as high as six-fold. In other market segments, green building is becoming a condition to remaining competitive, especially where international or multinational activity is high. The percentage of firms expecting to have more than 60 percent of their projects certified green is anticipated to grow from 18 percent currently to 37 percent by 2018. Respondents also suggested that green building would see especially strong future growth in the developing world. “Overall,” the survey concluded, “the global commitment to green building is transforming the built environment.”³⁵

Influences on global green building growth varied across regions, but on average included high client demand (40 percent), an emphasis on environmental regulations (35 percent), growing market demand (30 percent), and a commitment to “doing the right thing” (25 percent). This sense of “doing good” was also increasingly accompanied in mature markets by “doing well”: Green building practitioners expected a 14 percent savings in operational costs over five years for new green buildings, and 13 percent savings in operational costs over five years for green retrofit and renovation projects. Client demand has remained a consistently important driver for green building across seven years of studies, the report noted, demonstrating “how critical it is to create greater public awareness of the benefits of green and the importance of establishing the business benefits of green building.”³⁶

These benefits are real and include the creation of long-term equity. Building owners reported that both new and renovated green buildings command a 7 percent increase in asset value over traditional buildings.³⁷

The genesis of the green building revolution, and still its most influential player, is LEED, a global certification system that provides third-party verification of the features, design, construction, maintenance, operation and effectiveness of green buildings.³⁸ Every day, nearly 172,000 gross square meters (GSM) of space is certified using LEED®, with nearly 70,000 projects representing more than one billion GSM underway in 150 countries and territories around the globe.³⁹ Rick Fedrizzi, CEO and founding chair of the U.S. Green Building Council, the founder and sponsor of LEED certification, has said the global success of LEED “is a sign that international business leaders and policy makers recognize that a commitment to transforming the built environment is crucial to addressing major environmental challenges.”⁴⁰

China has the distinction of being the world’s third largest practitioner of LEED, behind only the U.S. and Canada—while still being very early in its adoption curve.

Although LEED was the first standard to be introduced in China, the country’s Green Building Evaluation Standard was launched in 2006 and has become a second, important mainstream green building rating system. Administered by the Ministry of Housing and Urban-Rural Development, the standard is sometimes called “Three Star” because it awards “three stars” to the highest rated green buildings. To promote adoption, some local governments require developers to commit to the standard when they bid for or acquire land. There can also be subsidies available at various government levels. Updates to China’s green building standard in 2014 provided evaluation protocols to differentiate between residential buildings and public-purpose buildings, and to provide bonus points for ongoing improvements.⁴¹ “Three Star” emphasizes land-saving and the environment, energy-savings, water resource utilization, construction material-saving, and interior environmental quality,⁴² and is designed to advance green building by showcasing leading technologies.

China has about 40 billion square meters of building space—five times that of the U.S.— with more than 2 billion square meters added annually.⁴³ Between China's two green building programs, more than 320 million square meters around the country is certified green building space.⁴⁴ According to China's Ministry of Housing and Urban Rural Development, this is slightly more than the 310 million square meters of LEED gross floor area (GFA) in the United States,⁴⁵ making China the largest single green builder in the world.

At the same time, one third of Chinese World Green Building Trends respondents report that less than 16 percent of their projects are green, while only 5 percent report at least 60 percent.⁴⁶ Green buildings on the Chinese mainland make up less than 1 percent of all buildings.⁴⁷ This speaks to the vast opportunity China has to accelerate adoption of green building practices, in the process helping to educate 800,000 real estate developers⁴⁸ and meeting the needs of a public worried about clean air, clean water, and energy costs. As professor Yu Zhou has observed, "In contrast to the widespread name recognition of LEED labeling in the United States," China's efforts at green building are still early and feel "like a best-kept secret."⁴⁹

This is rapidly changing, however. By 2018, some 28 percent of Chinese respondents expect to be doing more than 60 percent of their projects green.⁵⁰ In particular, Chinese developers, especially in the largest cities, have made a conscious effort to adopt LEED certification. Beijing and Shanghai, both home to a large number of multinational companies, were the first urban areas in China to embrace green building standards. But interest has now expanded to other cities like Guangzhou, Chengdu, and Shenzhen.⁵¹ One of China's richest cities, Shenzhen aims to have 80 percent of its new buildings green certified by 2020 along with extending user subsidies for electric vehicles and the city's new metro system. Shenzhen's goal is to have the city's carbon emissions peak by 2022, well before the national goal set for 2030.⁵²

Within mainland China, Hong Kong, Taiwan and Macau, there are more than 2,200 projects participating in LEED representing 110 million gross square meters.⁵³ Mainland China, for example, boasts the Haworth Showroom in Beijing, the first project in the world to certify under the latest version of LEED, which places an emphasis on building performance and human health. TAIPEI 101 in Taiwan, one of the world's tallest buildings, is a LEED Platinum skyscraper able to withstand earthquakes and typhoons.

On the Ground: Green Building in China

Angela Li Fei is General Manager for Environmental Market Solutions, Inc. (EMSI), China, a pioneer and international leader in green building and sustainable community design. EMSI offers LEED design consulting, sustainable building design support, as well as commissioning of services for new construction, existing buildings and sustainable communities. In her role, Li Fei works with environmentally focused organizations in China, and serves as EMSI's principle liaison to the U.S. Green Building Council and China Green Building Council. Li Fei's more than 20 years with United Technologies Corp. (UTC) in a variety of positions has given her a first-hand view of the rise of green building in China.

"EMSI entered the market in early 2003 at a time when there had not been much focus on green building in China," Li Fei says. "We were able to participate in many remarkable milestones in the country's green building development."⁵⁴ Some of those milestones included Fraser Place Shekou in Shenzhen, China's first LEED for New Construction & Major Renovations™ project; Beijing Olympic athletes' village, China's first LEED for Neighborhood Development™ Stage 2 golden class certification; and Shanghai Pratt & Whitney Aircraft Engine Maintenance Co., Ltd., China's first LEED Platinum project.⁵⁵

“In our early days, our major customers were multinational companies,” Li Fei continued. “Those were the companies that grasped the concept of LEED and brought it to China in 2006 and 2007. They planted seeds in the market, demonstrating how buildings could be designed, constructed and operated in a way that would improve the occupants’ working and living space while conserving resources. As these first commercial building projects were completed over three or four years—while the construction market was booming—customers began to see the impact. Because of this, the LEED market in China began to accelerate around 2010.”⁵⁶

The recent Green Building Study 2016 suggests that Li Fei has witnessed a market evolution in China unique from other countries. The top triggers included market demands (43 percent selected this as a top-3 trigger), environmental regulations (36 percent), client demands (34 percent), and “the right thing to do” (28 percent). But respondents in China also placed substantial importance on healthier neighborhoods (30 percent)—twice that of global respondents.⁵⁷

Likewise, China significantly exceeds global averages for respondents who plan to do green projects in new commercial buildings, new high-rise residential (4 floors and above), and mixed use development combining residential and commercial buildings.⁵⁸ These mixed use communities and emphasis on extended, green neighborhoods signifies an important direction in China’s need to create sustainable megacities.

“In our early days,” Li Fei says, “most of EMSI’s projects were single buildings where LEED for New Construction and LEED for Core & Shell were applied. Then we worked at the complex level—for example, a campus with high end residential buildings, commercial and office buildings, and malls, all in one district. In those cases, we introduced LEED for Neighborhood Development (LEED ND). Starting early in 2015,” she adds, “we saw governments looking for standards and that could involve much larger areas—for example, how to make an entire district or city ‘green.’”

This emerging demand is consistent with China’s desire to leverage green buildings into green neighborhoods, creating sustainable cities. Respondents in China were unusual in their desire to build green for benefits beyond energy use reduction, including protecting natural resources, creating healthy communities, and improving indoor air quality.⁵⁹ The emphasis on healthy indoor air puts China on the leading edge of a green building innovation that can have a direct and immediate impact on human health.

A new study from the World Bank determined that one in 10 deaths worldwide is attributable to air pollution exposure. The welfare losses from ambient and household air pollution cost the global economy more than \$5.1 trillion in 2013. Some 87 percent of the world’s population lives in areas that suffer pollution levels higher than the World Health Organization’s air quality guidelines.⁶⁰ “Reducing air pollution,” University of British Columbia Professor Michael Brauer has said, “is an incredibly efficient way to improve the health of a population.”⁶¹

Most people spend about 90 percent of their time indoors.⁶² A body of scientific evidence on perceived indoor environmental quality (IEQ) and health in green buildings has grown throughout the years in step with the green building revolution. Green building design has explicitly targeted the reduction of environmental contaminants linked to adverse health effects. In a series of studies, occupants of green buildings reported fewer sick building syndrome symptoms, fewer respiratory symptoms in children, and better physical and mental health. One study showed lower absenteeism and fewer hours affected by asthma and allergies in green buildings. However, all of these earlier studies relied on self-reported and subjective measures of health.⁶³

A 2015 study from the Harvard T.H. Chan School of Public Health’s Center for Health and Global Environment, SUNY Upstate Medical University, and Syracuse University was different. By simulating IEQ conditions in “Green” and “Conventional” buildings,

with participants blind to test conditions, the study was able to report quantitative, objective results. The result: Improved indoor environmental quality doubled occupants' cognitive function test scores.⁶⁴

The study found that task orientation, crisis response, information usage and strategy were significantly better in an environment with a high outdoor air ventilation rate and artificially elevated carbon dioxide levels. "We found that when participants spent a full day in a Green building," the study concluded, "there was a significant increase in their cognitive function scores compared with when they spent a day in an environment that had been designed to simulate a conventional building by elevating VOC [volatile organic compound] concentrations."⁶⁵

In other words, green building not only makes its occupants healthier, but also more productive. And in many urban settings, a healthy built environment can offer immediate relief from outdoor pollution that may take years to address.

In 2015, the Green Building Certification Institute (GBCI) and the International WELL Building Institute (IWBI) formally introduced the WELL Building Standard in China. WELL focuses on human health and well-being in the built environment, including air, water, nourishment, light, fitness, comfort, and mind.⁶⁶ WELL is designed to complement LEED, Three Star and other green building rating programs.

"In China," Li Fei explains, "air quality and health issues have become critical, especially in big cities like Beijing and Shanghai. The focus on health and well-being comes at the right time. It's positively received in China by both developers and multinational companies because it closely addresses current market needs."

Challenge and Growth

Challenges to green building in China include higher first cost, lack of public awareness, and concerns about affordability.⁶⁷ "When we first introduced the LEED system to our Chinese customers," Li Fei says, "the most common questions were: What is the incremental cost to do this? What is my return? That's when we shared with them the U.S. Green Building Council's studies that showed improved return in terms of the rental rate and value of buildings certified under LEED. These customers came to believe that LEED was a market differentiator that could bring the project to a better competitive position."

"Customers were also encouraged by the building's lifecycle savings," she explains, "especially energy, heating and cooling. EMSI conducted computer analysis together with real life cases to show these efficiencies, and how upfront incremental costs would be returned over time. So customers could see improved rentals prices, long-term energy savings, and a higher value of the building in the long term."

Experience has demonstrated in China that "green" does not mean "expensive." And the incremental cost of green buildings is falling.⁶⁸

Builders and developers in China have also tended to focus on green building for new construction at the expense of existing buildings.⁶⁹ A recent slowdown the new construction market, renewed focus by the government, and better understanding of retrofit economics, is changing this dynamic. "In China," Li Fei says, "the new norm is focused on both new and existing buildings. The construction market has slowed. A lot of our clients with many existing buildings, for example, are thinking of setting up a corporate level energy monitoring system to benchmark the energy efficiencies among different buildings and to look for further energy savings opportunities. This is an opportunity," she says, "for LEED to address China's large stock of existing buildings."

China's Ministry of Construction has targeted a retrofit of 25 percent of existing public and residential buildings to make them greener by 2020. If successful, this could reduce coal use in the country by 135 million metric tons annually, or about 10 percent of the total used nationally in 2014 to generate power.⁷⁰

Li Fei sees continued geographic acceleration in China's green building program. "While LEED has been introduced in China's largest cities," she says, "there are still huge opportunities in the second and third tier cities. We need more education and more sharing of benefits, both tangible and intangible."

The intangible return has become especially significant, she says. "It is very important that China's top developers show to the public that they are moving their companies in a way that will bring about a better future." Over time, she concludes, "a lot of our clients incorporated part of the green building code into their corporate social responsibility and sustainability roadmaps, things that matter to society and to the public. Green building has helped to change people's mindset."

Great Change, Great Opportunity

EMSI, which operates as part of UTC Climate, Controls & Security, a unit of UTC, is an established leader in helping its clients achieve both Three Star and LEED certification. The company's work "on the ground" in cities across China showcases a full range of green building advances. Notable projects,⁷¹ which serve as models for green building around the world, include:

- **Baoshang Bank**, now under construction in the north China city of Baotou, is a mixed office building and shopping mall complex in which EMSI is helping target Three Star certification. Slated for completion in October 2016, the project features high-efficiency energy solutions and an indoor air quality control system. It represents a prime example of the rapid spread of green building practices into second- and third-tier cities throughout China.
- **The Tianjin Community Culture and Sports Center**, another EMSI-assisted project, received China Green Building Label Three Star in June 2013, and LEED for Core and Shell Platinum certification in February 2015. The project, aimed to showcase how integrated design and technologies could achieve net-zero energy, included electricity generation from solar and geothermal sources, intelligent lighting control and automatic control of fresh air flow rate based on CO₂ concentrations, and an adjustable shading system. As a result, the Tianjin Community Center reduced its annual water usage by 45 percent and its energy use by 77 percent.
- **The Shanghai Pratt & Whitney Aircraft Engine Maintenance Co., Ltd.** (Shanghai Engine Center) is located in the Qingpu district, a joint venture between China Eastern Airlines and Pratt & Whitney.⁷² It officially opened in September 2009 as the first LEED Platinum facility in China, an environmentally friendly and highly efficient CFM56® engine maintenance, repair, and overhaul facility. The 26,000 gross square meter facility features at least 20 percent of its construction material sourced locally, 10 to 20 percent with recycled content, and 70 percent of construction waste diverted from landfills. The facility includes high-performance, energy-efficient windows that contribute to reduced electricity and cooling. At least 12.5 percent of the facility's energy is produced from renewable sources.
- **The LEGO Toy Manufacturing (Jiaxing) China Factory** is located in the Jiaxing Economic & Technical Development Zone, Zhejiang Province. This is The Lego Group's first Asian factory, and will become its largest manufacturing facility when completed. EMSI assisted The Lego Group in making this the first industrial project in China to receive certification under LEED v4 for New Construction.

- EMSI provided LEED consulting services to **Beijing's China Development Bank**, including strategies for reducing energy and water usage, and a carbon dioxide and fresh air monitoring system that ensured optimal fresh air to occupants. The project also focused on public illumination strategies that optimized efficiency. As a result, annual water usage was reduced by 55 percent, energy by 19 percent, and waste recovery reached 82 percent.
- **The Early Childhood Center of the Beijing City International School** received its LEED for Schools Gold Certification in August 2015. EMSI worked closely with the project team, teachers, administrators and the community to help create a healthy learning environment for its 3-year-old to 5-year-old occupants. Green strategies included a fresh air filtration system with CO₂ sensors, 100 percent low volatile organic compound paint, and occupancy sensors to control illumination. The result was a facility that used 34 percent less water and 18 percent less energy.

Angela Li Fei also notes, “China Sino-Ocean is one of China’s top real estate developers. EMSI provides LEED services, sustainable design, energy consulting and the WELL service to many of its projects. In the very beginning, we only introduced LEED to their key, high exposure, high end projects—a few commercial buildings and shopping malls. After the certification was given, these early projects began to generate the benefits of green building. Now,” she says, “Sino-Ocean provides LEED standards to virtually all of its commercial projects. And they dig much deeper into the areas that matter to them including things like energy efficiency; they will go beyond the LEED standard to explore all possible solutions to make the building more energy efficient. This is a good example of how a company adopted LEED early on and used it to expand its green building perspective.”

Examples of the EMSI/Sino-Ocean partnership include **Yuanyang Tianjiao A1-A10**, a multifamily residential project that was certified LEED Gold and was the first mixed-use project in China to register for WELL certification. Likewise, **Ocean International Center Phase 2 Building A** is located along Beijing’s 4th Ring Road, a Grade-A office tower built not just with “green” in mind, but with the theory of “We Live,” combining energy savings, environmental protections, and occupant well-being. Highlights include energy cost savings of more than 12 percent, extensive water conservation strategies, low volatile organic compound paint and low-emission formaldehyde construction materials, integrated recycling, and open space for 25 percent of the project with drought resistant and native plants, and smart controls utilizing drip irrigation.

This kind of development represents the future, helping to evolve and extend green building practices. These visionary projects also demonstrate the kind of global leadership that China can play. “The customers in the early days cared more about certification to attract occupants and to get a financial return,” Li Fei says. “Now, they have started to care more about the elements that matter to their clients. Certification is still important, but equally important is water conservation, air quality, and a healthy built environment.”

With great change comes great opportunity. Chinese cities represent places where people and the built environment will come together in numbers never before seen. “Green mountains and clear water are as good as mountains of gold and silver,” Chinese President Xi Jinping has said. “To protect the environment is to protect productivity and to improve the environment is to boost productivity.”⁷³

The acceleration of green building in China can serve as a model to the rest of the world, creating not just green buildings, but the kinds of healthy, sustainable cities that will ensure rising wealth and well-being for humankind throughout the twenty-first century.

About EMSI and UTC

EMSI (Environmental Market Solutions, Inc.) is an international leader in providing energy efficient, green and sustainable services for building and community. EMSI provides energy related solutions throughout a building's lifecycle. Clients include many of the world's largest companies in the industrial, retail, real estate, and service sectors, as well as numerous independent small private developers. Projects include commercial office buildings, shopping malls, hotels, factories, multi-family residential properties, and education facilities. EMSI offers services of green building certification consulting, building physical analysis, sustainable design support, commissioning, retro-commissioning, energy audit,

energy management, measurement and verification, and energy turn-key retrofit for new construction, existing buildings, and sustainable communities. The company works with large multinational companies to prepare global green building/sustainable strategies and implementation plans, which can be applied across clients' global real estate portfolios. EMSI has offices in the U.S and China and we are currently active in 12 countries in North American and South America, Asia, and the Middle East.

UTC serves customers in the commercial aerospace, defense and building industries and ranks among the world's most respected and innovative companies.

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