

CTBUH Journal

International Journal on Tall Buildings and Urban Habitat

Tall buildings: design, construction, and operation | 2012 Issue III

China Special Issue: 9th World Congress

Greenland's "Breathing Tower" in Wujiang

China's Advanced Façade Technologies

Details on China's Unique Linked Towers

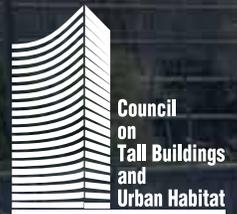
Special Report: China's New Economy

Meet the President of Shanghai Tower

Inside the China Broad Group

Special Issue
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SOM



This Issue

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Print

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Front cover: Suzhou Center, Wujiang © SOM
Back Cover: Suzhou Center – “The Lung” © SOM



In 1929 the Sassoon House opened in Shanghai along the Bund at an incredible height of 77 meters and 13 floors. The art deco structure, built

for Victor Sassoon, was the tallest building in China at the time. Although far shorter than the 381-meter Empire State Building, which was two years away from completion in New York City, the Sassoon was a major achievement for China and a symbol of Shanghai’s growing international prominence. The high-rise was born in China!

It wasn’t until 1990 that another significant tall building would again define the Shanghai skyline. With the completion of John Portman’s Shanghai Center, China was back on the map. Through a complex of three buildings, the tallest rising to 165 meters and 48 floors, and its signature “Portmanesque” inner drop-off covered courtyard, this urban enclave set in motion a boom in tall buildings that is still steaming forward today.

Today the 492-meter Shanghai World Financial Center, completed in 2008, is the tallest building in China and the third tallest building in the world. However, this will be short lived as the adjacent Shanghai Tower will soon zoom by on its way to 632 meters and 121 floors. At this writing the tower is constructing its fourth of eight zones that are stacked and enclosed by twisting sky gardens that rotate up around the tower, creating the dynamic signature and internal social spaces that will make this building an instant landmark and the second tallest building in the world when it is completed in 2014.

The history of the “tall building” in Shanghai is a fitting foundation for the excitement and enthusiasm for our 9th CTBUH World Congress in Shanghai. The continued pace of tall building construction in China is unprecedented and there is no mystery to why our most important CTBUH event is hosted in one of the most exciting cities and countries in the world. Currently there are 63

buildings around the globe that exceed 300 meters – 24 of those are in China!

China is dealing with the issues and challenges of developing urban environments on a massive scale. The migration of a great portion of the country’s 1.3 billion people from a rural society to an urban society has demanded that the Chinese government embrace the tall building as possibly the only strategy to create vibrant, livable cities – and they are putting their exclamation mark to it. The Chinese have fostered a global partnership with some of the most creative and skilled urban planners, architects and engineers from the West to create more tall buildings in a short period of time than any period before them.

Now China is entering a new era in its tall building history. As documented in this special issue of the CTBUH Journal, the talent working on the next generation of China buildings is on the cutting edge of new technologies and new designs. Sustainability and efficiency are now at the forefront of the tall building planning process, not an afterthought. Creating landmark towers is only part of the equation in China these days.

But many challenges lie ahead. The World Congress is bringing together the broad multi-disciplinary cast customary with CTBUH events from around the world to share ideas, exchange best practices, and present leading innovation in the field of tall buildings. The level of expertise and experience represented at the Congress is truly amazing. Perhaps more than any single event, the Congress will capture the energy and spirit of the industry at this key moment in China’s tall building history.

Onward and Upward,

Timothy Johnson, CTBUH Chairman / NBBJ

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Case Study: Greenland's Suzhou Center, Wujiang

A Unique Collaboration Results in "Breathing" Tower

The latest project in the long partnership between Greenland's Suzhou Center and the local Chinese government is a 300m tower in Wujiang, Jiangsu province. The project is a unique collaboration between Greenland's Suzhou Center and the local Chinese government, resulting in a unique architectural design.

Research: China's Unique Linked Towers. Finding Structural Solutions by Connecting Towers. This article explores the structural challenges and solutions for connecting towers in a linked tower structure, focusing on the innovative design and engineering used in the project.

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Special Report: China 2012

Special Report: China 2012. Big Shifts Ahead as China Enters New Era. This report discusses the major shifts in China's architectural and construction landscape in 2012, including the rise of supertall buildings and the impact of the new era on the industry.

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“The rise of supertall buildings in modern Chinese architecture has a social context... Chinese ancestors relentlessly tried to conquer the highest mountains and the biggest rivers in order to challenge the order of nature.”

Zhang Junjie, Chairman of the Board, East China Architectural Design & Research Institute, Page 34

Is China's Property Bubble Ready to Burst?

Soaring prices led many analysts to predict that a bubble was forming in China's housing industry and prompted government measures to dampen the market. This month's debate looks at the future of China's property market.

NO

KK Fung

Managing Director, Jones Lang LaSalle, China

There are few topics on which reasonably well informed people disagree as passionately as this one. So that there is no mistaking our view on the subject, I will say it right up front – it's not a bubble. This is not to say that a bubble could have formed if the government had not intervened as actively as it has over the last two and a half years. But it is our view that, thus far, these interventions have effectively mitigated those risks and the fundamentals of the market make the likelihood of a policy mistake by the government relatively low over the short and medium term.

Why does the government manipulate the housing market in China? The first reason is that it accounts for nearly 10% of GDP on a direct basis. So in order to effectively manage the macro economy the housing market must play a central role. The second reason is to achieve a number of socially desirable outcomes, such as encouraging the development of more affordable housing.

We see both goals at work under the current iteration of the housing policy regime. Market conditions have been suppressed to an ever-increasing extent since late 2009 to cool off an overheating economy and are now being eased to support the economy in its soft-landing trajectory. At the same time, policy has had a much greater dampening effect at the high end of the market, where investor demand has effectively been marginalized, thereby making more affordable housing aimed at first time home buyers the path of least resistance for developers.

Equally important have been the slew of policies designed to de-incentivize land-banking, so that developers are building apartments rather than hoarding land. By suppressing demand and boosting supply, we have seen rapid price appreciations completely arrested.

The government has been steadily taking its foot off the brake since the beginning of 2012 and transaction volumes are rising. With so much supply, developers are unlikely to gain pricing power anytime soon, so the risks of rapid price increases are very low. And the industry as a whole is moving away from building upper middle class housing and toward apartments for people who make average incomes.

Rather than a bursting bubble, we see China's housing market as healthier than it has been in several years, though conditions for developers remain challenging on the ground.

YES

Dr. Tianlun Jian

Economist who has worked for China's Central Bank and several investments corporations

Is the ice thawing and spring returning to China's housing market? The recent interest rate cuts and Premier Wen Jiabao's words reemphasizing "stable growth" have led the market to wonder if the Chinese state has changed its policies for controlling the housing bubble.

Moreover, in a few cities, housing prices and sales volumes either stopped declining or picked up in the last couple of months. Nonetheless, the facts don't support optimism about the housing market at this time.

First, even though the decelerating economic growth forced the People's Bank of China to cut interest rates twice within a month, the Chinese state seems to be firm about its housing control strategy. Within ten days, four ministries independently made announcements to stop the rumors about easing the controls on the housing market. Second, for the country as a whole, the downward trend has been continuing since October 2011. Among the 70 cities that the National Bureau of Statistics follows, housing prices declined in 55 in May compared to a year earlier.

Third, housing prices in large cities are too high by any measure. In many cities, including Beijing and Shanghai, price-to-income ratios are around 30 to 1, almost twice as much as Japan's 16 to 1 when its housing bubble burst in 1990. In the United States, the housing price-income ratio was only 3.3 to 1 in 2011, and even in Q4 2005, at the peak of the housing bubble, it was just 5.1 to 1. Fourth, vacancy rates in China have been well above the normal range of 5 to 10% in advanced countries. Several studies in Beijing, Zhengzhou, and Hangzhou show that vacancy rates are around 30%.

On March 31, 2012, the Beijing Public Security Bureau published a report of a 100-day population investigation project. It says that in Beijing, 3.8 million housing units, out of the existing 13.2 million housing stock, are vacant.

In sum, the correction in China's housing market will continue. The soaring prices in Beijing, Shanghai, and other largest cities will drop significantly. It is only a matter of time. A hard landing will speed up this process.

Asia

Several high-profile projects under construction hit newsworthy milestones in recent months, including **Shanghai Tower**, which sailed passed the 300-meter mark. The Gensler-designed tower in **Pudong** will eventually hit 632 meters, making it the tallest building in China and the second tallest in the supertall world. The Tower will join the 420-meter Jin Mao building and 492-meter Shanghai World Financial Center to anchor the Lujiazui business district.

Meanwhile, Skidmore, Owings & Merrill (SOM) started work on landmark towers in **Beijing** and **Tianjin**. The **China World Trade Center Phase 3B** project, part of the China World Trade Center, will reach 280 meters, while the **CTF Tianjin Tower** will hit 530 meters, making it the second tallest tower in the city.

The Tianjin Tower will incorporate several new technologies to make it “significantly quieter, with less movement than other tall buildings,” said William Baker, SOM Structural and Civil Engineering Partner and a member of the CTBUH Board of Trustees. The curving glass façade conceals eight sloping columns that will help the structure handle gravity and lateral loads, as well as seismic conditions. In addition, multi-story vents combined with the aerodynamic shape of the building “dramatically reduce wind forces by reducing vortex shedding,” the firm says.

But perhaps the biggest news in China was the long-delayed completion of the OMA-



Shanghai Tower, Pudong. © Gensler



China World Trade Centre Phase 3B, Beijing. © SOM

designed **CCTV Headquarters** in Beijing, which is already a landmark of the Chinese capital. The 234-meter tall complex with its jarring, complex angles was under construction for eight years. Although the façade was completed for the 2008 Olympic Games, a deadly fire in an adjacent building in 2009 stalled construction.

“It’s mainly the end of our work, but it’s actually the beginning of its life,” co-designer

Ole Scheeren told the Associated Press when the project opened. “From here on, the building finally will be what it’s made for.”

In Japan, another long-awaited tower opened to the public, the **Tokyo Sky Tree**, which has officially debuted as the world’s tallest telecom tower. The Sky Tree, which is twice as tall as the Eiffel Tower, is already a city landmark and popular tourist destination, with observation decks at 350 meters and 450

THEY SAID

“In fact, the serial arrangement of air conditioning units turns them into an architectural absurdity.”

Ferdinand Oswald, in his paper “Natural Ventilation of Residential High-Rises in Subtropical Regions,” presented at the CTBUH 9th World Congress Shanghai.



CTF Tianjin Tower. © SOM



Tokyo Sky Tree. © Orghi Dean

Case Study: Greenland's Suzhou Center, Wujiang

A Unique Collaboration Results in "Breathing" Tower



Ross Wimer



William Baker



Mark Nagis



Aaron Mazeika

The latest project in the long partnership between Skidmore, Owings & Merrill and the Greenland Group, a 358-meter tower in Wujiang, incorporates passive ventilation techniques into the design to create a unique interior "lung."

In today's world of increasingly sophisticated design technology, it is rare to find an established architect/client partnership that has consistently advanced the innovation of tall building design. Capitalizing on their successful collaboration on Zifeng Tower (formerly Nanjing Greenland Financial Center), the architecture, engineering, interior design and urban planning firm of Skidmore, Owings & Merrill (SOM) has since partnered with Shanghai's Greenland Group on several important, high-profile additions to the Greenland portfolio: Zhengzhou Greenland Plaza, Jiangxi Nanchang Greenland Central Plaza Parcel A, Jiangxi Nanchang Greenland Zifeng, Greenland Center Dawangjing and Greenland Group Suzhou Center, as well as several design competitions (see an overview of these projects at the end of this article). These towers are designed to anchor large developments and act as world-class monuments within these new districts, while also introducing new technologies that are

setting precedents for the design of tall buildings in China and throughout the world.

This paper focuses on the most recent addition to the team's collaborative portfolio. At 358 meters, Greenland Group Suzhou Center marks the Wujiang waterfront with an aerodynamic form that has a unique presence, while accommodating its program with economy and efficiency. The design incorporates passive ventilation techniques through a unique interior "lung," creating an efficient "breathing" tower.

Site and Context

With a total building area of more than 284,000 square meters, Greenland Group Suzhou Center will become the defining visual landmark for the new Wujiang lakefront development and, by extension, for the city as a whole. Sited prominently along Lake Taihu

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Ross Wimer has created innovative architectural projects in over 20 cities on five continents. Although the majority of these designs are for large scale mixed-use programs such as Leamouth Peninsula in London, Infinity Tower in Dubai, and White Magnolia Plaza in China, his projects are dramatically diverse. Since joining SOM in 1995, he has worked to integrate the rigor and logic of engineering into his designs. Environmental sustainability and expressive structure typically help define the aesthetic of his architecture, which can be seen in projects such as Zhengzhou Greenland Plaza.

William Baker is a Structural Engineering Partner at SOM and a member of the CTBUH Board of Trustees. Throughout his career, Bill has dedicated himself to structural innovation. His best known contribution has been to develop the "buttressed core" structural system for the Burj Khalifa, the world's tallest manmade structure. While widely regarded for his work on supertall buildings, his expertise also extends to long-span roof structures, such as the Virginia Beach Convention Center, as well as specialty structures like Broadgate-Exchange House.

Mark Nagis has had the opportunity to work on diverse and innovative architectural projects throughout the Middle East and Asia. Notable projects include the Greenland Central Plaza, a pair of 289 meter tall towers in Nanchang, China, as well as the Greenland Group Suzhou Center.

Aaron Mazeika has led the structural engineering team in the design of over 30 high-rise towers in China. Notable projects include the New Poly Plaza in Beijing, China, which features the world's largest cable-net supported glass façade, and the Al Hamra Tower in Kuwait City, Kuwait.





Figure 1. Greenland Group Suzhou Center, Wujiang. © SOM

in the Jiangsu province of China (see Figure 2), the building's dynamic tapering form effectively unifies its office and residential uses within a gently curved volume that culminates in a 30-story tall opening which marks the tower's presence on the city skyline.

Like many of the SOM towers now being designed for Greenland, this building is in the first phase of a new development that encompasses many city blocks. It needs to be the catalyst that encourages other developers to follow. Since the adjacent blocks have yet to be developed, the Suzhou Center will function as a "city within the city." With office, retail, residential and hotel uses, the complex is active throughout the day. Although housing a mix of uses within a tower is a complex task to design and construct, by stacking the uses and providing shuttle elevators to access sky lobbies for each program, the core works efficiently. At ground

level, separate lobbies ensure that each use can operate independently.

Shaped by the prevailing views, prominent wind direction and environmental performance factors, the design and positioning of the tower contribute to defining a place of memorable and lasting value. The design takes full advantage of its unique and dramatic location immediately adjacent to the lake as well as the pedestrian promenade which defines the heart of the Wujiang central business district. The designers' decision to orient the tower in the east-west direction is in direct response to two environmental factors—the wind and sun. Elongating the tower in the east-west direction takes advantage of solar radiation at the times of the day when it is most beneficial, while minimizing the impact when it is least advantageous.

Site and Context

- 1 Lake Taihu
- 2 Regional Bus Depot
- 3 Primary Pedestrian Paths
- 4 Panoramic View to the South
- 5 Retail Podium
- 6 Local Elevated Train Stop
- 7 Central Retail Plaza & Media Wall
- 8 Ballroom Drop-off
- 9 Hotel Drop-off
- 10 Office Drop-off
- 11 Retail Drop-off
- 12 Panoramic View to the North
- 13 Local Bus Stop
- 14 Prevailing Summer Wind
- 15 Primary Development Axis

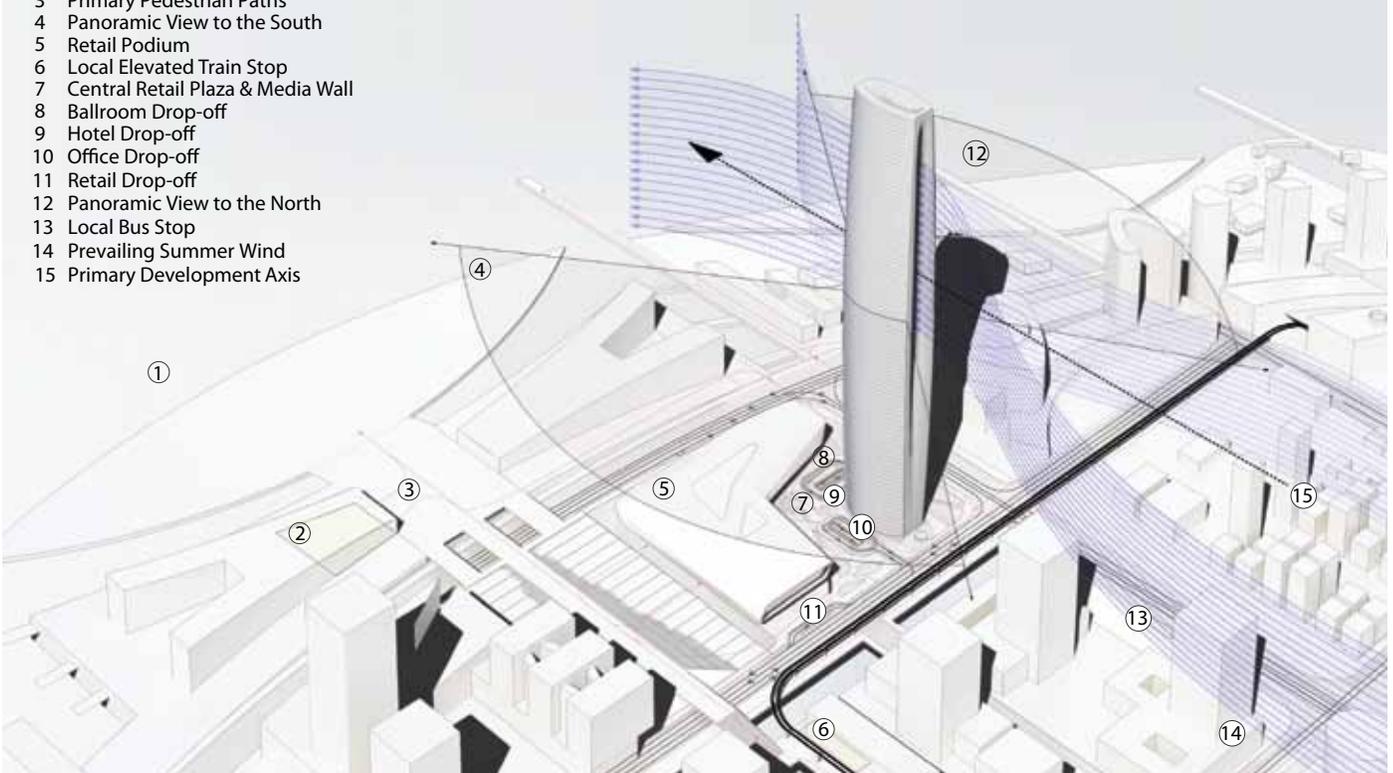


Figure 2. Suzhou Center contextual plan. © SOM

Big Shifts Ahead as China Enters New Era

Report by Kevin Brass, CTBUH Public Affairs Manager

Reports out of China these days are a jumble of mixed messages and conflicting imagery. One night network business news programs spotlight video of empty shopping malls and deserted residential developments. The next night the screen fills with scenes of booming cities teeming with life and landscapes covered with soaring new towers under construction.

One thing is clear: for more than a decade China's economy produced historic, unprecedented double digit annual growth, churning out the type of numbers that make economists swoon. The country turned from sleeping giant to economic power, sending out tsunami-like ripples through markets around the world. It was a wild, jaw-dropping era – and, by most accounts, it is over. The economy is slowing to rates not seen in a decade, government data shows.

But China's slowdown is another country's halcyon days. While the United States and EEU zones stutter, China's GDP is expected to grow by 8% this year. Even within the slowdown, the country's business and industry is forecast to expand to record levels, as the government pushes to meet the needs of its dramatically changing country.

China is in the midst of a historic transition, a shift that will profoundly change the global economy, analysts agree. At its heart is a

rapidly forming middle class, a new generation of well-educated Chinese with disposable income.

"The demographic change going on is unmatched in human history," said Michael Klibaner, head of research in China for Jones Lang LaSalle. In Shanghai, for example, the number of residents earning US\$5,000 or more a year will rise from 15% in 2006 to 51% in 2045, according to JLL data. "The same trend is happening all over the country," Mr. Klibaner said. "That is a massive opportunity."

Global Reality

A large portion of China's current economic woes are attributable to forces beyond the country's control. Once isolated, China is now directly linked to the global economy. In the last year slowdowns in Europe and North America undercut China's best customers. "The reality is that we are seeing a slowdown in China's economy through 2012 due to a lagging economic recovery in Europe and the United States impacting China's manufacturing and export sectors," said Ben Cavender, Associate Principal of China Market Research Group (CMR).

Foreign direct investment in 2011 was down 2.8% in the first quarter from a year earlier, in part due to a 30% drop from Europe, which

has been wrestling with its own issues. "With the European Union accounting for one-third of global import demand, a recession there will inevitably take its toll on East Asia," the World Bank noted in a recent statement.

The residential property market, one of the key drivers of tall building construction, has been one of the areas hardest hit by the country's economic twists. After a decade of record price escalations, sales have slowed in the wake of government measures designed to dampen an overheating market. With new homes far out of reach of the typical Chinese family's income, the government enacted measures to limit the number of homes any one person can purchase and increased the restrictions on financing, hoping to deter speculators.

On one level, the measures have had the desired effect. Prices for new build homes in 20 major cities dropped 6% from the peak in the third quarter of 2011 to the end of June, 2012, according to Knight Frank data. Prices are expected to fall further in the next six months.

Real estate accounted for 10% of the country's GDP in the boom years, with residential the biggest contributor. "There was a huge dependence on the [real estate] sector, even after the peak of the market in the United States in 2007," Mr. Klibaner said. Uncertainty has stalled many projects, particularly developments targeting the luxury markets in Tier 1 cities such as Shanghai and Beijing. "The high end of the market, where foreign investors typically played, was impacted more significantly by policies," Mr. Klibaner said.

Chinese developers were particularly hard hit by the recent economic shifts. Many were heavily leveraged to banks – a scenario familiar in Western markets. "Weak property developers in China are likely to face a test of their survival this year," Standards & Poor concluded in a report issued this spring.



Pudong Skyline, Shanghai. © MORI

With so many factors buffeting the economy, China's economic growth slipped to 8.1% in the first quarter of 2012, the fifth consecutive quarter of slowing expansion. The decreasing rate of growth is expected to continue through the rest of 2012, led by sliding prices and slower sales in residential housing. Some analysts are even more pessimistic. Deutsche Bank AG has reduced China's growth estimate for this year to 7.9%, while Credit Suisse Group AG lowered its forecast to 7.7%. The predictions compare with a 9.2% expansion in 2011.

"Clearly the economy is much, much weaker than most people thought until recently," Diana Choyleva, a China economist in the Hong Kong office of Lombard Street Research, told the New York Times this spring. "They have a real mess on their hands."

State of Transition

But even the most pessimistic analysts recognize that China's leaders hold an extraordinary ability to manipulate the economy. In the first half of 2012 the government enacted a series of stimulus measures to help stabilize the economy, including an estimated 1 trillion Yuan (US\$157 billion) of spending on everything from road and bridge projects to subsidies for home appliance purchases. Interest rates were cut for the first time in three years.

While nowhere close to the size of the stimulus package put together in 2008 – which sparked three years of growth, despite the global slowdown – the measures were a clear signal the government was responding to the realities of the market. Premier Wen Jiabao announced China will continue to focus on the continued growth of the economy, rather than concerns about inflation, in line with the China's 12th Five Year Plan, released in 2011. The plan calls for a focus on scientific development and emerging industries, as well as transportation and energy infrastructure.

In the wake of the economic slowdown, from January to April of this year the National Development and Reform Commission

Developers Eyeing New Markets, New Cities

China's slowing residential market is attracting headlines, but other segments of the property industry continue to surge. Demand for office and retail space is still driving development, especially in inland cities eagerly creating new central business districts.

Office rents increased last year in all 15 major cities tracked by the property firm CB Richard Ellis. Office rates in Beijing jumped 80% from 2010 to 2011, while the price of Shanghai space jumped 25%, according to CBRE.

The vacancy rate in Beijing was a skimpy 3.5%, while only 6.7% of Shanghai space was available, Knight Frank reports. Outside a few high profile projects, the next wave of office towers is not expected to hit Beijing and Shanghai until 2015 and 2016

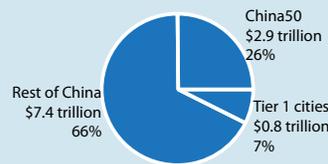
"Occupier demand remains strong in Tier One cities but it is rising rapidly in emerging markets, particularly in gateway cities such as Chengdu," said Andrew Slevin of CBRE.

But developers are shifting their focus to Tier Two and Three cities, which are trying to woo regional operations away from the high prices of the big cities. "Many large domestic and international companies are in the process of shifting their operations from first tier cities like Shanghai and Beijing to these other cities as infrastructure improves and the operation costs... are significantly more favorable," said Ben Cavender of CMR

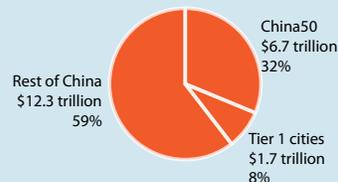
Retail development is also attracting renewed interest, despite the oft-reported glut of space. China's continued move to a consumer-driven economy as the retail sector "poised for a major update... and we expect its impact to be significant," Jones Lang LaSalle reports

Major international retailers such as Tiffany and Marks & Spencer continue to make their first foray into such cities as Nanjing, Chongqing and Wuhan. For investors, it is "hard to find retail assets in China anywhere," said Michael Klibaner of Jones Lang LaSalle.

China 2011: \$11 trillion (GDP PPP*)



China 2020: \$21 trillion (GDP PPP*)

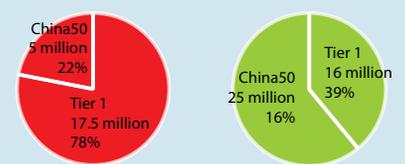


*PPP is Purchasing Power Parity

Source: EIU, IMF, IHS Global Insight, and Jones Lang LaSalle Real Estate Intelligence Service, 2012

Note: China50 refers to the next top 50 non-Tier One Cities

Tier 1 Cities vs China50 in 2011



Tier 1 Cities vs China50 in 2020



■ Grade "A" Office
■ Retail

Source: Jones Lang LaSalle Real Estate Intelligence Service, 2012

Comparison of China's Tier 1 cities vs China50 economic growth in 2011 and 2020.

About the Council

The Council on Tall Buildings and Urban Habitat, based at the Illinois Institute of Technology in Chicago, is an international not-for-profit organization supported by architecture, engineering, planning, development and construction professionals. Founded in 1969, the Council's mission is to disseminate multi-disciplinary information on tall buildings and sustainable urban environments, to maximize the international interaction of professionals involved in creating the built environment, and to make the latest knowledge available to professionals in a useful form.

The CTBUH disseminates its findings, and facilitates business exchange, through: the publication of books, monographs, proceedings and reports; the organization of world congresses, international, regional and specialty conferences and workshops; the maintaining of an extensive website and tall building databases of built, under construction and proposed buildings; the distribution of a monthly international tall building e-newsletter; the maintaining of an international resource center; the bestowing of annual awards for design and construction excellence and individual lifetime achievement; the management of special task forces/working groups; the hosting of technical forums; and the publication of the CTBUH Journal, a professional journal containing refereed papers written by researchers, scholars and practicing professionals.

The Council is the arbiter of the criteria upon which tall building height is measured, and thus the title of "The World's Tallest Building" determined. CTBUH is the world's leading body dedicated to the field of tall buildings and urban habitat and the recognized international source for information in these fields.

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