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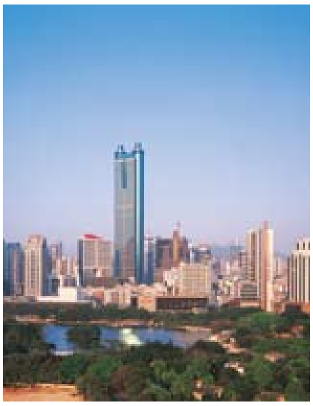
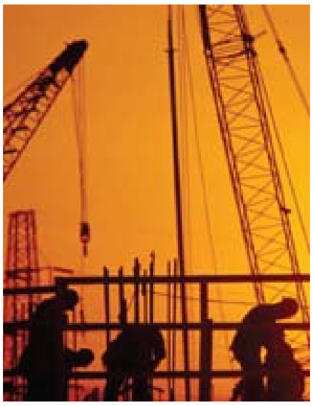
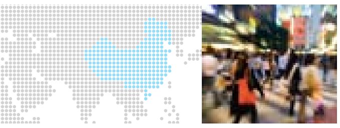




March 2009

Preparing for China's urban billion



McKinsey Global Institute

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Our research is conducted by a group of full-time MGI fellows based in offices in San Francisco, Washington, DC, London, Brussels, and Shanghai. MGI project teams also include consultants drawn from McKinsey's offices around the world and are supported by McKinsey's network of industry and management experts and worldwide partners. In addition, MGI teams work with leading economists, including Nobel laureates and policy experts, who act as advisers to MGI projects.

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Preparing for China's urban billion

McKinsey Global Institute

March 2009

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Preface

The McKinsey Global Institute (MGI) launched a major initiative two years ago to study the evolution of urbanization of China and to derive insights into how this process will develop. More than 20 consultants and experts have explored the global economic and social implications of the unprecedented expansion of China's cities and how national and local policy makers can shape China's urban development to 2025 and beyond. *Preparing for China's Urban Billion* describes the findings of our research and is available to download for free at our web site www.mckinsey.com/mgi.

The views presented in this two-volume work are based on long-term macroeconomic trends in China. While the recent downturn in the global economy is bound to impact China in the short term, we believe the long-term fundamentals on which we have based our study are likely to hold out.

Janamitra Devan, an MGI senior fellow in the Shanghai office, worked closely with us to provide overall leadership for this project. Stefano Negri, an engagement manager in the Shanghai office, managed the project, which, for the most part, involved our professional staff in China. The project was comprised of three significant components, each led by a sub-team. Luke Jordan, a consultant in the Shanghai office, led and managed the analysis of urbanization scenarios with team members Flora Yu, Wayne Chen, Wander Yi, Nica Liu, Ellen Mo, and Zhiqiang He. Geoff Tsen, a consultant in the Shanghai office, and Alexander Maasry, a consultant from the New York office, led our city case studies and field visits with team members Liang Wang, Kevin Huang, Yichan Yuan, Ji Zhong, and Alexandra Liu. Other consultants who provided significant research support included Xiao Chen from the Munich office, Francesco Renzo from the Milan office, and Dapeng Lai from the Shanghai office. Senior research analyst

Yangmei Hu led the econometric modeling effort with team members Jonathan Ablett from the North America Knowledge Center, and Xiujun Lillian Li, Mei Song, and John Gao from the China Knowledge Center. Geoff Greene, an independent econometrician, made significant contributions to the building of the McKinsey Global Institute China All City model.

Many McKinsey colleagues around the world including Dominic Barton, Andrew Grant, Gordon Orr, and Ian St-Maurice from the Shanghai office; Heinz-Peter Elstrodt from the Sao Paulo office; Kevin Lane from the Zurich office, and Diana Farrell from the San Francisco office provided valuable insights and advice.

We owe a special debt of gratitude to our external advisors Professor Li Shi from Beijing Normal University and Professor Kam Wing Chan from the University of Washington in Seattle. Their guidance and unique perspectives on China's urbanization were critical throughout the project. In addition, Professor Zhao Renwei, retired professor of economics from the Chinese Academy of Social Sciences, and Professor Xiao Geng, Director of the Brookings-Tsinghua Center for Public Policy, provided invaluable insights.

We are grateful to Glenn Leibowitz and Joyce Hau in Shanghai, and Rebeca Robboy in San Francisco for their help with external communications; Janet Bush, MGI senior editor in London, for providing strong editorial support; and Helen Zhang, MGI's administrator in Shanghai, who managed complex logistics for the project team. We also thank McKinsey's superb R&I staff from the China Knowledge Center and the technical and production services of the Firm.

We benefited from numerous interviews with public and private sector leaders in several of China's cities, and we are very grateful for their time and help.

The work is part of the fulfillment of MGI's mission to help global leaders to understand the forces transforming the global economy, improve company performance, and work for better national and international policies. As with all MGI research, we would like to emphasize that this work is independent and has not been commissioned or sponsored in anyway by any business, government, or other institution.

Dr. Jonathan Woetzel, Director, McKinsey Shanghai office
Lenny Mendonca, Director, Chairman of the McKinsey Global Institute

March 1, 2009

Fast forward to the future—China's urbanization in 2025

350 million

will be added to China's urban population by 2025—more than the population of today's United States

1 billion

people who will live in China's cities by 2030

221

Chinese cities will have one million + people living in them—Europe has 35 today

5 billion

square meters of road will be paved

170

mass-transit systems could be built

40 **billion**

square meters of floor space will be built—in five million buildings

50,000

of these buildings could be skyscrapers—the equivalent to constructing up to ten New York cities

5 **times**

—the number by which GDP will have multiplied by 2025

Contents

Executive summary

China's burgeoning economic success and the rapidly rising standard of living of its people have resulted in a historically unprecedented surge of urbanization that is set to continue. If current trends hold, nearly one billion people will live in urban centers by 2025. China will have 221 cities with more than one million inhabitants—compared with 35 in Europe today—of which 23 cities will have more than five million people. The urban economy will generate over 90 percent of China's GDP by 2025.

As the nation's urban economy grows, China seems destined to continue to enjoy an impressive pace of increasing national prosperity.[1] In all likelihood the nation's continuing urbanization will ensure that China will fulfill the ambitious economic growth target set out at the 17th Party Congress in 2007 of quadrupling per capita GDP by 2020. For companies—in China and around the world—the scale of China's urbanization promises substantial new markets.

At the same time the expansion of China's cities will represent a huge challenge for local and national leaders. Of the slightly over 350 million people that China will add to its urban population by 2025, more than 240 million will be migrants. Urbanization along current trends will imply major pressure points for many cities including the challenges of securing sufficient public funding for the provision of

1 While we were researching and writing this study, two significant events have taken place: 1) the global financial crisis had begun to unfold. While we expect that there will be a short-term slowdown in China's economic growth and that this could decelerate the pace of China's urbanization, our long-term perspectives on urbanization in China will likely hold; 2) the Chinese government has announced a package of land-reform measures which will, *inter alia*, enable residents of the rural sector to lease their allotted lots to others. We expect that, if fully enacted, this reform could increase the scale of urbanization significantly. However, China had not, at time of writing, released details of the measure and MGI has taken only an initial view of the package. Therefore, the results presented in this report do not reflect the potential impact of this reform.

social services, and dealing with demand and supply pressures on land, energy, water, and the environment. All of these pressures will intensify in time, as China's leaders acknowledge. Although China will likely achieve its GDP growth target in the timeframe it has set for itself, a focus solely on GDP growth will not achieve the harmonious development that the Chinese leadership desires.

As China seeks to mitigate these pressures, there are in fact several paths open to China's national government but most particularly to China's city governments, which can, to a great extent, influence how urbanization plays out. In a bid to understand these paths, the McKinsey Global Institute (MGI), the economics research arm of McKinsey & Company, conducted a study of China's urbanization to a unique level of detail. We employed rigorous macro- and microeconomic approaches through a granular city-level econometric model. From this model, we derived data-driven projections of urbanization's future challenges. We visited and researched 14 Chinese cities and interviewed hundreds of officials, business leaders, city managers, and academics about the policy levers that were used to influence the scale and shape of development of their cities. We developed and examined four urbanization scenarios, each plausible outcomes of urbanization over the next 20 years.

Our analysis finds that a more concentrated pattern of urbanization is most likely to mitigate pressures and increase the overall productivity of the urban system. Concentrated urban growth scenarios could increase per capita GDP by up to 20 percent over dispersed urban growth scenarios. As a percentage of GDP, public spending will also be lower (16 percent of GDP in concentrated compared with 17 percent in dispersed urban growth scenarios). For China to move in this direction, policy shifts at the national level would be required including, for example, continuing to enforce stricter regulations against city land acquisition, supporting the economic development of larger cities, and adjusting the incentives of China's city officials. By 2025, these policies could boost the growth of 15 supercities with average populations of 25 million people, or spur the further development of 11 urban "networks" of cities, linked by strong economic ties, with combined populations of 60-plus million each on average.

We also find that encouraging "urban productivity" initiatives at the city level—for example, the implementation of transit-oriented development or the creation of incentives for energy-efficient industrial equipment—could generate substantial positive outcomes in all scenarios. Through the adoption and effective implementation of such policies, China could reduce its annual public spending in 2025 by more than 1.5 trillion renminbi (equivalent to 2.5 percent of 2025 GDP), going some way toward reducing its funding needs and releasing capital for other uses. Such initiatives could also generate additional savings for the private sector, in particular its resource bill. Potential savings here will total up to an amount equivalent to an additional 1.7 percent of China's 2025 GDP.

In all scenarios, businesses have not only an opportunity to leverage China's impending urban billion as a new consumer market, but also to become major investors—in road and rail, public-transit systems, buildings, the energy-supply infrastructure, and energy-efficient technologies—as China manages its urbanization phenomenon. These opportunities will require a new generation of public-private partnerships to enable additional capital and knowledge infusion from the private sector, at the same time as guaranteeing greater efficiency and productivity from major public projects.

CHINA'S URBANIZATION—A MASSIVE TRANSFORMATION

China's economic goals are intertwined with urbanization. The expansion of China's cities has loomed large over the past two decades—and will continue to do so over the next 20 years. There will be unprecedented investment opportunities for business amid a booming middle class and a stratum of affluent consumers. The scale of urbanization will also be large and migration will be its main driver. As urbanization takes shape, China will have to contend with severe pressures on the basic inputs of its urbanization—land, funding, and natural and human resources.

China's economic goals imply continued urbanization

At the 17th Congress of China's Communist Party, President Hu Jintao committed the country to the bold target of quadrupling per capita GDP by 2020 compared with its 2000 level. Attaining that goal implies China continuing to urbanize. As it does, our research suggests that China will, barring unforeseen economic shocks, meet its per capita GDP goal with relative ease.

Urbanization and China's robust economic growth have gone hand in hand. Cities have been the major drivers of China's GDP growth over the past two decades and they will become even more so over the next 20 years. Projecting current trends forward, we find that the proportion of China's GDP generated by cities will rise from 75 percent today to 95 percent by 2025.

Private-sector investment has been concentrated in China's cities. Over the past ten years, almost 50 percent of China's overall GDP growth has come from urban fixed investment with an annual expenditure of 6.4 trillion renminbi in 2007. If this trend continues, overall urban investment will reach over 24 trillion renminbi by 2025 or 93 percent of total Chinese fixed investment compared with almost 79 percent in 2007.[2]

Growth in private consumption has also largely been an urban affair with China's rapidly growing middle classes concentrated in cities. Between 1990 and 2005 China's urban consumer market began to emerge as a driver of growth in its own right, accounting for 26 percent of overall GDP growth. The urban consumption share of GDP will rise from 25 percent or 3.9 trillion renminbi in 2005 to 33 percent or 21.7 trillion renminbi by 2025.

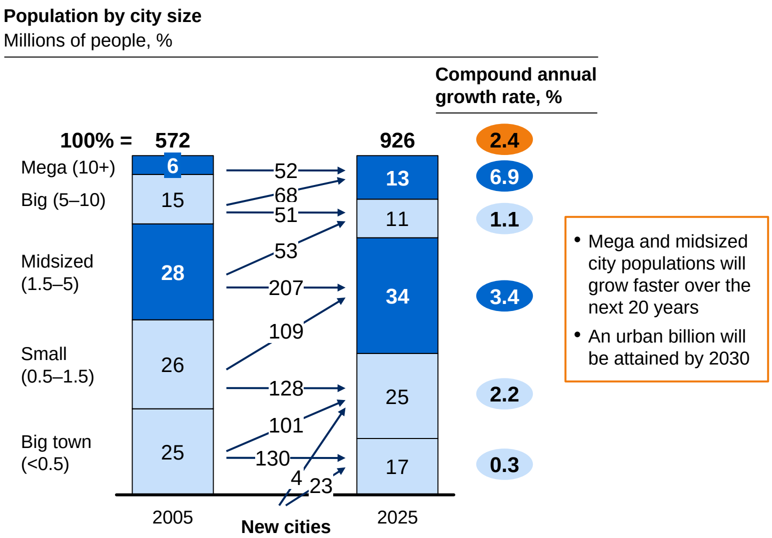
The scale of urbanization is—and will be—immense

On current trends MGI projects that China's urban population will expand from 572 million in 2005 to 926 million in 2025 (Exhibit 1). To put the sheer scale of this dynamic into perspective, this increase of more than 350 million Chinese city dwellers is larger than the entire population of the United States today. By 2030, China's urban population is on track to reach one billion.

Exhibit 1

China is moving toward an urban billion by 2030

TRENDLINE FORECASTS



Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

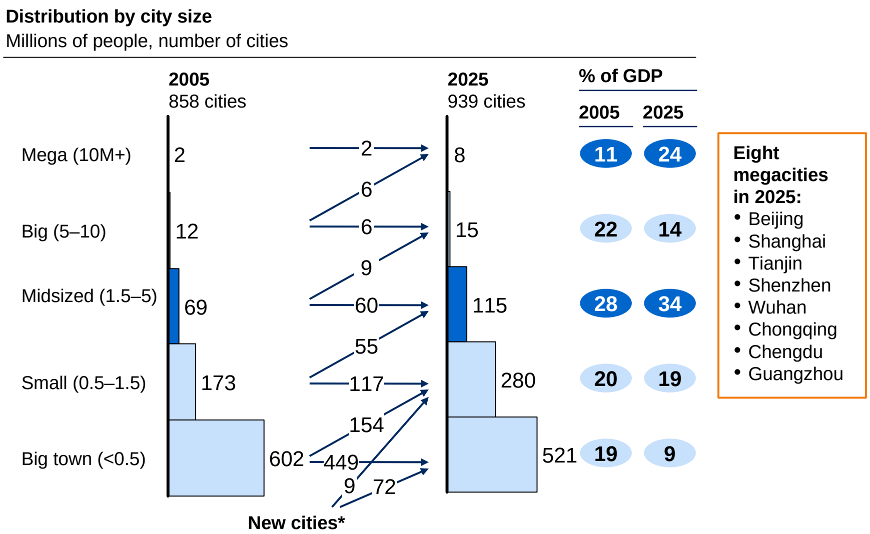
2 We express all renminbi figures in real 2000 renminbi. Urban fixed investment primarily comprises construction and purchases of fixed assets in urban areas.

Over the past 15 years, two Chinese megacities with populations of more than ten million have emerged. On current trends, six more such cities will emerge over the next 20 years (Exhibit 2); of these, two will have populations of more than 20 million. MGI estimates 41 percent of China's higher income classes (that is, with real per capita disposable incomes of greater than 40,000 renminbi in 2025) compared with 11 percent in 2005 will live in them.[3] Overall, the trend points to China heading toward a dispersed urbanization pattern with more pronounced expansion in the number of midsized and small cities. These cities, together with megacities, will drive future growth.

Exhibit 2

Six new megacities will emerge by 2025

TRENDLINE FORECASTS



* From the MGI model, the number of new cities between 2000 and 2005 was nine, accounting for about half a percent of total urban population.

Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

Moving in lockstep with urbanization, China's GDP growth in the next 20 years will be larger than the total current GDP of Japan and will account for 20 percent of global GDP growth in this period.[4]

3 MGI's household definition of incomes includes "upper aspirant" households having an income between 40,000 and 100,000 renminbi and "affluent" households having an income between 100,000 renminbi and 200,000 renminbi. For a detailed analysis of evolving urban incomes in China, please see *From 'Made' in China to 'Sold' in China: The Rise of the Chinese Urban Consumer*, McKinsey Global Institute, November 2006 (www.mckinsey.com/mgi).

4 Global Insight, February 17, 2008.

To fuel its investment requirements, urban China will account for around 20 percent of global energy consumption and up to one-quarter of growth in oil demand. We estimate that China would need to build at least 170 Gigawatts of new coal power capacity from 2005 to 2010, which is around 55 percent of the global total, but China has already announced that it intends to outstrip that number.[5] In total, China will need to construct between 700 Gigawatts and 900 Gigawatts of new coal-fired power between 2005 and 2025.

In transportation, up to 170 cities in China could meet planning criteria for mass-transit systems by 2025, more than twice the current number in Europe. This could promise to be the greatest boom in mass-transit construction in history. In addition, China will pave up to five billion square meters of road and up to 28,000 kilometers of metro rail. China's skyline will change spectacularly, fulfilling the most ambitious dreams of real-estate developers. We project that China will build almost 40 billion square meters of floor space over the next 20 years, requiring the construction of between 20,000 and 50,000 new skyscrapers (buildings of more than 30 floors)—the equivalent of up to ten New York Cities.

Urban China will also become a dominant global market with its aggregate consumption almost twice, and disposable income over two times, those of Germany by 2025.[6] The incremental growth alone in urban China's consumption between 2008 and 2025 will amount to the creation of a new market the size of the German market in 2007.

Migration will emerge as the clear driver of future urbanization

China's urban centers will become even more dominant in the years ahead. China's level of urbanization has already more than doubled since 1980 to 44 percent in 2005. By 2025, MGI projects that about two-thirds of the population—64 percent—will live in cities.

While the speed of overall population growth will not be dramatically different from its recent pace, China's urbanization will nonetheless be fundamentally different from its experience of the past 15 years (Exhibit 3). Between 1990 and 2005, MGI estimates that 103 million people migrated from rural to urban areas (accounting for 32 percent of the population increase).

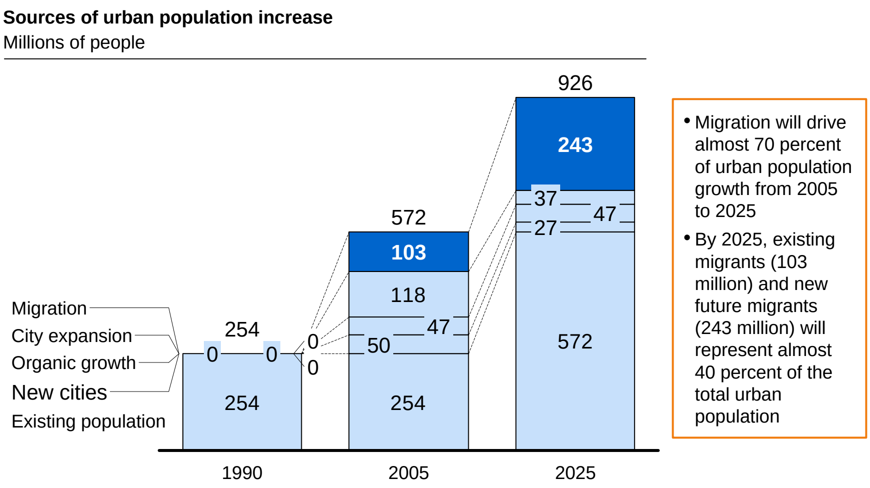
5 Various Chinese sources announced plans for 180 Gigawatts to 300 Gigawatts of new coal power capacity by 2010.

6 Data for Germany is from Global Insights, 2007.

Exhibit 3

Migration will be the driving force of future urbanization

TRENDLINE FORECASTS



Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

An even more important driver of urban population growth was the acquisition of adjacent land and the simultaneous incorporation of populations living there (about 120 million people). This accounted for close to 40 percent of the increase in urban population during that period. Over the past five years this pattern has reversed. A large number of cities are running out of land into which to expand and national government policy has made land acquisitions more difficult.

We expect that rapid urban development coupled with surplus populations in rural areas generated by gradually increasing productivity in the countryside will together act to boost the mobile population to about an additional 240 million people in the next 20 years. The mass-movement of people we are about to see will eclipse even the substantial migration of the past.[7]

7 For the purposes of this study, MGI defines a migrant as fulfilling three criteria. First we adopted the same standard as the National Bureau of Statistics of China (NBS) in the length of stay—i.e., a minimum of six months residency in the receiving city or six months away from the individual's hometown qualifies that individual as a migrant. Second we chose to use a geographic boundary determined by China's census methodology that combines the city center with its suburban fringe. We can classify any individual moving into, or out of, this area as a migrant. Third, we only count as migrants those who move from a rural to an urban area and effectively discount urban to urban movements. These definitions are explicit to the quantitative estimates we derived from the McKinsey Global Institute China All City Model.

With continued economic growth, job creation in cities will be huge. MGI estimates that urban China will have between 450 million and 500 million jobs in 2025, compared with almost 290 million in 2005. Migrants will tap into this increasing demand for employment, bringing the proportion of mobile population in the cities at above 40 percent under every urbanization scenario. Driven by the high share of job growth in these cities and their rapidly aging officially resident populations, most of this migration will take place in mid- and larger-sized cities where migrant populations will constitute a greater proportion—around 50 percent—of their populations by 2025; in many cities, the mobile population will account for more than half of total populations.

China will also continue to see the emergence of new cities through 2025 but on nothing like the scale that we have seen over the past 15 years. Between 1996 and 2005, MGI estimates that there were 195 additional urban centers that "behaved "like cities according to government criteria prevailing in 1996 but which the government did not designate as such. Some of these "unofficial cities" have so far eluded the radar screens of most businesses but they offer promising sources of future growth. For instance, Cangnan, officially not classified as a city, grew at a compound annual growth rate of 19 percent between 2000 and 2005, higher than the average Chinese city's GDP growth of 15.3 percent and by 2005 boasted a population of more than 750,000.

Between 2006 and 2025, we expect a considerably slower pace of city creation than in the past 15 years. We find that 81 more urban centers will develop the characteristics of cities, with a cumulative population of approximately 27 million, or about 7.5 percent of the urban population increase during this period, compared with 50 million or close to 16 percent from 1990 to 2005. Moreover, most will be located within a 50 kilometer radius from existing cities, reflecting the tendency of these future cities to develop in close proximity to larger cities (Exhibit 4).[8]

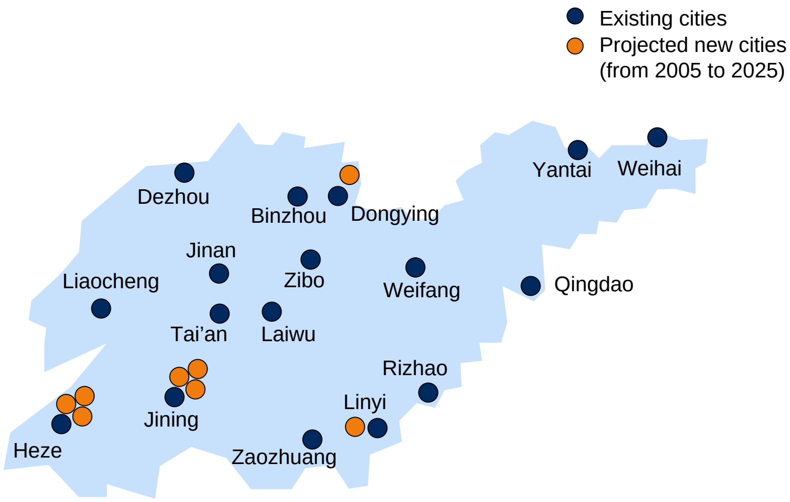
8 In addition to migration, city expansion and the added populations of "unofficial cities", organic or natural growth in existing urban populations will account for close to 13 percent of overall cumulative growth—or 47 million people.

Exhibit 4

New cities will emerge near existing cities

Shandong province

EXAMPLE



Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

The pressure of rapid urbanization will intensify

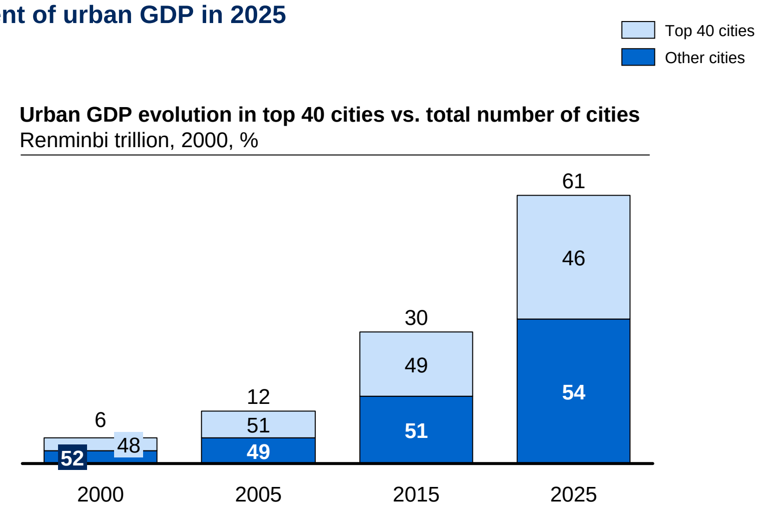
As well as generating impressive growth and rising living standards, rapid urbanization since 1990 has also generated serious pressures, many of which are linked to the dispersed model of growth China has followed as a result of current policies. We believe these could intensify in the future, driven by the rising cost and increased resource requirements of urbanization.

These pressures, moreover, will be widely felt. MGI's trendline estimates indicate that China's urbanization will continue to be a relatively dispersed affair. While half urban GDP in 2005 was concentrated in the top 40 cities, all of China's other (smaller) cities generated the rest. The relevance of these remaining "smaller" cities will not decrease over the next 20 years. Indeed, some 900 smaller cities will represent 70 percent of the population by 2025, generating 54 percent of urban GDP and 55 percent of urban GDP growth (Exhibit 5). And it is these cities that will feel the pressure points of urbanization most acutely.

Exhibit 5

Some 900 smaller Chinese cities will account for 54 percent of urban GDP in 2025

TRENDLINE FORECASTS



Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

We can group these pressures into four main categories:

1. **Land and spatial development**—the addition of more than 350 million urban residents over the next 20 years will require unprecedented construction. This will threaten extensive urban sprawl, further intensive land development, and extreme congestion. Pressure will continue to bear down on the availability of arable land, which could decline by as much as 20 percent in the worst-case scenario. At the same time larger cities will face crippling congestion pressures (Shanghai's traffic could outstrip its projected road capacity threefold by 2025). There will be intense tension between the loss of arable land on one hand and cities' dependency on land sales for revenues to finance urban development on the other hand—a phenomenon that MGI found has thus far afforded China added flexibility in its funding of urbanization.

2. **Resources and pollution**—demand for resources from urban China will double. Energy demand will rise from 60 quadrillion British thermal units (QBTUs) to between 123 QBTUs and 142 QBTUs. Water use is very likely to be a severe challenge, particularly for the megacities in the north that will need national water-transfer projects to meet their needs. However, it is fair to note that most water consumption will still be in agriculture. During our city visits we witnessed the relentless search for new energy and water sources

by local governments and the massive build up of infrastructure to deliver them, particularly in midsized cities. No matter what, pollution will be severe. Today 59 percent of China's river water is already below international potable standards, and if the amount of wastewater generated relative to GDP stays at today's level in midsized and smaller cities, urban water pollution could rise almost five times. Air pollution, in particular NO_x, could reach critical levels in larger cities.

3. **Labor and skills**—while migrant labor may still be plentiful, aspiring city officials will face challenges in finding sufficient university graduates. As costs go up, it will be important to create higher-value jobs necessary for top-line growth. China's stock of university graduates will more than triple by 2025, theoretically meeting the growing economy's demand for skills. However, these people will spread out unevenly across the country as larger cities offering greater opportunities and benefits will more easily attract them. Moreover, as a previous MGI study noted, China's talent suffers from quality issues, the most commonly cited deficiencies being in practical skills such as teamwork and taking responsibility, as well as communication skills.[9] We confirmed these findings in many interviews during our city visits and they apply to multinational corporations as well as to local companies. This shortage of skilled labor and talent will pose a serious threat to China's aspiration to move quickly toward increasingly higher-value-added economic activity.

4. **Funding**—cities will face increased costs in providing services. An important factor will be gradual pressure to extend the provision of services to migrant populations (consistent with recent policy announcements). MGI estimates that by 2025 an additional 1.5 trillion renminbi or almost 2.5 percent of urban GDP will be required to extend public services and benefits including health care and education to migrants across China (Exhibit 6).[10]

9 See Andrew Grant and Diana Farrell, "China's looming talent shortage," *The McKinsey Quarterly*, 2005, No. 4, pp 70–9 (www.mckinseyquarterly.com); and *Job Seeking Among Chinese Graduates*, BeiHang University Economic and Management Institute, January 2007.

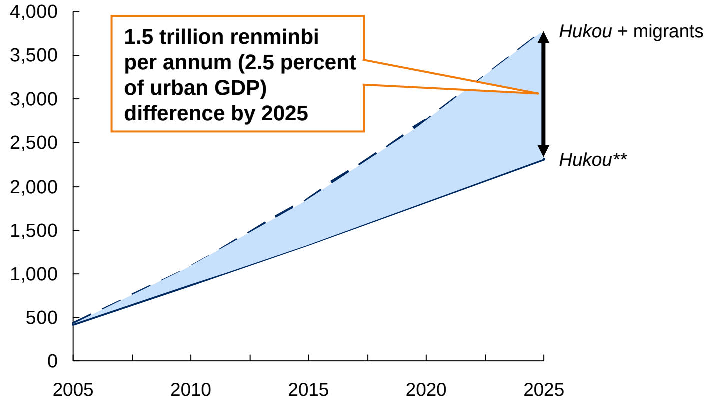
10 We expect this amount to rise even further if the recent land reform package is fully implemented.

Exhibit 6

Including migrants would significantly increase spending on urban public services

TRENDLINE FORECASTS

Spending on urban public services*
Renminbi billion, 2000



* Most policy statements imply rollout of coverage between 2010 and 2015 with some cities already doing so; spending per person covered likely to rise through period—we have assumed this to be the same for *Hukou* residents and migrants to illustrate the cost of expanding coverage only; public services include education, health care (government spending), maintenance, and sundry services.
** Formal residency status.

Source: Literature search; McKinsey Global Institute analysis

This new cost for Chinese cities, piled on top of increasing needs for capital to build infrastructure, will place strains on the entire public-funding system. Although the overall public-funding requirement for urbanization will grow only slightly relative to GDP, the allocation of funding among different cities and geographies is an issue that will have to be resolved. If it is not resolved, there are likely to be marked imbalances across the nation. Small and medium-sized cities have found—and will continue to do so—that it will be increasingly difficult to fund their ongoing needs as well as to finance necessary infrastructure. And funding is going to be more difficult going forward than it was in the past when revenues from land sales helped to mitigate tightness in financing. Relying on this source of funding is set to become more difficult now that the central government is enforcing tighter restrictions on additional land acquisitions.

Almost all cities, apart from the very large ones, could face significant funding challenges. For example Suzhou (in Anhui province) today already has a budget deficit (before accounting for central government transfers) of about 16 percent of its GDP. In the future, these pressures could increase significantly. A detailed analysis of a midsized city (Taizhou), chosen as representative because of its medium size and its deficit broadly in line with the national average (4 percent of its GDP), showed that its pretransfer deficit could rise substantially, up to 9 percent by 2025. This will occur because even sustained rapid growth will not be enough to compensate for rapid increases in the service and administration cost components of city budgets. Local funding limits will remain a challenge that cities will have to face.

Managing all of these pressures and optimizing urbanization's opportunities will require policy actions not only at the national but also at the local level. These policies will need to be oriented mainly towards increasing the overall efficiency and productivity of the urban system in a holistic sense, devoting China's resources to the goal of a more economically developed and socially balanced society.

POLICY OPTIONS FOR CHINA'S FUTURE

The policy choices that China's leaders make at national and local levels can significantly alter the shape of urbanization.

Contrary to conventional wisdom among many outside observers, decision making in China is relatively decentralized. Most tax revenues are retained locally. The local government can take decisions on everything from industry subsidies to retail licensing, subject mainly to "negative control" by Beijing. Traditionally Beijing has relied on, and indeed incentivized, the entrepreneurial nature of local bureaucrats to identify and pursue growth opportunities. This means that each city faces different urbanization opportunities and challenges. MGI's visits to a range of China's cities served to reinforce this view: we noticed, for example, how pressures caused by pollution, congestion, and land scarcity can be more or less critical, depending on the development path followed by each city. Urbanization is local—policy choices enacted at the level of individual cities, under the overall guidance of the national government, have strongly influenced China's urban growth.

At the same time there is a powerful national framework for urbanization that fundamentally influences the degrees of freedom available at the local level. National decisions on land policy, location of strategic infrastructure, the process and limits of investment approval authority among other areas, define the level of local authority. Differential treatment of local municipalities can tilt the playing field across cities as well.

We find that there are opportunities at both the national and local level to shape urbanization towards a more positive outcome than the current path. By refocusing on the concept of more balanced and productive growth, China's leadership can have a dramatic impact on the quality of life of its expected billion urban citizens.

The advantages of scale in China—the case of Shanghai

There are four levels of cities in China—directly controlled municipalities and subprovincial, prefecture-level and county-level cities. All except the directly controlled municipalities (for example, Shanghai) come under the purview of a province. In China, larger cities have packed a more powerful economic punch. Out of a total of 858 cities (official and unofficial), only 14 cities today have populations above five million yet they accounted for 33 percent of China's total GDP in 2007. Why are China's larger cities more successful? Without doubt history, location, economies of scale, and broad preferences granted by the central government (for example, Special Economic Zone status) have contributed to these cities' relative successes compared with others. But that is not all. During our visits to cities, we observed three critical factors that point to why larger cities have more advantageous conditions for economic success: their ability to attract talent, their ability to attract investment, and network effects.

1. Larger cities attract the most talent. Shanghai has the skills and talent it needs to feed current growth. Many high school graduates come to the city for their college education every year while Shanghainese students are reluctant to go to other cities. The city has access to 100,000 or more graduates from 60 higher-education institutions every year. One recent university graduate in Beijing told us, "All of China's graduates want to go to Beijing or Shanghai for jobs. That is why there is such an oversupply in these cities." And a leading academic said, "Everyone wants to move to Shanghai." As a result, more than one-quarter (28 percent) of Shanghai's labor force has a college education—double the proportion a decade ago. The city is also beginning to attract talent from overseas—the expatriate community is half a million strong. Migrants have also moved in large numbers to fill low-wage jobs in manufacturing and service industries. As a result of a huge influx of migrants, Shanghai has actually put in place a scoring *Hukou* system designed to give residency only to migrants with sufficient skills so that the city attracts only the best.

2. Large cities attract more investment. Foreign direct investment (FDI) has disproportionately landed in larger cities. FDI in emerging markets at least initially tends to go to those areas that have market access but also better infrastructure, services, and tax and other financial incentives. Larger cities in China have been more competitive than smaller ones in the provision of these and other benefits that are favorable to businesses and Shanghai is no exception. Moreover, the establishment of a foreign invested community reduces perceived investment risks and creates a virtuous cycle that serves to attract more investment in the future. In addition, large cities tend to attract a disproportionate share of total financing for infrastructure, driven by larger local equity pools, greater perceived creditworthiness, and access to a larger range of financing sources due to scale (e.g., large cities can tap the bond market).

3. City network effects stimulate economic growth. Large cities are almost always at the center of a cluster of smaller cities. Economic network effects spur economic growth and productivity. Within China, Shanghai and the Yangtze River Delta is arguably the best example of an efficient hub and spoke model. The city sits in the middle of a very close-knit cluster of economic centers on the delta, which has driven growth in the entire region.

Concentrated urbanization is the optimal path

At the national level, broadly speaking, there are four approaches to urbanization that China might choose to pursue. Two of these foresee patterns of concentrated growth. Under a "supercities" scenario, a small number of very large cities—with populations of 20 million or more—could emerge. Under a "hub and spoke" scenario, clusters of medium-sized and small cities could develop around larger ones. Two other quite different approaches would involve patterns of dispersed growth. Under a "distributed growth" scenario, we could see a large number of cities with populations of 1.5 million to 5 million spread throughout China. Under a "townization" scenario, many smaller cities—with populations of 500,000 to 1.5 million—could be the model. Other nations around the world have applied all these options. All four are open to China; all four are subject to current public and political debate.

While our trendline projections are not identical in population distribution to any of the four scenarios, their outcomes are closer to the potential implications of dispersed growth scenarios (distributed growth and townization). In these scenarios, midsized cities, which will have the largest share of middle-class consumers, will emerge as the engines of growth over the next 20 years.

Although each scenario presents a largely distinct set of opportunities and challenges, out of the potential urban shapes that we have analyzed, the concentrated growth scenarios appear to be the most optimal. It is important to note that we base this evaluation on the performance of cities in China over the past two decades and would not hold it relevant to other countries. Not all megacities (and potential megacities) of the world are success stories; nor do all midsized and smaller cities face severe challenges. However, in aggregate and for various historical and local reasons, large concentrated cities in China are performing more effectively than smaller cities and our projections indicate that this pattern could hold true in the future.

Concentrated growth would have many positive economic implications linked to higher productivity and efficiency. If China were to adopt a strategy of fostering more concentrated urbanization, the results would include:

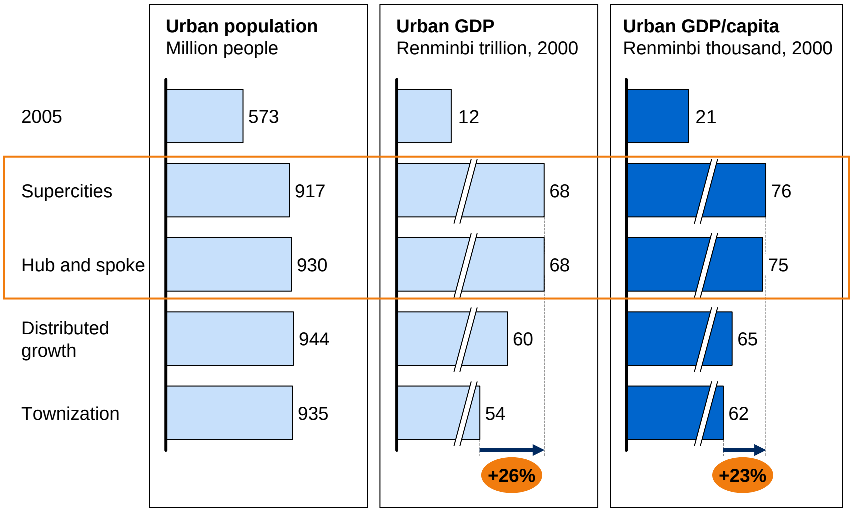
- **Highest per capita GDP**—supercities and hub and spoke scenarios, both concentrated growth models, would produce up to 20 percent higher per capita GDP than trendline and more dispersed growth scenarios (Exhibit 7). Scale effects and productivity gains, which the evidence shows tend to be larger in concentrated urbanization scenarios, account for most of this differential.[11]

- **More efficient use of energy**—energy productivity would be about 20 percent higher in concentrated models of urbanization, although hub and spoke will have the highest total energy use (Exhibit 8).

11 The major driver of higher GDP outcomes in more concentrated urbanization scenarios is the migration of people to wealthier cities as they search for higher incomes. A smaller gain comes from higher productivity as cities "jump" size categories through to 2025. This effect comes from the underlying Cobb-Douglas equation that MGI's China All City model employs. Importantly, total factor productivity increases as the population expands, but then declines once the population has reached a certain scale as the effects of congestion come into play. As a result, while China's bigger cities generally tend to be more productive than smaller ones, several larger cities will see population increases resulting in slightly offsetting productivity-induced declines in per capita GDP. For instance, MGI estimates show that a one million increase in the population of a megacity decreases per capita GDP by around 0.3 percent. Working in the opposite direction, the arrival of migrants with lower wages and earning power dampens per capita GDP by an average of 1,600 renminbi across scenarios. In addition, congestion eventually can have serious negative implications, for example through cutting effective working hours. In some cities, the effect of this cut has led to an estimated 15 percent decrease in productivity.

Exhibit 7

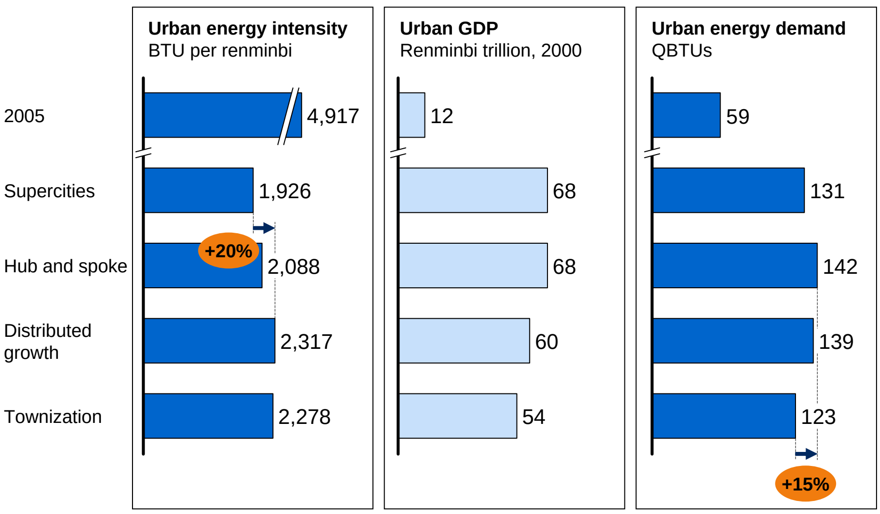
Concentrated growth scenarios would generate the highest per capita GDP



Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

Exhibit 8

Concentrated growth would entail higher energy consumption but also higher efficiency

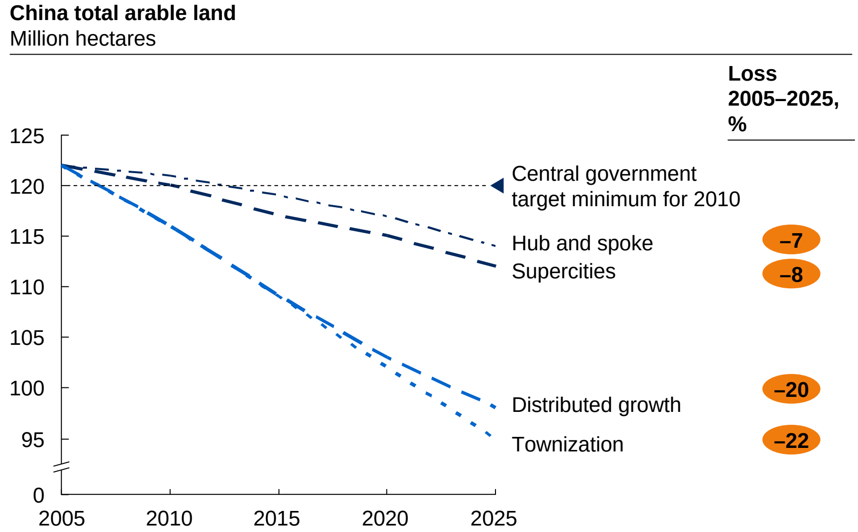


Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

- **Lowest rate of loss of arable land**—more concentrated models of urbanization could reduce the loss of arable land to only 7 percent to 8 percent of the current total, whereas a more dispersed pattern of urbanization would result in losses of more than 20 percent (Exhibit 9).

Exhibit 9

Concentrated urbanization would contain the loss of arable land



Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

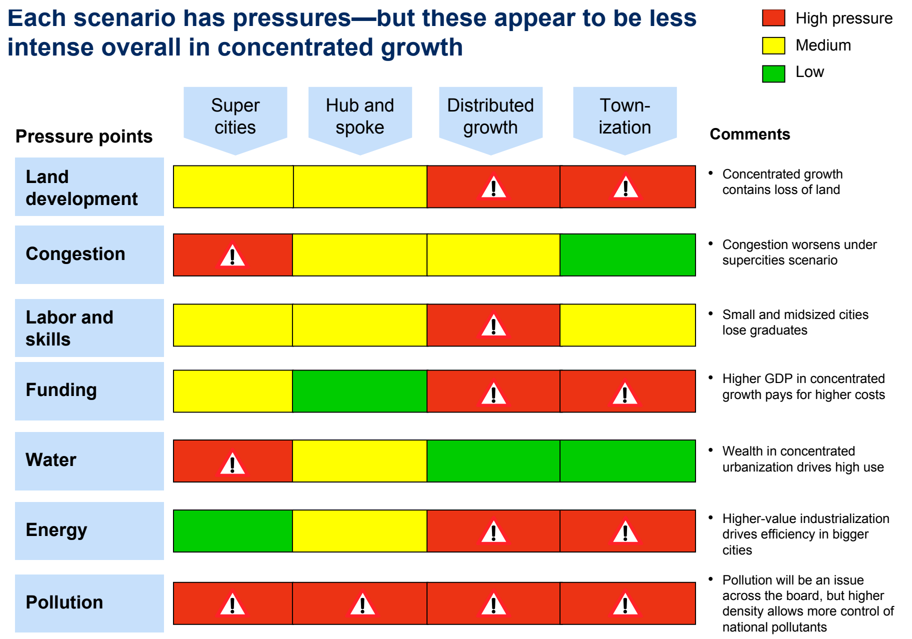
- **More efficient mass-transit**—concentrated urbanization scenarios would attain the necessary public-transport capacity with lower costs and higher chances of successful execution. In a supercities scenario, China would need to expand its current subway system eight times. But under distributed growth the light-rail system would have to grow nearly 300 times. Indeed distributed growth would require the largest investment in each of mass transit, inner-city roads, and city buses.

- **More effective control of pollution**—although megacities that develop in a supercities scenario would face extremely serious peak pollution problems (e.g. NO_x), MGI research shows that enforcement of measures to regulate pollution is more widespread and effective in larger cities than in smaller cities. Moreover, MGI finds that a distributed urbanization model would generate the greatest amount of emissions countrywide. Dispersed urbanization would produce more water pollution than would concentrated urbanization scenarios.

- **Availability of talent**—while talent will tend to concentrate in big cities, we expect a significant shortage of these workers in small and midsized cities (the trend is already clear today). Concentrated urbanization scenarios would thus have the advantage of having an abundance of talent in centers that are the engines of economic growth, enabling a more rapid transition to higher-value-added activities.

Each model of urbanization has its tradeoffs and concentrated growth would certainly have its pressures (Exhibit 10).

Exhibit 10



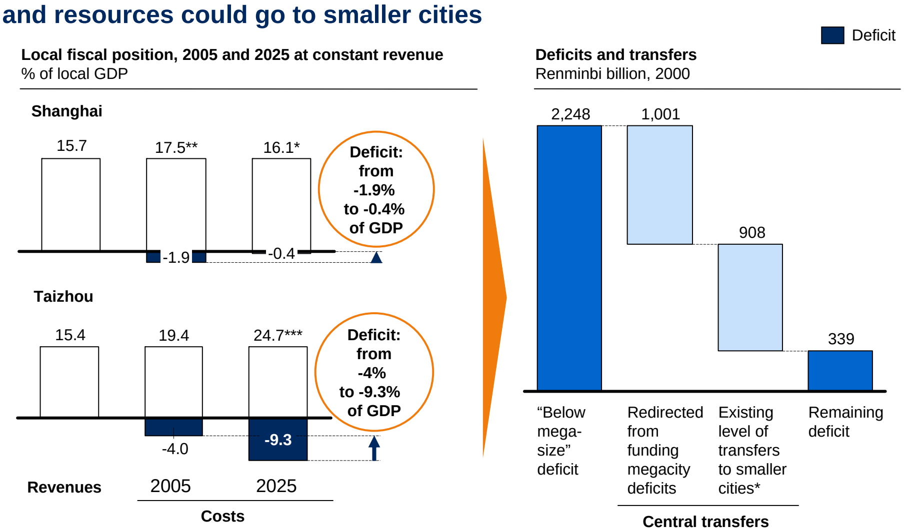
Source: City visits; interviews; McKinsey Global Institute analysis

For instance, a shift toward the direction of more concentrated urbanization in China would likely result in more severe peak pollution and more intense congestion in cities than would a dispersed urbanization strategy. But the funding squeeze in a supercities scenario—at the extreme of concentrated urbanization—would be widespread and acute: while overall public spending as a percentage of GDP would be lower, MGI finds that almost 60 percent of the urban population could live in "funding-at-risk" cities—i.e. generally smaller and midsized cities running a significant budget deficit before central government transfers. Conversely a more moderate form of concentration—a hub and spoke scenario—would be highly effective in mitigating the funding challenge in at-risk cities by being able to pull financially struggling spoke cities closer to their more well-endowed hubs. Only some 30 percent of the population would live in at-risk cities under this scenario.

Moving toward concentrated urbanization would in fact guarantee that today's engines of China's growth--a set of dynamic clusters of cities--would be able to generate bigger economic surpluses and reduce their deficits to near zero. Megacities will not need financial transfers from the central government any more, therefore freeing up enough resources to ease financial strains of non-megacities without raising taxes (Exhibit 11).

Exhibit 11

Under a supercities scenario, megacities would have no deficit and resources could go to smaller cities



* Costs rise rapidly (9.7 percent per annum), but GDP rises even faster (10.2 percent per annum), allowing deficit reduction. ** Numbers do not add due to rounding. *** Transit/utility costs rise quickly at >15 percent per annum and health care and administration spending rises 9 percent per annum, driven by rising input costs and GDP rising by 7.5 percent per annum.

Source: McKinsey Global Institute China All City Model; McKinsey Global Institute analysis

National policy makers can shift China toward concentrated urbanization

Is it possible for China to adopt a more concentrated urbanization model? We base our trendline estimates of urbanization on a well-established policy framework and forces that are already exerting a powerful influence on the pattern of urbanization. The question is whether there are options to reshape China's urbanization away from the trendline that, as we have noted, is closer to the distributed growth scenario than to any other scenario. We believe that the answer is yes. The areas where relevant policy action can make a decisive difference in the shape of urbanization include:

- **Land policy.** Greater enforcement of policies and tighter restrictions on further acquisition of land by cities would have a greater impact on slowing growth in less-developed urban centers—most of which depend heavily on land sales to fund urban development—while preserving arable land. A preferential land policy that gives more freedom to maneuver to larger cities would enable their growth and therefore encourage a shift toward concentrated urbanization. However China needs to monitor these cities carefully to ensure that such preferential policies are not abused (leading, for example, to unmitigated urban sprawl).

- **Infrastructure investment.** The pattern of transport and other network infrastructure plays a major role in the distribution of growth and therefore in the overall shape of urbanization. Government can promote the development of a highway grid or a road system focused on megacities and/or hubs. Likewise the strategic siting of heavy infrastructure such as refineries and ports, and the development of national educational institutions can make a big difference to regional economic development.

- **Preferential political treatment.** The central government has the option of determining different levels of local autonomy for cities to encourage a certain urbanization outcome. For instance, government could choose to grant more megacities municipality status, thus giving them more freedom to set their own development policies. The recent establishment of Chongqing as a directly reporting municipality is an example of this. Or the government could encourage certain cities that are already in close proximity to each other to coalesce into larger metropolitan areas within a single political unit. The downside of such policies is that they may introduce unhelpful distortions (for example, leaving behind some cities in the peripheries); as such they would need careful monitoring to avoid unwanted risks.

- **Financial pressure.** Establishing national standards for the provision of services to all segments of the population, including low-cost housing and education for migrants, in and of itself will place a significant financial burden on smaller cities. Combined with the requirement that cities maintain balanced budgets, this would in effect make it challenging for smaller cities to pursue aggressive labor-intensive growth policies.

- **Incentives for China's city officials.** The current system explicitly promotes city-level GDP growth with the effect of favoring distributed growth in particular and dispersed growth in general. Changes to today's framework of incentives would be difficult and China would have to calibrate any reformulation effectively. For instance, to enhance the viable development of a predominantly hub and spoke scenario, it would be crucial to ensure that incentives took into account the performance of each existing hub and spoke system in order to encourage the necessary intercity co-operation.

China's cities can benefit from local urban productivity policies in all scenarios

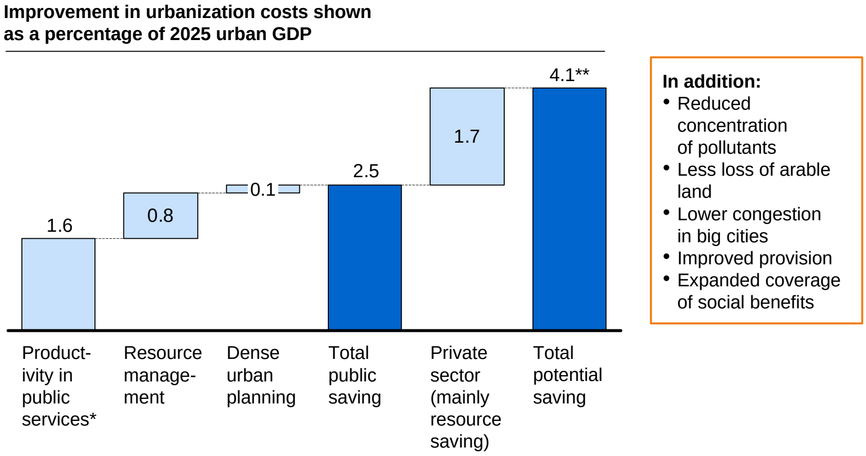
Regardless of urban shape, it is possible to encourage the adoption of an "urban productivity" agenda for local governments. The prime objective of this would be to move towards a productivity-based approach that would incentivize the efficient use of inputs such as energy, water, and land; would focus cities on matching sufficient skilled labor to higher-value-added activities; and would improve the provision of public services. Urban productivity initiatives have the potential to reduce future funding pressures, producing outcomes that are both cost-effective and beneficial to the overall quality of urban life.

MGI estimates that, if China were to move in this direction, the opportunity would be substantial. Independent of the shape of urbanization, China would cut its public spending requirement by 2.5 percent of its GDP, amounting to 1.5 trillion renminbi a year; reduce SO_2 and NO_x emissions by upward of 35 percent; and halve its water pollution. In addition, savings from the private sector could produce benefits equivalent to 1.7 percent of GDP in 2025, mainly via reduced natural resource consumption (Exhibit 12).

Innovative city governments are already enacting many effective policies but there is a major opportunity to expand, replicate, and coordinate these, as well as to measure their performance. If cities were to implement urban productivity policies across the board in a market as large as urban China, they would open up unprecedented opportunities for innovation in areas such as energy conservation, water recycling, and clean technology. Central government could aim to act as an "enabler" and "distributor" of city best practices, encouraging pilots and, subject to local conditions, aggressively promoting other cities' take-up of new solutions. By doing this, it could help ensure that cities widely adopt urban productivity measures rather than a few vanguard cities selectively applying them.

Exhibit 12

Urban productivity initiatives would reduce costs and increase quality of life



* Productivity gains in service delivery (9 percent of costs) and lean government administration (20 percent of 2025 projection).

** Numbers do not add due to rounding.

Source: National Bureau of Statistics; Construction, Labor and Finance Yearbooks; McKinsey Global Institute analysis

We see four major planks of an urban productivity agenda:

1. Plan for integrated, dense development

The freedom that China's cities have had to acquire land—and subsequently sell it for development—has been one of the key ingredients of China's urbanization story and distinguishes China from other countries such as India. There is no doubt that without this source of revenues China's urbanization would not have been so rapid. The purchase and sale of land has allowed China's cities to be proactive in funding and building infrastructure. Built-up land in China has increased by 150 percent over the past 15 years and sales of acquired land account for 10 percent to 50 percent of local governments' revenues. We believe that the tool of land acquisition is one of the primary reasons why China has been able to urbanize without creating massive slums.[12] Yet aggressive land acquisition has also caused horizontal development—urban sprawl—and the depletion of arable land.

In the years ahead, China has the option of building denser, more productive cities. Denser cities tend to produce lower demand for energy—up to 20 percent lower in the case of energy for transport translating to up to four QBTUs in energy savings per year. They also tend to support an economy with a larger

12 Population control and land reform are two other important factors.

share of high-value activities due to the availability of more skilled labor. While national land policy will play a role in managing land-related pressures, there is a range of policies that cities themselves can adopt to contain urban sprawl, and by doing so improve the quality of life of urban residents, cut energy demand, and optimize the use of land.

In order to create this type of dense development, cities will need—possibly within the framework of a comprehensive strategic land-development plan—to focus on maximizing the effectiveness of their transportation infrastructure, on holistic congestion-fighting strategies, and on urban planning that uses land strategically—for instance by developing integrated, mixed-use areas; pursuing transit-oriented development; and increasing floor area ratios (FARs), which regulate building height. New York City, for instance, has long used FARs to guide strategic development, encouraging taller buildings and therefore density around key transportation nodes. In contrast, today many Chinese cities set FARs on an ad hoc, project-by-project basis. This creates inefficiencies such as the location of residential buildings on the outskirts of cities that are much bigger than those in the center and that do not enjoy optimal connections with the main city transportation systems. The result is increased traffic (with a consequent loss to overall productivity) and major difficulties in implementing mass-transit solutions.

2. Manage demand for, not just supply of, resources

Cities could manage demand for resources rather than simply focusing on building the supply infrastructure needed to keep pace with demand. For example, boosting energy productivity—the level of output we achieve from the energy we consume—is largely a "pain-free," measurable, "low-hanging fruit" option. China's cities would generate positive returns from future energy savings, freeing up resources for investment elsewhere.[13] Urban China has the opportunity to abate energy demand growth by 30 QBTUs, including the potential to reduce oil demand by just over four million barrels of oil per day. In tandem, China would be able to cut urban water demand by close to 40 percent by 2025.

To reap the full benefits of higher energy productivity, standards and incentive programs backed up by rigorous monitoring and enforcement at the national level will be important. Nevertheless policy and implementation at the local

13 For a full analysis of energy productivity and the investment needed to capture available opportunities, see *Curbing Global Energy Demand Growth: The Energy Productivity Opportunity*, McKinsey Global Institute, May 2007; and *The Case for Investing in Energy Productivity*, McKinsey Global Institute, February 2008 (www.mckinsey.com/mgi).

level will be crucial. Among the effective tools at cities' disposal will be the use of incentives to encourage investment in energy-efficient industrial equipment such as regasification technology; standards-based regulations such as establishing energy efficiency in building codes and improved insulation; the deployment of the latest technologies; and "resource saving" pricing schemes. For instance, China's cities could be bolder in their promotion of energy-efficient lighting—today compact fluorescent lighting (CFL), in the next few years probably light-emitting diodes (LED)—by mandating its use in all new construction.

Or cities could introduce staggered water-price tariffs (e.g., with exemptions at certain value levels for low-income consumers) with aggressive increases in order to cross the "price sensitivity" threshold. Tianjin, for instance, has already begun to move in this direction. Standards in, for instance, lower-volume showers and toilets, would further boost water savings. In addition, cities have a substantial opportunity to optimize the detection of leaks and then the processes used for repair—action that could cut leakage without the need for huge capital outlays as demonstrated recently by a major European water company. MGI estimates that reduction of leakages alone could save almost 20 billion tonnes of water a year. Through such policies to deliver the more efficient use of resources, cities would not only reduce costs but also open up new markets for businesses that can provide solutions.

Combating pollution will require further efforts in tightening standards and requiring technology upgrades. For instance, to control PM_{10} emissions cities could mandate the use of methods such as the water-based suppression of dust on construction sites—as we are beginning to see in some parts of Shanghai. Cities could also increase vehicle emission standards and implement "clean" regulations on city fleets that could not only save energy but also provide greater benefits in terms of mitigating pollution. An example of this is Chengdu's aggressive roll-out of a taxi and bus fleet that runs on compressed natural gas. Enforcement will again be crucial to increase wastewater treatment especially in smaller cities where the current level of compliance is relatively low.

3. Invest in labor and skills development

In addition to guaranteeing a sufficient supply of labor overall, all cities need to increase the quality of labor in order to maximize their economic output through a gradual shift toward value-added economic activities.

To develop the right talent, it will be necessary to target the overall quality of graduates. Farsighted city and provincial leaders are already doing much to raise the quality of graduates by, for instance, encouraging team work in the class room or partnering with local companies in the provision of internships. These latter arrangements increase work skills and help businesses to secure an advantage in what promises to be an ever-escalating talent war developing in China over the next 20 years. But it will also be important to shift from the current system of measuring performance that emphasizes quantity of inputs (e.g., enrollment numbers) to one that measures attainment (e.g., the employment rate of graduates in those professions that a city may need the most) and therefore encourages improvements in overall quality.

Even more broadly, cities should complement such a shift with systems to measure and improve the labor productivity of their workers. Industrial organizations such as the Hong Kong Productivity Association or Singapore's National Productivity Board (NPB) could provide one model for how to do this.[14]

Attracting and retaining talent after graduation is another story. Smaller urban centers are likely to face pronounced shortages of skilled labor, especially of graduates. Local leaders and businesses have a number of tools to mitigate the effects of this gap. MGI believes that "pull" strategies would work better than "push" strategies to rebalance the situation. Some cities already work with companies to offer special salary and benefits packages to attract the talent they need. City governments and local businesses could tailor these packages so that they offer clear career opportunities and social benefits to make them even more appealing to graduates. Taizhou has already been doing this, as has Chengdu, where Intel opened its manufacturing base while simultaneously funding the construction of a hospital in the area. The aim for all smaller urban centers should be to develop competitive packages offering a quality of life comparable or even superior to that offered in larger cities today.

4. Enhance public sector productivity

Enhancing the productivity of China's public sector is another short-term opportunity for China to have a significant impact. Cities around the world have demonstrated they can improve the effectiveness and efficiency of government through greater clarity around goals, accountabilities, and measurement processes. In some Chinese cities (for example, Wuhan), local mayors are already piloting more aggressive and transparent performance-management systems.

14 The NPB was established in 1972 to improve productivity in all sectors of the Singapore economy. Increasing individual and company productivity at all levels was a priority especially as the economy had already gained steady full employment and greater worker productivity was viewed as a means to extract even greater value added. The NPB used a total productivity approach that emphasized measurement, product quality, a flexible wage system indexed to productivity and used mass media and widespread education to communicate to Singaporeans that productivity needed to be a pillar of the society.

Making service provision and general administration more productive is one vital and easily measurable opportunity that could generate savings worth up to 1.6 percent of GDP and therefore ease future strains on public funding (for example, by closing the remaining deficit after transfers among those cities "left behind" in a supercities scenario). On health care, cities could, for instance, push the utilization of primary care (basic facilities are today at a 50 percent utilization rate) possibly using differentiated co-payment on the basis of patient incomes; redesign the overall incentive system in hospitals by focusing on reducing some key metrics such as the length of stay, which is substantially above international benchmarks (11 days compared with 6 in Europe); and undertake public education and free periodic screening programs to increase the effectiveness of health care spending.

There is also margin for improving the efficiency of capital expenditures. Most often, current inefficiencies arise from overoptimistic price or demand projections, improper design, e.g., in selecting origin and destination points for transit infrastructure, or a failure to consider competition in provision of services. For example, 70 percent of water companies in Western China are reported to be losing money, some due to operating inefficiencies, others from expectations of price rises that have proved to be politically infeasible, and many from underutilized water plants.

Finally, there are also practical steps that smaller cities can take to attract the capital they need to build their urban infrastructure. For instance, by securing participation from experienced Chinese and foreign infrastructure investors and operators (e.g., mass-transit or toll-road operators), they can "buy in" planning and development skills, the lack of which cities currently consider a major barrier. However, doing so could require granting greater protection and flexibility to such investors than cities have so far been willing to do—for example, in determining ticket fares on mass-transit systems. To make equity and debt investments viable, cities will also need to institute greater transparency to allow investors to evaluate the risks and returns of such capital outlays, as well as the fiscal stability of the cities themselves.

CONCLUSIONS

MGI believes that China will see challenges arising out of the sheer scale of its urbanization over the next 20 years. However, China has already demonstrated considerable understanding of these challenges and skill in its management of rapid urbanization. The next test is for China to shift its urbanization strategy from one of dispersed growth aiming above all to maximize GDP to one that gives priority to enhancing the overall productivity of urban areas through the more efficient use of their financial, human, and natural resources. By doing so, China can mitigate the financial, environmental, and social costs of urbanization while still realizing its full economic potential.

The overall opportunity is significant. By 2025 there is the potential to generate 20 percent higher per capita GDP, reduce public spending by the equivalent of 2.5 percent of urban GDP, and reduce the private sector resource bill by an additional net amount equivalent to 1.7 percent of GDP. To take advantage of this opportunity, in which productivity becomes central, policy actions at both national and local level are necessary.

At the national level, China should tailor policies that would shift urbanization towards a concentrated growth pattern. MGI finds that pursuing this option would not be costless but that its benefits would be large.

At the local level, China could mandate the adoption of an array of urban productivity policy initiatives that will both maximize the outcomes of urbanization and mitigate its costs and pressures. Those cities that are already successfully executing an urban productivity agenda can be at the forefront of China’s growth. If they are successful in putting in place a long-term sustainable model for others to replicate, China can ensure its stature as a rapidly growing and developing economic power that is following a sustainable path toward long-term prosperity.

This change of emphasis is urgent because continuing urbanization will increasingly pressure those least able to sustain themselves—i.e. smaller cities, migrant workers. A change of gears is also crucial as decisions taken now will set the course for the next two decades and beyond. Getting the process right now will be far less costly than attempting to fix problems further down the road.

The scale of China’s urbanization and the role that mega and midsized cities will play will create enormous new opportunities for companies in China and around the globe. Business has an opportunity to play a significant and growing role in the dynamic development of this huge new urban market. Businesses looking to invest in China and serve its urban market need to look carefully at the policies cities are implementing. The effectiveness—or lack of it—of these policies should be a key component of strategic planning for entry, including decisions about where to locate and which geographies to target. The deeper the understanding companies develop about this dynamic process, the more effective will be their strategic choices in China.

Volume I

1. Why we studied China's cities

Urbanization is a defining global movement in the 21st century, in particular for fast-developing countries. How well existing and new cities confront their own unique challenges—from crime to pollution to slums—will determine whether they thrive or barely survive. At the same time, this global movement poses many unanswered questions to business leaders and policy makers.

In 2008, more than half of the world's population lived in urban areas—and one in five of these city dwellers were Chinese.[1] China's urbanization has proceeded at a comparable or slightly faster pace than that of other developing economies in Asia. What is different about the process in China is the astounding scale of the phenomenon that reflects China's huge population and that will have profound consequences not only for the People's Republic itself but also for the rest of the world.

For this reason, the McKinsey Global Institute (MGI) launched a major initiative in March 2007 to study the past and future evolution of urbanization in Chinese cities to reach an understanding of how China's urbanization will proceed in shape and pace, its global implications, and the potential opportunities that lie ahead for both business and policy makers.

As we went to press, two significant events occurred that could influence the results presented in this report: the ongoing global downturn and the land-reform package announced in October 2008. Although the recent downturn in the global economy is bound to impact China in the short term, the long-term fundamentals, on which we have based our analysis, are likely to be sustained.

1 *World Population Prospects: The 2006 Revision*, Population Division of the Department of Economic and Social Affairs, United Nations, 2007.

We also believe that the land reform, which for the first time grants farmers official land-use rights certificates and the right to lease out their contracted farmland, will likely prove to be a critical turning point for China's development, both in rural and urban areas. If fully enacted, this reform could increase the scale of urbanization significantly. However, the government has not provided sufficient detail about the implementation and timing of the reform; thus, while we refer to this reform package in this report, we do not discuss its potential impacts in our trendline estimates.

The purpose of this report is to explore this spectacular shift toward urban living and use our findings to provide a reliable fact base for the benefit of political decision makers as well as those in the private sector. Thus far the debate on China's urbanization has suffered from inadequate and inconsistent economic and population data, and many questions remain. What has been driving urbanization? How will the shape of urbanization unfold? Can China influence the shape of urban expansion and, if so, how? And what are the implications of different patterns of urbanization for the policy agenda?

WHAT DO WE KNOW ABOUT CHINA'S URBANIZATION SO FAR?

It is clear that China's urbanization thus far has delivered tangible benefits to its citizens in terms of rising prosperity. There is an unambiguous link between the rapid pace of industrialization and population growth in urban areas and an increase in urban per capita incomes that has far outstripped the rise in incomes we have seen in rural China. Consumption levels in urban areas have moved higher in lockstep with urbanization, and a new urban middle class has expanded inexorably, as previous MGI research has showed.[2] Indeed, there is evidence that urban incomes would have been even further ahead of rural incomes had the Chinese government not focused its initial attention on rural development when it initiated the modern era of economic reform in the late 1970s and early 1980s.

The private sector's role in the urban economy has also been expanding. In 1990, private enterprise contributed 0.7 percent to China's GDP.[3] By 2005,

2 *From 'Made in China' to 'Sold in China': The rise of the Chinese urban consumer*, McKinsey Global Institute, November 2006 (www.mckinsey.com/mgi).

3 Jiayong Hu, "China private enterprise: Contribution and prospects," *Management World*, 2000, Vol. 5, pp. 41–48. Also see National Bureau of Statistics, 1999. Private sector here does not include state-owned companies or companies controlled by the state, foreign-invested companies, or Hong Kong, Taiwan, and Macau companies.

this share had risen to 40.0 percent.[4] Education and college enrollments in cities have consistently increased since China's opening and may well prove to be the foundation for a transformation of China's economy from the world's manufacturing hub to a center for higher-value-added production in both manufacturing and services.

But alongside such benefits, a range of pressure points and bottlenecks associated with rapid urbanization have already become evident. The 17th National Congress of the Communist Party of China held in October 2007 aired a number of worrying issues including the depletion of arable land, problematic air and water pollution, and the question of how unequally the economic fruits of development have accrued to different parts of the population. The national Gini coefficient—the internationally recognized indicator of inequality—has increased from 13 percent in 1985 to some 31 percent in 2005.

During interviews with many scholars in the course of this research project on the key pressure points facing China as it urbanizes, virtually everyone expressed the view that the thorniest task will be coping with continued migration in the face of already-evident shortages in housing, and limited access to education and provision of social security. Migrants without city residency permits—*Hukou*—frequently have no housing allowances or subsidies. Urban schools often refuse to take the children of migrants, and those migrants whose children do find places in city schools face a financial struggle. Migrants frequently also have no health insurance, retirement pensions, or other unemployment benefits. Fear of unemployment in urban areas—and a perceived associated threat to social cohesion and public safety—is often discussed in the local and international media alongside other social issues associated with migration. There is already evidence that the supply of labor is outstripping demand in the largest cities. The unemployment rate in Beijing, Shanghai, Guangzhou, Wuhan, and Chengdu has risen continually from 1990 to 2006.[5]

WHY DOES CHINA'S URBANIZATION MATTER?

As the nation's urban economy grows, China seems destined to continue to enjoy an impressive pace of increasing national prosperity. In all likelihood the nation's

4 Houyi Zhang, "China private enterprise class: Political participation during its development," *Society Attention*, 2008, Vol. 42, Chinese Sociology Net (http://www.sociology.cass.net.cn/shxw/shgz/shgz42/P020080218335108758352.pdf).

5 China Labour and Social Statistical Yearbooks 1991 and 2007, National Bureau of Statistics.

continuing urbanization will ensure that China will fulfill the ambitious economic growth target set out at the 17th Party Congress in 2007 of quadrupling per capita GDP by 2020. For companies—in China and around the world—the scale of China's urbanization promises substantial new markets.

Urban China will become a dominant global market with its aggregate consumption almost twice, and disposable income more than two times, those of Germany by 2025.[6] The incremental growth alone in urban China's consumption between 2008 and 2025 will amount to the creation of a new market the size of the German market in 2007.

As the motivating force in China's economic development for the past 20 years, urbanization's pace and shape will also fundamentally influence poverty alleviation, income distribution, and migration patterns. These, in turn, will have implications for the preservation of societal cohesiveness. On the economic front, urbanization will influence the industrial structure, with implications for science and technology and industrial organization, for instance.

The large demands for resources such as energy, construction, and other basic materials will influence global commodity supply and demand imbalances (as they already have begun to do) and, consequently, global prices. The demand for high talent and skilled labor will require new competitive policies and better training.

Concerns about the impact of China's rapid development on the global environment will only heighten. We find much of China's air and water pollution centered in its cities, and the world's deepening dependence on China serving as its manufacturing "hinterland" has exacerbated the growth of such pollution. This will likely continue to worsen, challenging policy makers in China and beyond to find the most effective ways to contain environmental strains without hindering China's urbanization and the positive contribution that this process is making to China's economic growth and prosperity.

OUR APPROACH

China is big, diverse, complex, and rapidly changing. In order to get the most accurate picture of the evolution of urbanization in China, we took a three-pronged approach to studying its impact:

6 Data on Germany is from Global Insight, 2007.

- **Econometric models.** We developed the MGI China City Model system. This model system contains 20,000-plus stochastic equations and 17,000 identities and builds on the MGI China Consumer Demand Model that we completed in 2006. The new model incorporates a total of 858 cities and provides trendline GDP and demographic estimates for them. The model also enabled us to generate—for 138 cities—city-level projections of fixed-bracket incomes and consumption patterns.

- **Scenarios.** In addition to trendline projections, we selected four urbanization scenarios on the basis of our research, interviews with experts in the field, and published local and international academic material. These four scenarios depict contrasting directions for China's future urbanization, ranging from a "supercities" scenario, which is the most highly concentrated form of urbanization, and a "hub-and-spoke" scenario, in which clusters of medium-sized and small cities could develop around hub cities, to a "distributed growth" scenario of predominantly midsized cities and "townization," the most dispersed of the scenarios in which China develops small cities scattered throughout the country. These scenarios enable us to draw out the economic, environmental, and social implications on China and its cities. We studied ten factors that would derive the most substantial impact from urbanization: the economy, labor and skills, construction, public infrastructure, intercity transport, arable land, energy, water, pollution, and funding. Drawing from the trendline estimates we derived from our econometric model, we established outcomes for each of these ten factors in the four urbanization scenarios that we have examined.

- **City cases.** To complement the findings of our econometric model and arrive at a qualitative judgment on the progression of China's urbanization at the local level, we selected and visited 14 representative cities, conducting in-depth interviews with scores of government officials, academics, and leading businesses in each city. We studied the historical progression of urbanization along economic, social, and environmental dimensions and developed an understanding about how cities have employed a range of policy levers to shape urbanization at the local level. We found that urbanization behavior evolves as cities develop and grouped the cities that we studied in depth into three urbanization "horizons." For each city, we then deepened our understanding by examining the major areas of policy and inputs into urbanization—land policy, infrastructure, urban planning, industrial strategy, networks, labor and skills, and quality of life—and looked at how their use changes as cities move through the urbanization spectrum. Through this exercise at the grass roots, we built up a granular, qualitative perspective on the likely patterns of future urbanization and a detailed view of the kinds of policies and priorities that cities might employ to ensure that they seize the opportunities and mitigate the challenges of urbanization to 2025.

ORGANIZATION OF THE REPORT

We divide the rest of this report into two volumes containing the following chapters and sections:

VOLUME I

- **Chapter 2. A historical frame of reference.** This chapter describes the history of urbanization from 1949 and national policies that have influenced different stages of evolution. We illustrate how recent years have seen power devolve from the center to cities that are now the driving force of urbanization. We examine the economic factors that have enabled rapid urbanization. We lay out the main drivers of China's urban expansion—land acquisition, migration, and the concentration of investment and GDP growth in China's cities—with a focus on the period from 1990 to 2005. We present our findings on the emergence of new and "unofficial" cities. In an appendix to this chapter, we describe the definitional challenges that we have had to overcome in order to analyze China's urbanization and explain the definitions of "urban," "urbanization," and "migration" that we use in this report.

- **Chapter 3. China's urbanization is local.** This chapter tells a predominantly qualitative urbanization story at the city level based on 14 city visits and research. It presents the microeconomics of the drivers of urbanization in cities and describes the three-horizons framework that MGI formulated as the basis for analyzing the evolution of policy and approaches that cities employ as they urbanize.

- **Chapter 4. Where is China's urbanization heading?** This chapter describes MGI's trendline projections for China's urbanization. The chapter shows that urbanization will likely continue at a pace resulting in huge scale over the next 20 years, drawing out comparisons with the period from 1990 to 2005 and putting urbanization in a global context. The chapter also describes how the current trends are leading China toward a dispersed pattern of urbanization, and it lays out alternative urban shapes—two dispersed urbanization scenarios and two concentrated urbanization scenarios. In this chapter, we analyze the benefits and costs that the trendline or other similar dispersed patterns of urbanization would portend in terms of land, funding, natural and human resources, and the challenges that China will face.

- **Chapter 5. The opportunity of concentrated urbanization.** This chapter articulates the argument for concentrated urbanization, spells out its benefits and challenges, and outlines the policies that China could put in place at the national level to engineer a shift toward a concentrated urbanization model. We describe why we judge that a dispersed pattern of urbanization (more or less extreme) would not bring about optimal outcomes and discuss the implications of concentrated urbanization and other scenarios along four dimensions: land and spatial development, resources and pollution, labor and skills, and the economy and funding. We introduce the concept of urban productivity as a way of engraining a shift in mind-set from an exclusive emphasis on GDP growth toward a focus on the efficiency of urbanization.

- **Chapter 6. An urban productivity agenda for city leaders.** We state the case that, regardless of the shape of urbanization, China can pursue an effective urban productivity agenda at the local level. Cities can focus such an effort around the four "pillars of urbanization": land and spatial development, resources, people development (labor and skills), and the economy and funding. We enrich each of these categories with examples of city-level initiatives and put these in the context of local and international best practices.

- **Glossary of terms**

VOLUME II

We have arranged this volume into three parts that together describe in more detail the dynamics of urbanization and its implications. It includes technical notes on the methodologies we employed.

- **Chapter 1. City profiles.** This section presents stand-alone profiles of 14 representative cities with a short preface explaining the urbanization framework prevalent in China in three urbanization horizons: industrializing, transforming, and modernizing. Each city case will present the fact base of observations along the dimensions of urbanization used in our horizons framework.

- **Chapter 2. MGI China City model (CCM) system.** This chapter describes the MGI CCM system. It explains how we developed the 20,000-plus stochastic equation econometric model that extended the 2006 MGI China Consumer Demand model. It outlines the broad parameters and assumptions of the model, details the construction of the underlying data, and lays out the basis of the forecast of city-level economic and demographic projections through 2025.

- **Chapter 3. Impact of urbanization.** This section looks at sector-specific pressure points and opportunities over the next 20 years across urbanization scenarios. We discuss the implications of urbanization for the economy, labor and skills, construction, public infrastructure, intercity transport, arable land, energy, water, pollution, and government funding. This chapter includes a technical appendix providing more detailed information on the methodology we used as the basis of our analysis of the implications of four urbanization scenarios for these ten features of the Chinese landscape.

- **Bibliography**

2. A historical frame of reference

The economic alchemy that turns a country of villages into one of cities has happened quite differently in China than in the rest of the world. In Europe the process took a few hundred years; in the United States, just a century. The length of time it takes for the average Chinese village varies a great deal, but on average it has shortened enormously. Some of today's urban centers have been cities for millennia; others have sprung up out of farmland in as little as ten years.

Historians trace the early settlement of Shanghai on the Yangtze River Delta back to 5,000 years ago. By the 13th century, Shanghai was already a well-known and rising trading town—but Shanghai is exceptional, having experienced periods of international prominence during the 19th century. Other ancient Chinese towns have a long cultural history and infrastructure but began to industrialize recognizably only in the past half century. Indeed, the vast majority of cities have sprung up since China opened itself up to the outside world in 1978 and the country initiated its program of economic reform. Shenzhen, today a boisterous trade and shipping city with more than 9 million people, was only a small village with an urban population of 10,000 people in 1980, the year that Shenzhen was designated a special economic zone (SEZ).[7] Still newer cities such as Taizhou in Jiangsu Province have sprouted in less than a decade.

And China's urbanization is different in other respects too—notably in the size of its cities. While the average size of a city in major European countries might be between 100,000 to 300,000 people with average incomes in real terms of some $10,000 to $20,000, in China, even Chinese cities that we can say are in

7 Hong Mei Zheng, "Probing into SZ's urbanization: The transition from farmer to citizen," *Special Economic Zone*, 2005, Vol. 6 (http://scholar.ilib.cn/Abstract.aspx?A=tqjj200506054).

an early stage of their urban development have populations as large as 2 million people but much lower average incomes of under $1,500 per annum.[8]

In this chapter, we briefly describe the history of China's urbanization since the creation of the People's Republic in 1949 and discuss the political drivers and economic trends that have enabled China's urbanization on a massive scale. At the end of this chapter, we describe the complexities of defining urbanization, urban areas, and migration in China and the definitions that MGI opted to use for the purposes of the analysis in this report.

URBANIZATION HAS NOT FOLLOWED A STEADY COURSE

Urbanization in China has not followed a smooth trajectory since 1949. In 1950, just after the formation of the People's Republic, the level of Chinese urbanization (measured as the number of people who lived in urban enclaves as a proportion of the total population) was 11 percent. Even as recently as 1990, this share had still reached only 20 percent. However, urbanization then started taking off. By 2000, the urbanization rate had risen to 36 percent; by 2007, it was 46 percent.

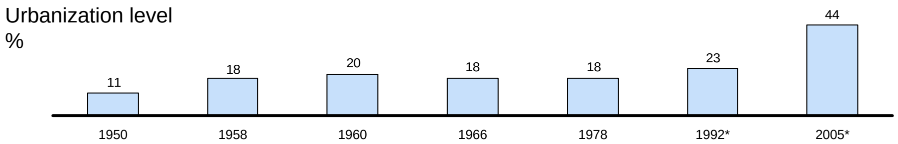
However, comparing these numbers does not give us much information about what happened in between. We should also note that some of these numbers are inconsistent and therefore do not allow us to make sensible comparisons (see MGI's definition of "urban" and MGI's definition of "migration" in the appendix to this chapter).

There have been periods in which the urban population has undergone growth spurts and others in which its growth has been anemic. We can often trace these fits and starts to new policy initiatives and switches in economic strategy emanating from central government in China's unique socioeconomic and political postwar history. We identify six distinct periods that have influenced the pace and scale of urbanization (Exhibit 2.1).

8 National Institute for Statistics and Economic Studies (INSEE); UK National Statistics.

Exhibit 2.1

Both policy and events have influenced urbanization in China over the past 50 years



	Early economic development (1950–58)	**Great Leap Forward (1958–60)**	**Economic recovery (1960–65)**	**Cultural Revolution (1966–76)**	**Economic reform (1978–90)**	**Continued economic development (1990–2005)**
Highlights	• **1950–52** Farmers granted arable land • **1951–58** Government establishes separate urban and rural *Hukou* (living permits) to restrict and control migration • **1953–58** Planned economy system officially kicks off under 1st 5-year plan	• **1958–60** Economy suffers big blows • **1958** Sino-USSR relationship deteriorates, and over 600 large industrial projects stall	• **1964** Many factories were moved from coastal and big cities to underdeveloped areas	• **1966–76** This period saw a ransacked economic and social structure • **1966–76** 14 million–17 million Chinese youth (*Zhi Qing*) sent to rural areas to be “reeducated”	• **1978** General policy reforms and early economic liberalization initiated • **1979 and 1980s** Special economic Zones (SEZ) formed and many cities in coastal regions opened to foreign investment • **1980s** *Hukou* system relaxed and surge of peasants begin to migrate to cities	• **1992** Market economics becomes mainstream • **2000–05** Further relaxation of *Hukou* system leads to acceleration of rural migration to cities; market economics further strengthens after China joins World Trade Organization

* Estimates for these years are from the McKinsey Global Institute China All City model.

Source: China Compendium of Statistics 1949–2004; World Market Monitor database; literature search; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Early economic development, 1950–58. During this period, China introduced new land reforms and granted farmers rights to arable land. At the same time the central government implemented a formal residential registration system, aimed at controlling migration and facilitating an incipient benefits system of food coupons, health care, and access to education in the citizens' registered area (see “China's *Hukou* system”). The system also enabled the separation and identification of urban versus rural residents. Even with these restrictions, the level of urbanization grew relatively rapidly from 11 percent at the start of this period to 18 percent at the end, primarily due to a baby boom in the 1950s encouraged by China's leader Mao Zedong, who exhorted Chinese families to have as many children as possible to make their country strong.[9]

9 See, for example, Susan Greenhalgh and Edwin A. Winckler, *Governing China's Population: From Leninist to Neoliberal Biopolitics*, Stanford University Press, 2005.

China's *Hukou* system

China's household registration system identifies a person as a resident of a particular area. One of the most persistent problems in estimating urban populations is that official statistics often fail to differentiate between populations registered as *Hukou* and other resident populations. China issues its "internal passports" to families. Every family gets a *Hukou* booklet that records information about its members. Before 1980 this system was inviolate. People were required to stay in the neighborhood in which they were born and, while they could travel, the system did not permit them to move to seek employment, educational opportunities, or better public services. Nor could they qualify for coupons (*Liangpiao*) for food or receive treatment in a hospital or clinic other than in their designated *Hukou*.

After China initiated its program of economic reform and opening after 1980, it enforced the *Hukou* program less strictly. Coupons were no longer required to buy food. A worker without a *Hukou* was now able to find employment in a city—but was still not eligible for many services in that area including education and medical care. Despite these continuing limitations, the relaxation of the *Hukou* system had a major impact on China's subsequent rapid urbanization because it allowed migration to take place. However, this shift also presented new issues in determining the exact population of a city. *Hukou*-based urban population data records solely the number of *Hukou* registrants a city can currently show in its books whether or not they actually reside there—but not people without *Hukou* who reside there.

The Great Leap Forward, 1958–60. During this period, China introduced the collectivization of agriculture and the nationalization of industry and commerce, but the program did not lead to economic revival as intended. Rather, the economy suffered serious blows. Agricultural production weakened, and tens of millions died from starvation. Moreover, the Sino-USSR relationship deteriorated, and more than 600 large industrial projects stalled as a result. This period was the beginning of a two-decade stretch that saw urbanization stagnate until 1978—the rate of urbanization barely changed, moving from 18 to 20 percent during this period.

Economic recovery, 1960–65. This period still didn't spark a revival of the process of urbanization. Indeed quite the opposite occurred with urbanization reversing as the government emphasized development in the underdeveloped inland areas. To reverse the disastrous Great Leap Forward period, the government tried to increase agricultural labor to step up food production and simultaneously alleviate food supply and unemployment pressures in urban areas. The government in effect enacted measures that sent more than 26 million people back to rural areas between 1960 and 1963, diminishing the coastal and other big-city populations in accordance with China's 3rd Category Regions plan.[10] The level of urbanization ended this period essentially unchanged from the 20 percent in 1960.

The Cultural Revolution, 1966–76. This period of China's history saw between 14 million and 17 million (counterbalanced by other youth moving to urban areas) young Chinese people sent to rural areas to be "reeducated."[11] Official records show that the level of urbanization dropped from 19 to 18 percent. However, given the huge enforced movements of people out of China's cities, we believe that this percentage is likely to have been understated. Economic growth stalled, and the country underwent a decade of stagnation.

Early economic reform, 1978–90. After Mao Zedong died in 1976, the president of the central military commission, Deng Xiaoping, led China along the path of economic reform and opening up China to global investments. From 1979 through the early 1980s, SEZs formed and many cities in coastal regions opened up to foreign direct investment (FDI). During this period the youth who had been migrated out to the rural areas returned to urban centers, later followed by a surge of peasants migrating to cities to take advantage of better wages in the SEZs, as the *Hukou* system was gradually relaxed. The *Hukou* system had been a major reason for the relatively sedate pace of urbanization. If China had abandoned the system entirely in 1980, we believe that urbanization would have occurred significantly more quickly than it is proceeding now. One reason that China opted to retain the *Hukou* system in some form was that during this period the government did not have sufficient capital on hand for infrastructure spending that would have been needed to help cities to absorb this wave of migrants and returning émigrés from the traumatic Cultural Revolution period. By 1990, MGI estimates, the level of urbanization was 22 percent (compared with the National Bureau of Statistics (NBS) estimate of 26.4 percent).

10 These 3rd Category Regions were the most underdeveloped regions at that time and were mostly located in the Northwest and Southwest of China.

11 National Bureau of Statistics, Department of Social Statistics, *China Labor Wage Statistics: 1949–1985*, Beijing: China statistics publication, 1997; Hongzhang Gu and Mengzhou Hu, *History of China educated youth working in the countryside or mountain areas*, Beijing, 1996.

Continued economic development, 1990–2005. This period has seen tremendous change, and we have chosen this time frame for the focus of our study. Economic reform has accelerated. FDI in 1990 stood at $4.0 billion in constant dollar terms ($3.5 billion in nominal terms) and by 2005 stood at $61.3 billion ($72.4 billion in nominal terms).[12] Per capita GDP increased from almost $400 to about $1,550.[13] During the same period, the urban population increased at a compound annual rate of 5.6 percent, and the level of urbanization doubled from 22 to 44 percent.[14] If we compare this with the 3.6 percent compound annual increase in the level of urbanization during the first 40-year period between 1950 and 1990, we can see how dramatically urbanization has accelerated since 1990.

It is beyond doubt that China's policy of economic liberalization has played a central role in the quickening pace of urbanization in recent years, enabling the conditions that have encouraged the expansion of cities. China's entry into the World Trade Organization (WTO) in 2001 reinforced the shift to market economics and has intensified urbanization as investment opportunities expanded in the mainly urban centers of the coast. Investment is perhaps the most important factor in fueling the development of cities. Fixed investment in cities has moved in lockstep with the expansion in the urban population of China as well as in the expansion of urban areas (Exhibit 2.2). Since reform began in the early 1980s, per capita investments grew 15 percent from 1981 to 1995 before slowing to 7 percent in the next five-year period and leaping to 19 percent in the most recent five-year period from 2000 to 2005.

As has been the case in many other countries, investment in China's cities has, in turn, fueled more rapid income growth in the urban areas compared with rural parts of the country. The resulting income disparities have served only to reinforce the pull toward China's cities as increasing numbers of rural laborers have moved to urban centers in search of better-paid work. Reinforcing this movement has been the low productivity of China's rural sector compared with the rapid productivity growth of industrial and services sectors, mostly concentrated in urban areas that have been the key driver of large-scale jobs generation. In its simplest expression, the transition of a rural worker to a job in an urban factory provides an immediate and very large increase in that worker's value added, which not only increases the worker's income but also boosts company profits, fueling further investment.

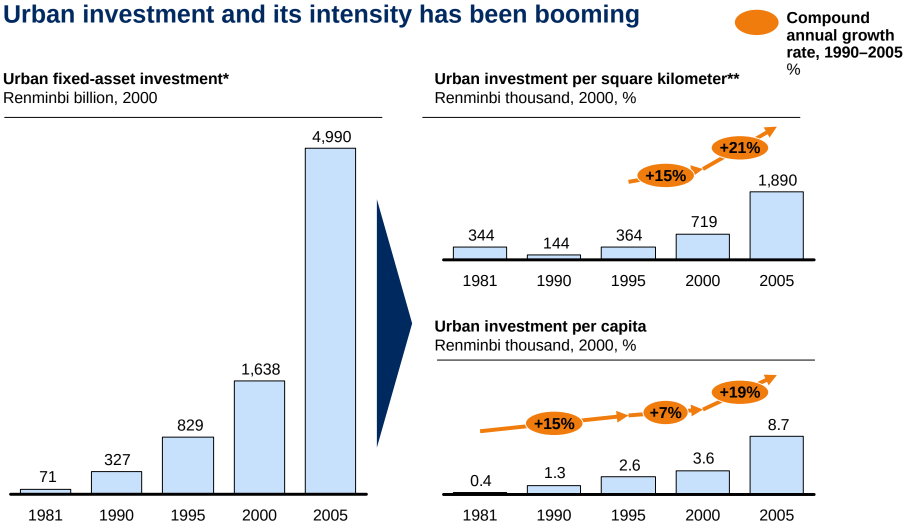
12 We obtained statistics from CEIC Data and the National Bureau of Statistics. All numbers in this report, unless otherwise noted are in constant, 2000 US dollar or 2000 renminbi terms.

13 CEIC Data; Global Insight.

14 All estimates are from the McKinsey Global Institute China All City (CAC) model.

Exhibit 2.2

Urban investment and its intensity has been booming



* Fixed-asset investment and urban population in 1981 are from CEIC Data; others are from McKinsey Global Institute China All City model.

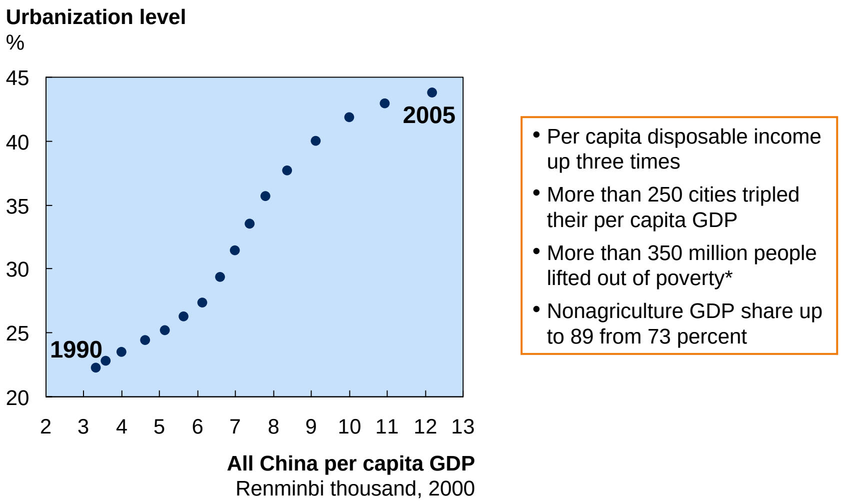
** Urban area 1981 information from China City Construction Statistical Yearbook 2005 (National Bureau of Statistics). Others are from McKinsey Global Institute China All City model. MGI urban area includes all 858 cities; National Bureau of Statistics urban area in 1981 includes only prefecture cities.

Source: China Statistical Yearbook; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

In summary, the dramatic expansion in urban living over the past 15 years has gone hand in hand with economic growth (Exhibit 2.3). During these years, more than 250 cities tripled their per capita GDP, and China lifted an astonishing 350 million people out of poverty as their per capita disposable income tripled.

Exhibit 2.3

China's urbanization has gone hand in hand with its economic development



* Poverty threshold at $2 a day, World Bank data, 2005.

Source: Demographia; World Bank; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

CENTRAL GOVERNMENT WAS THE MAIN ACTOR IN URBANIZATION—BUT CITIES NOW PLAY THE LEAD ROLE

Many observers of China's urbanization assume that the scale of the phenomenon that is unfolding has been possible only because China has a strong central government that is able to institute conformity even at the level of the smallest village.

It is certainly true that, in earlier years, the national government exerted significant influence on the balance between China's countryside and its cities. Often, national policies had the effect of making urbanization relatively anemic—and even throwing the process into reverse at times. In more recent times, central government has played a more enabling role and helped to shape China's urban expansion through, for instance, decisions to locate state-owned enterprises (SOE) in cities such as Harbin and Xingping, the designation of certain cities or clusters of cities—including Shenzhen and Xiamen—as SEZs with the freedom to offer potential investors incentives, and strategic shifts in economic strategy such as China's Great Western Development Strategy.

Central government's emphasis has, at times, taken a "small-town" approach. In the 1980s, this took the form of the township and village enterprise (TVE) system, which focused on building small cities and township enterprises to tackle rural unemployment.[15] However, this system has increasingly come into question due to ambiguous ownership rights (although peasants operated and owned the enterprises in name, it was local government that really controlled the enterprises). Such problems eventually dampened worker enthusiasm, elevated the cost of management, and resulted in heightened losses.[16] The system also resulted in the depletion of arable land all around the country.[17]

The past 15 years have seen a sea change in China's approach to urbanization. The hallmark of this period has been a significant decentralization of power, which has vaulted China's urban expansion to a new scale. This period has seen

15 For a more extensive discussion of TVEs see Yasheng Huang, *Selling China: Foreign Direct Investment during the Reform Era*, Cambridge University Press, 2003, (http://catdir.loc.gov/catdir/samples/cam033/2002024674.pdf) and Yasheng Huang, *Capitalism with Chinese Characteristics: Entrepreneurship and the State*, Cambridge University Press, January 2008

16 Guanghai Liu, "Related discussion on the sustainable development of villages and towns enterprises," *China Soft Science*, 2001, Vol. 7.

17 China originally developed TVEs as an industrial complement to agricultural production. This scheme provided employment for farmers so that they would not need to migrate to distant cities. TVEs comprised companies that were in partnerships with local governments, collectives, and private entrepreneurs. TVEs first appeared in 1978 and accounted for significant production. At the end of 2004, the TVE sector employed 138.7 million people. See "China hand," *The Economist Intelligence Unit*, January 2006, pp. 71–72.

central government incentivize local officials to achieve the highest GDP growth in their cities that they can and give these local leaders considerable freedom in how they can go about achieving this aim.

Today, the decisive actors in China's urbanization are city governments themselves. When we looked at what has been happening on the ground in individual cities, we found that policies or practices that exist in one city may be quite different from those in another urban center only a few kilometers away. We found very little evidence of conformity in the pattern of urbanization because of policies imposed from the center.

One uniquely Chinese form of urbanization has been the freedom of city leaders to expand their administrative purview by reclassifying surrounding counties—and their populations—as part of the urban center. As cities made space for urban development and an influx of new businesses, so migrants flocked to these cities in ever greater numbers. It is local governments—usually at the level of cities—that make urban investment decisions, frequently in conjunction with local SOEs and now increasingly with private sector entities as well. Typically, these investments at the local level cover basic infrastructure—power, water, roads and bridges, telecommunications, and so on.

We will explore this largely localized urbanization phenomenon in greater detail in the next chapter of this report, but we now turn our attention to analyzing what lies behind the mass migration from countryside to city that we have witnessed over the past 15 years.

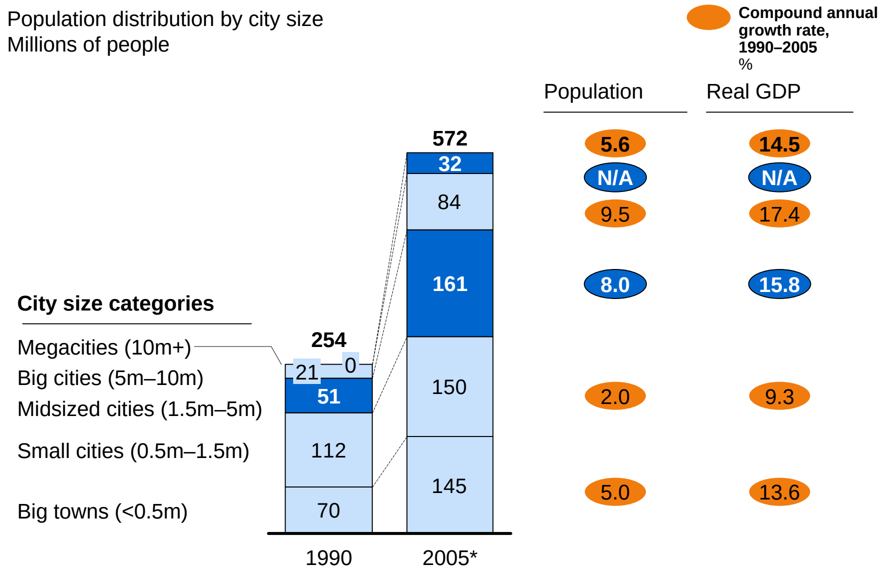
FROM WHERE DID CHINA'S 300 MILLION-PLUS NEW URBANITES COME?

Over the past 15 years, China's urban population has more than doubled from 254 million people in 1990 to 572 million in 2005 (Exhibit 2.4).

Conventional wisdom has long focused solely on migration as the overwhelming component of population growth in urban China. MGI has established that migration to date has been only half of the story (see the appendix at the end of this chapter for details of MGI's definition of "migration"). Indeed, a larger portion of the urban population increase came from cities' land expansion that incorporated existing population, while the inclusion of "unofficial" and new cities accounted for a smaller portion and, of course, natural growth the remainder (Exhibit 2.5).

Exhibit 2.4

China's urban population has more than doubled in the past 15 years



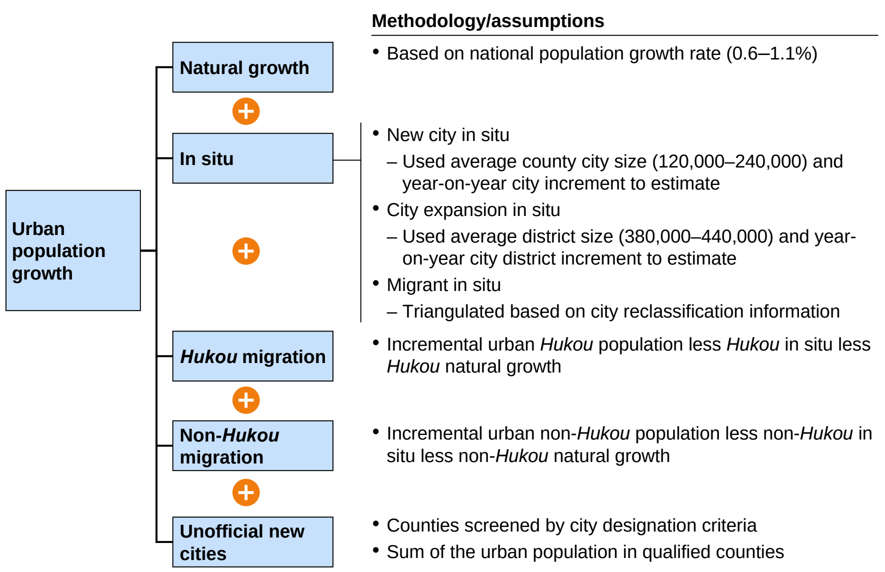
* Includes 663 official cities and 195 additional areas that we consider to be cities using various government qualification criteria. These criteria were discontinued in 1996 for practical reasons but, in our view, remain valid.

Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Exhibit 2.5

There are a number of sources of urban population growth

ILLUSTRATIVE



Source: McKinsey Global Institute analysis

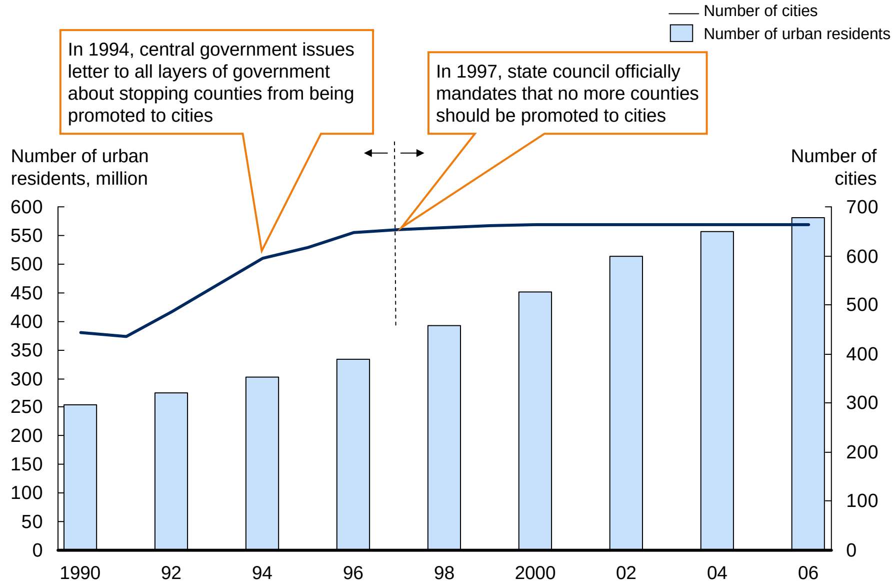
Land expansion. It was clear from our research that cities expanded their land area significantly during the period 1990–2005 (see the appendix at the end of this chapter for details of MGI's "urban" definition). While the total urban land area in China was 2.3 million square kilometers in 1990, by 2005 this had expanded to 2.6 million square kilometers—a rate of expansion 24,727 square kilometers per year or roughly equivalent to adding an area the size of the state of Maryland in the United States (25,314 square kilometers) every year. Much of this expansion was not an expansion of jurisdiction alone but officially sanctioned encroachment of cities into their rural fringes. Thus, millions of people who held rural *Hukou* status of the city jurisdiction obtained urban *Hukou* as a result and became urban citizens; we call such population expansion "in situ" expansion.

"Unofficial" cities. In the course of our research, we discovered that no new areas were designated as cities post-1996. According to the NBS, China had 663 cities in 2005, a large number of which came into being between 1991 and 1996. After 1996, however, there appears to be no increase in the number of Chinese cities in statistical records, which appeared to be counterintuitive given the rapid pace of urbanization that was evident during this period (Exhibit 2.6). When we looked more deeply at this apparent contradiction, we discovered that the halt in the creation of cities was artificial. In 1994, China's central government issued notices to all layers of government indicating that it would henceforth cease to promote counties to cities, a process that it had carried out previously according to a fairly exhaustive list of criteria (Exhibit 2.7). By 1997, the state council had officially mandated this decision, and China named no more new cities thereafter.[18] Using the same criteria that the Chinese government had used to determine cityhood before it changed its approach, we found that an additional 186 counties would have qualified to become cities by 2000, the last year for which we have official census data. We then extended this analysis to 2005 and found that another nine new cities would have formed. Not only did this finding increase the tally of cities we considered in China (to a total of 858 instead of 663 by official records), it forced us to assess what China's total urban population would be with these "unofficial" cities included.

18 *Further strengthening the protection and management of arable land*, State Council Notice No. 11, 1997.

Exhibit 2.6

China added no new cities to its official count after 1996



Source: National Bureau of Statistics; McKinsey Global Institute China All City model; *Further strengthening the protection and management of arable land*, State Council Notice No. 11, 1997; McKinsey Global Institute analysis

Exhibit 2.7

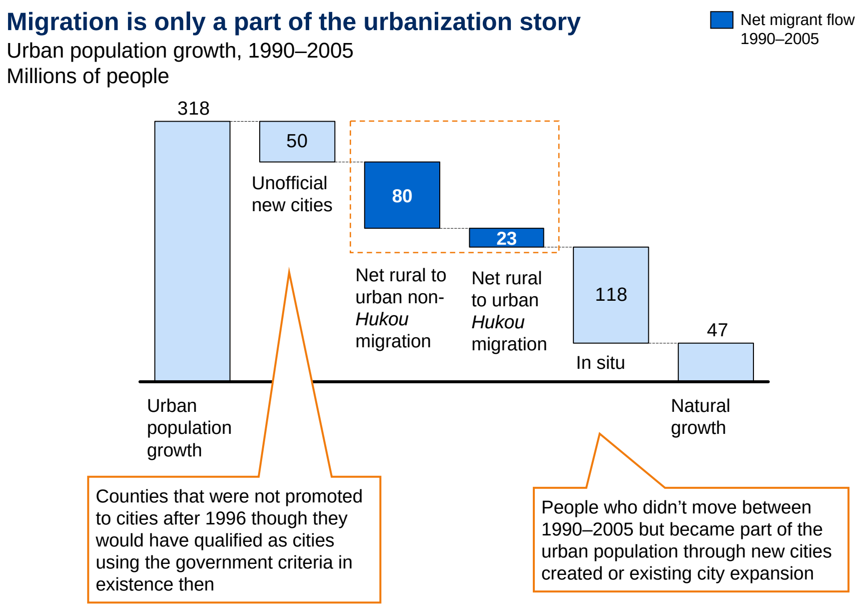
China used detailed criteria to determine county to city promotion up to 1996

	If density >400 people/km²	If density 100–400 people/km²	If density <100 people/km²
Population	• In government-located town, nonagriculture population >120,000, among whom >80,000 are of nonagriculture *Hukou* • Total nonagriculture population >30% of total population and >150,000	• In government-located town, nonagriculture population >100,000, among whom >70,000 are of nonagriculture *Hukou* • Total nonagriculture population >25% of total population and >120,000	• In government-located town, nonagriculture population >80,000, among whom >60,000 are of nonagriculture *Hukou* • Total nonagriculture population >20% of total population and >100,000
Industry mix	• Gross output value of industry accounts for >80% of agriculture and industry and >1.5 billion renminbi • >20% of GDP contributed by service sector	• Gross output value of industry accounts for >70% of agriculture and industry and >1.2 billion renminbi • >20% of GDP contributed by service sector	• Gross output value of industry accounts for >60% of agriculture and industry and >0.8 billion renminbi • >20% of GDP contributed by service sector
Economic development	• GDP >1 billion renminbi • Budget fiscal income >100 renminbi/capita and total fiscal income >60 million renminbi	• GDP >0.8 billion renminbi • Budget fiscal income >80 renminbi/capita and total fiscal income >50 million renminbi	• GDP >0.6 billion renminbi • Budget fiscal income >60 renminbi/capita and total fiscal income >40 million renminbi
Infrastructure	• Central water coverage >65% • Paved road rate >60% • Good sewage system	• Central water coverage >60% • Paved road rate >55% • Good sewage system	• Central water coverage >55% • Paved road rate >50% • Good sewage system

Source: Civil Administration, *Report on adjustment of city-setting criteria*, 1993

Total migration. We estimate that in 2005 103 million more people lived as rural migrants in urban centers than did in 1990 (Exhibit 2.8). This estimate is far below those of others that have ranged from 140 million to more than 300 million. While MGI's estimate is lower than others, it remains the case that a huge mass of people equivalent to one-third the size of the US population has moved in a short time.[19]

Exhibit 2.8



Source: Census 2000; Census 1990; 1% Census 2005; literature search; McKinsey Global Institute analysis

Our migration estimate translates to a compound annual growth rate of 28 percent over the period 1990–2005. So, while migration in China was anemic at best from 1949 to 1990, it has been on a marked expansion path since. From 1990 to 1995, the annual net migration flow was about 4 million people, expanding to 5.6 million in the next five-year period (1995–2000), and jumping to 11 million more recently (2000–2005) (Exhibit 2.9). Other estimates vary widely. For instance, government estimates give an annualized flow of between

19 The estimate we provide is a flow estimate. Stock estimates of migration (i.e., the number of migrants at any point in time) are notoriously suspect because of measurement difficulty. Some of these estimates measure migration flows on the basis of *Hukou* registrations that are not consistent with the location of current residency. Others appear to be based on an approximation of the population with rural *Hukou* in urban areas. Yet other estimates have been based on the nationwide population, whose current residency is not the same as their birthplaces. Of the stock estimates available, two for 2005 are 120 million reported by economist.com and 147 million cited by the NBS 1% Census Survey. UBS offers an estimate of 354 million as of 2000.

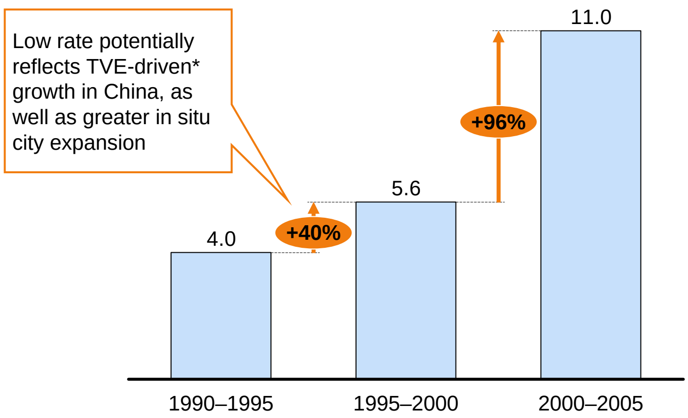
15 and 17 million in 2000–2005. *The Economist* estimates 8 million.[20] And an internal estimate from a private company estimates 18 million over the same period.[21] The relatively lower rate of migrant flows in the early 1990s reflects what we believe to be the TVE-focused growth in China that kept migration muted, as well as greater in situ city expansions through their cities' land purchases. During the later 1990s and into the early part of the millennium through now, the burgeoning economic expansion, FDI, and expansion in manufacturing were the magnets for migration.

Exhibit 2.9

Migration has recently accelerated after a relatively slow start

Annualized net migration flow, 1990–2005

Millions of people



* Township and village enterprises.

Source: Census 2000; Census 1990; 1% Census 2005; literature search; McKinsey Global Institute analysis

An expected but nevertheless interesting result of our migration analysis is that a large proportion of migrants are of working age. For example, in Shanghai, almost 90 percent of migrants are of working age (Exhibit 2.10), with a bulge appearing clearly at the 25 to 34 age bracket in the year 2000.

In the appendix that follows, we detail some of the definitional challenges that we had to negotiate at the start of this research project. Then, in chapter 3, we explore the local nature of China's urbanization in detail in the context of in-depth analysis of, and visits to, 14 representative cities.

20 "China's migrant workers: No place to call home (slum clearance in China)," *The Economist*, June 7, 2007.

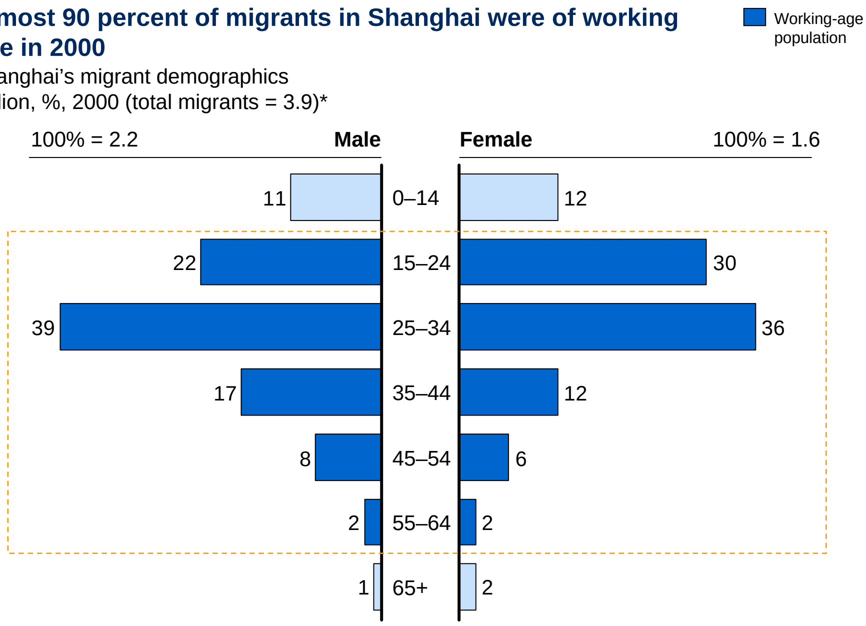
21 Robin Bordie, *Demographics, migration & urbanization: China's growth story*, BHP Billiton research paper, 2007.

Exhibit 2.10

Almost 90 percent of migrants in Shanghai were of working age in 2000

Shanghai's migrant demographics

Million, %, 2000 (total migrants = 3.9)*



Note: Numbers may not add due to rounding.

Source: Census 2000; McKinsey Global Institute analysis

2.1 Appendix: Definitions

URBANIZATION

It became clear at the outset of our work that there are significant difficulties in arriving at a true estimate of urbanization given that there is no international consensus about the definition of urbanization. This is even truer for China. The fact that there is no single definition of urbanization presented a fundamental challenge to our study on China's urbanization. In this section, we describe how we arrived at a consistent, single definition that we could apply to all cities in China and enabled us to arrive at a projected estimate for the pace and scale of urbanization over the next 20 years. Our research finds that every jurisdictional authority around the world uses one of four definitions (Exhibit 2.1.1).

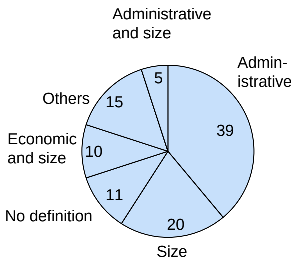
1. A definition that is strictly administrative and classifies urbanization by geographic zones or administrative centers (e.g., Brazil)
2. A definition based both on administrative and size criteria (e.g., China)
3. definition based on the size of city population (e.g., the United States)
4. A definition combining size and economics—i.e., a percentage of a city's population needs to be involved in defined economic activities (e.g., Japan)

Exhibit 2.1.1

Four urbanization definitions are used internationally

Distribution of countries according to criteria used in defining urban areas 2001

100% = 228 countries and regions



	Example	
Administrative	Brazil	• Urban and suburban zones of administrative centers of municipalities and districts
Administrative and size	China	• Density >1,500 people/square kilometer • For density <1,500 people/square kilometer, includes only areas where district/city/town governments are located
Size of population	United States	• Cities defined with density >4,000 people/square kilometer and population >50,000 • Urban clusters defined as areas with density >1,000 people/square kilometer and population no fewer than 2,500 people
Economics and size	Japan	• Densely inhabited districts (DID), defined as groups of contiguous basic unit blocks each of which has a population density of 4,000 inhabitants or more per square kilometer, or which has public, industrial, educational and recreational facilities, and whose total population is 5,000 or more within a *shi*, *ku*, *machi*, or *mura*

Note: Except for Japan, the other three countries' definitions were based on their 2000 census. Japan's was based on its 2005 census.

Source: *World Urbanization Prospects (2001 revision, 2003 revision)*, United Nations; US/Japan/China Census Bureaus

Close to 40 percent of countries around the world follow the first of these four definitions based on an administrative criterion, while some 20 percent use the definition based on size.[22] This creates obvious problems for cross-country comparisons between levels and rates of urbanization. More pertinent to this study, we had to satisfy ourselves about the usefulness of the definition that China uses and what adjustments we needed to make to this definition to achieve consistency across the landscape of Chinese cities.

China classifies cities on six jurisdictional levels

China today has a relatively decentralized but hierarchical structure that makes it difficult to define what constitutes a city as opposed to a rural area. The system has a government hierarchy stretching to six tiers. The central government in Beijing manages this huge country at the level of the province, prefecture, county, town, and township. Over the past 20 years, there has been a gradual devolution of economic powers toward lower levels of government, although government higher up the jurisdictional chain still controls the appointments of key leadership positions lower down.[23] The system is also urban biased. Because of the political importance accorded to industrialization since the 1950s, urban governments have consistently enjoyed a higher ranking than rural governments.[24] An additional peculiarity of the Chinese city hierarchy is that it employs a multitier evaluation system. For instance, higher-level cities evaluate the performance of lower-level urban centers using largely economic criteria such as GDP and its growth. Many academic observers of China's urbanization argue that the result of this has been an overwhelming focus on the economic growth achieved by cities, arguably at the expense of broader societal and environmental indicators.

How China's definition of urbanization has evolved

Since 1949, China has largely adopted a hybrid administrative/size definition of urban areas but has changed its measurement criteria within this broad definition several times during this period (Exhibit 2.1.2). In the mid-1980s, for instance, China lowered the standards that it had set for towns and cities to be considered urban. This boosted (and distorted) the level of urbanization, causing the World Bank at one stage to stop reporting China's urban population. In the 1990 census,

22 United Nations, Department of Economic and Social Affairs, *Principles and Recommendations for a Vital Statistics System Revision 1*, 1998.

23 Qingkui Xie, "Introduction to the central and local government system," *China Radio and Television publication*, 1998.

24 Kam Wing Chan, *Fundamentals of China's Urbanization and Policy*, Seattle, United States: University of Washington, 2007.

China began classifying all districts at the provincial and prefecture levels as part of cities. This led to an overcounting of cities with districts under their jurisdiction and conversely an undercounting of those cities without districts.

Exhibit 2.1.2

Definitions of urbanization in China have evolved

NOT EXHAUSTIVE

	1964	1982	1990	2000	2006
Urban population Millions of people	129.5	214.8	302.0	459.1	577.1
Urbanization level(%)	18.4	21.13	26.41	36.22	43.90
Definition in force	• A. City population >100,000 • B. Town* population >3,000; nonagricultural *Hukou*>75% • Urban = A + B • Urban population = nonagricultural *Hukou* in A + B	• A. City population >100,000 • B. Town* population >3,000; nonagricultural *Hukou* >75% • Urban = A + B • Urban population = total population in A + B	• A. All districts at provincial and prefectural level • B. For county-level cities and towns, only units with residential committee • Urban = A + B • Urban population = local *Hukou* + nonlocal *Hukou* yet residency >1 year	• A. City districts where population density >1,500 • B. For area where population density <1,500 then include a) street/town/township where district or city government is located; b) resident/village committee where town government is located • Urban = A + B • Urban population = local *Hukou* + nonlocal *Hukou* yet residency >6 months	• A. For city, street area with residential committee and public or residential facilities area with residential/ village committee • B. At county level, area with residential committee, public or residential facilities with village committee • Urban = A + B • Urban population = local *Hukou* + nonlocal *Hukou* yet residency >6 months
Implication	• Urban area and urban population reduced from the Great Leap Forward • Employment pressure alleviated • Urbanization rate tended to be slower	• In 1984 and 1986, the urban "qualifying" standards for towns and cities lowered • Urbanization level boosted but distorted • UN and the World Bank stopped reporting China urban population	• Overcounts of cities with districts; undercounts of cities without districts; undercounts of townships • Cities with and without districts are incomparable due to different urban definitions	• New definition moves closer to international practices, thus well received broadly • New standards of urban resulted in inconsistent and incomparable data sets with earlier census	• New definition standardizes urban criteria used in different region to facilitate comparison between urban areas • Stresses economic linkages more than administrative boundary • More difficult to collect sample data and • calculate urban data

* Includes units where county or county city government locates.

Source: China, Compendium of Statistics 1949–2004, China Statistical Yearbook 2001; Census 2000; Census 1990; China Population and Employment Statistical Yearbook 2007; Regulation of city and country classification in statistics, National Bureau of Statistics 1999; McKinsey Global Institute analysis

China's most recent adjustment to its jurisdictional classifications has effectively defined cities more narrowly and appears to make a more logically consistent distinction between rural and urban areas. In the 1990 census, certain town and township jurisdictions counted as urban if they had residents or villagers committees (Exhibit 2.1.3). By 2000, China had reweighted its definition toward density and a particular geography, and we have begun to see a definition that has converged somewhat with international standards (Exhibit 2.1.4).

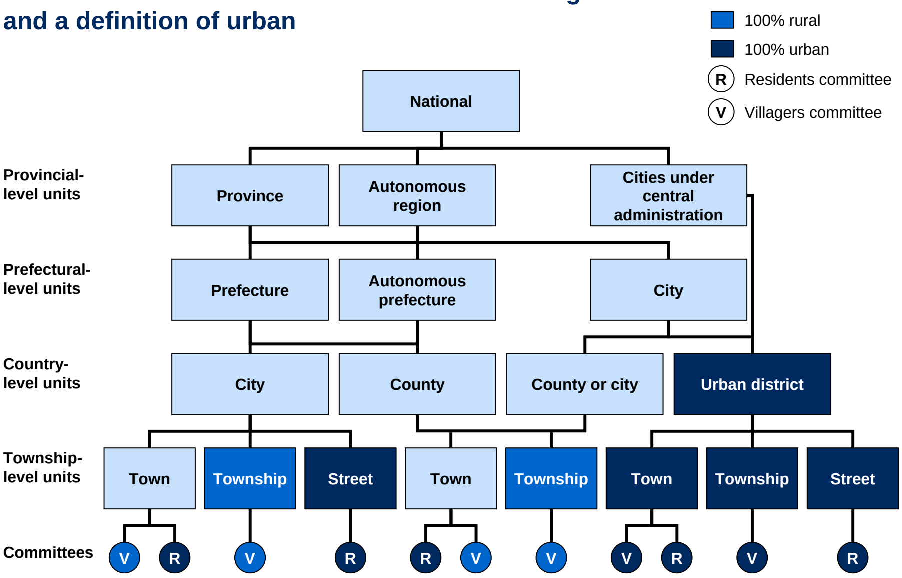
However, inconsistencies remain, and it is difficult to compare the 2000 census with earlier census data. We therefore adjusted the raw data to make it more consistent and statistically more measurable from 1990 to the present (see chapter 2 of volume II).

URBAN

Another complication in trying to ascertain China's urban population is determining what geographic boundary to use. Again, there is no standard approach internationally. The United States and several other countries have

Exhibit 2.1.3

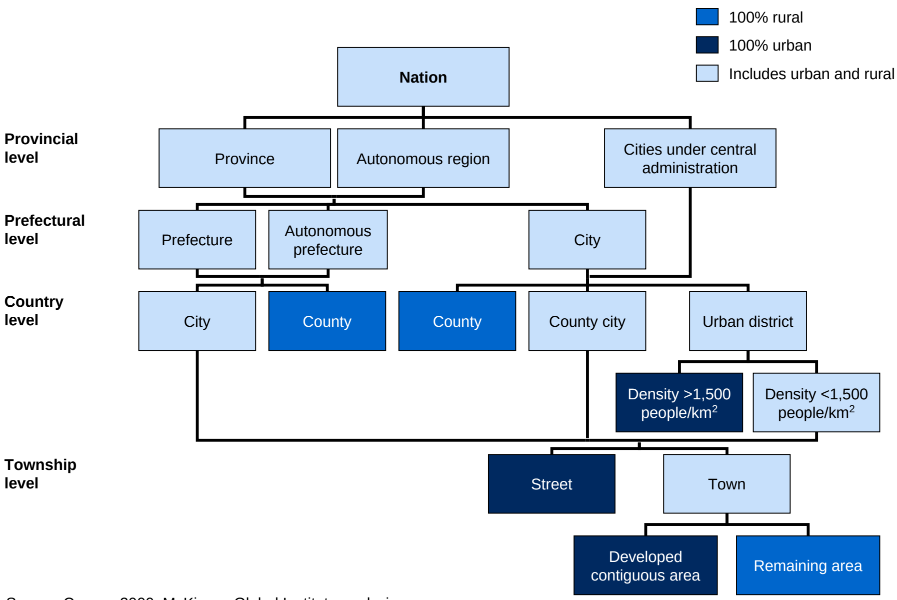
The 1990 census laid out a number of levels of government and a definition of urban



Source: Kam Wing Chan, *Cities with Invisible Walls: Reinterpreting Urbanization in Post-1949 China*, 1994; Census 1990

Exhibit 2.1.4

The 2000 census narrowed the definition of urban

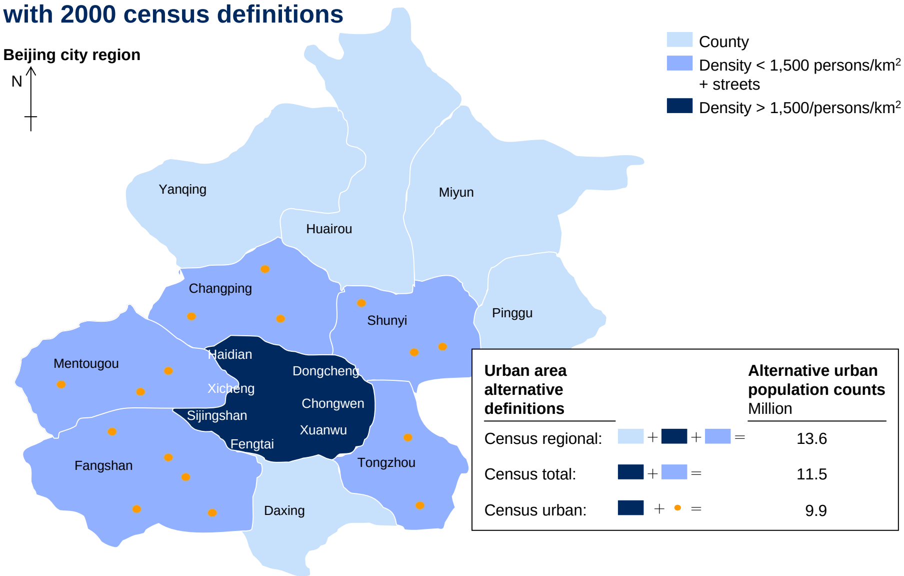


Source: Census 2000; McKinsey Global Institute analysis specific definitions of metropolitan boundaries that these countries use in their statistical classifications of urban areas, including the United States' Metropolitan Service Area (MSA). China has no such system. Instead, "urban" populations are defined on the basis of their geographical jurisdictions. In many cases this often means that cities classify as urban areas that are, in reality, rural. To illustrate how much this can skew estimates of urban populations, consider that the jurisdictions of Chongqing or Shanghai covered 25,657 and 5,155 square kilometers, respectively, in 2006—equivalent to Maryland and Delaware in the United States. If we use this broad geographical definition of urban areas determined by local jurisdictions, the estimate of the level of urbanization in China using actual 2000 census data on official cities amounts to 89 percent—which is clearly incorrect.

Any study of urbanization needs to tackle this issue to move beyond the wide range of reported urban populations provided by different Chinese cities and arrive at a consistent definition. A map using Beijing as an example explains the differences in population as measured by differing census concepts (Exhibit 2.1.5). Extending this to include comparisons from the United Nations that the National Bureau of Statistics of China provides shows how radically divergent these population estimates can be compared to either the *Hukou*- or census-based data for these cities (Exhibit 2.1.6).

Exhibit 2.1.5

Beijing's urban area can be defined in three different ways in accordance with 2000 census definitions



Source: McKinsey Global Institute analysis

Exhibit 2.1.6

Several measures of urbanization yield confusion

China's 12 largest cities, 2000, urban population, millions of people

	UN	Census regional (city districts + counties)	Census urban	Census total	*Hukou*	Difference between census total and *Hukou* (%)
Shanghai	12.89	16.41	13.46	14.35	11.37	**26**
Beijing	10.83	13.57	9.88	11.51	9.74	**18**
Guangzhou	3.89	9.94	7.55	8.52	5.67	**50**
Wuhan	5.17	8.31	6.79	8.31	7.49	**11**
Tianjin	9.16	9.85	6.76	7.50	6.82	**10**
Shenzhen	1.13	7.01	6.48	7.01	1.25	**461**
Chongqing	4.64	30.51	6.17	9.69	8.96	**8**
Shenyang	4.83	7.20	4.60	5.30	4.85	**9**
Chengdu	3.29	11.11	3.96	4.33	3.36	**29**
Dongguan	1.32	6.45	3.87	6.45	1.53	**322**
Xi'an	3.12	7.27	3.76	4.48	3.93	**14**
Nanjing	2.74	6.13	3.51	3.62	2.90	**25**
	Data National Bureau of Statistics provides to United Nations	Population under administration of municipality	Population of urbanized area	Population of urban administrative area	People registered in a city	

Source: National Bureau of Statistics; United Nations; Professor Kam Wing Chan, University of Washington; McKinsey Global Institute analysis

Based on academic research, we examined census data as the route to a consistent set of data on urbanization.[25] China's 2000 census data provides demographic information at three broad levels: census regional, census total, and census urban. Census regional captures all the people that live within a jurisdiction claimed by a city. As we have noted, this tends to overestimate urbanization as vast stretches of countryside that are officially within a city's jurisdiction are counted as urban. Census urban effectively captures the urban population at the city center. Our view is that this measure alone would tend to underestimate urbanization somewhat. The same would hold true if New York counted only the population of Manhattan as urban, as opposed to also including those living in the surrounding metropolitan area who have obvious economic connections to the urban center.

Finally, census total measures the population in the urban center coupled with people living in those areas—metropolitan or suburban—immediately surrounding the center. We believe that this measure most accurately measures urban China for two reasons. First, it recognizes the viable and vital economic connections between city centers and their peripheries. Second, census total explicitly takes

25 Kam Wing Chan, "Chinese census 2000: New opportunities and challenges," *The China Review*, 2003, Vol. 3, No. 2, pp. 1–12.

into account adequate space for the existing city to spill over into—important in the context of the continued rapid geographic expansion of cities in China. Even the census total definition has some shortcomings, including on occasion some city districts that are not entirely urban in nature. Nevertheless, this definition comes closest to international definitions of urban areas, more closely approximating acceptable boundaries of what we can consider urban living, and we have adopted this definition for the purposes of our study.

As the map of Beijing in Exhibit 2.1.5 vividly illustrates, there are often significant differences between these three census measures of urban. If we use census total, our preferred definition of urban, we would not include the counties of Yanqing, Huairou, Miyun, Pinggu, and Daxing despite the fact that these are technically part of the jurisdiction of China's capital city.

MIGRATION

Once we had arrived at a workable definition of urbanization and an estimate of China's total urban population today, we then turned our attention to the key macro- and microeconomic factors that are driving urbanization in China, including industrialization, investment, and job creation, all of which are largely focused on urban centers. Based on historical data and field visits that we undertook to a range of Chinese cities of different sizes, at various stages of development, we found that all of these drivers have a high correlation with the level of urbanization.

In particular, we looked at the impact of these drivers on two major forces at play in the expansion of China's cities—migration and land acquisition. Conventional wisdom has long focused solely on migration as the overwhelming component of urbanization in the Chinese context. We arrived at our own definition of migration and a new, bottom-up estimate of today's stock of migrants of 103 million people. But we also found that the acquisition of collectively owned farmland surrounding urban centers—both as a means to attracting more business investment and increasingly as a commercial venture providing a substantial source of funds to finance urban expansion—is another critical factor at work.

Mass migration to cities has been a major component of the expansion of urban China in recent years, but it has been difficult to ascertain with any precision the size of this phenomenon. Academic researchers who have been studying China's urbanization have used no fewer than four criteria of migration:

1. The first criterion includes estimates of migration based on a minimum movement of people within a type of locale. This definition has used movements within townships (from one street to another within a township), counties (from one town to another within a county), and cities (from one district to another within a city) each as minimums.
2. A second criterion uses length of stay to determine qualification as a migrant. Under the Chinese population census method, a migrant is a person who has stayed in a new locale for a minimum of six months. However, local bureaus of statistics have released estimates of migrants who have stayed in a new locale for just a day or more.
3. The third criterion uses the *Hukou* registration of migrants. Some academics have strictly treated the non-*Hukou* population as migrants—in other words, they would consider those who had obtained *Hukou* to be residents rather than migrants. Others have insisted on counting only people who have actually moved from one place to another as migrants.
4. Finally, there is an urban versus rural criterion. Some estimates count only those people who move from rural to urban areas as migrants; others have counted urban to urban movements as well.

None of these four criteria are wrong in themselves, but they have contributed to widely varied and confusing estimates of how many people have moved out of the countryside into the cities. It is clear that we need to adhere to a consistent set of rules to arrive at a broadly accurate estimate of the size of China's migration.

For the purposes of this study, MGI defines migration according to four criteria.

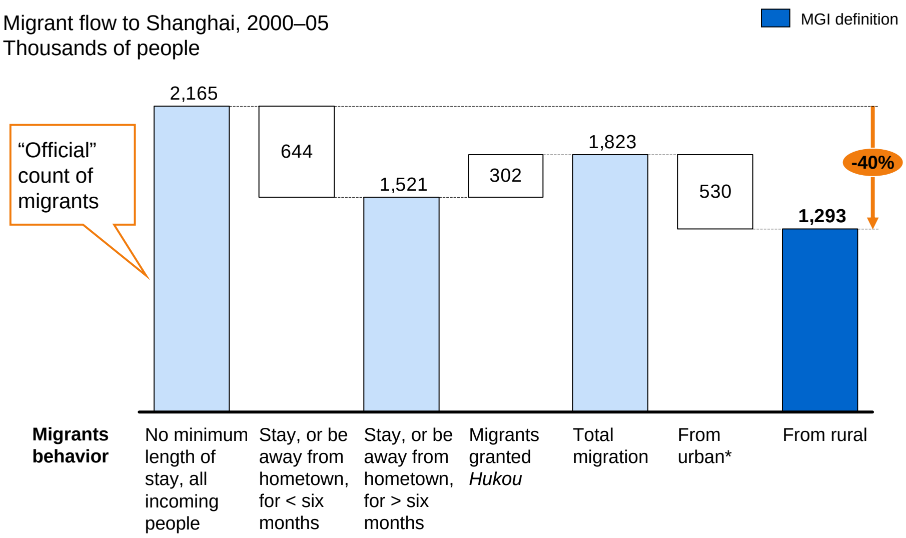
1. We adopted the same standard for length of stay as the NBS: a minimum of six months resident in the receiving city or six months away from the individual's hometown would qualify that individual as a migrant.
2. We chose to use a geographic boundary determined by the Chinese census methodology that combines the city center with its suburban fringe. We can classify any individual moving into or out of this area as a migrant.
3. We count as migrants only those who move from a rural to an urban area and effectively discount urban to urban movement, that effectively results in no change in the urbanization rate of the country as a whole.
4. We take into account people with and without *Hukou*. Just because some migrants are successful in getting local residency does not imply that they are no longer migrants—they still represent a net addition to the natural population and therefore add to the urbanization level of an area.

When we applied our definition to Shanghai's official count of its net inflow of migrants from 2000 to 2005, we found that only 60 percent of these met our definition (Exhibit 2.1.7). The main source of difference between the official count and our definition is the fact that those people defined in the Shanghai count as migrants included a statistically significant number of people relocating from other cities (urban-to-urban migration), whereas MGI's definition excludes urban-to-urban migration.

Exhibit 2.1.7

Only 60 percent of Shanghai's official count of migrants meets MGI criteria

Migrant flow to Shanghai, 2000–05
Thousands of people



* Estimate from literature.
Source: Shanghai Statistical Yearbook; literature search; McKinsey Global Institute analysis

3. China's urbanization is local

The idea of any country housing one billion people in urban centers in the short span of less than 20 years seems unfathomable in any context other than 21st-century China. Many foreign observers assume that the scale of this urbanization phenomenon has been possible only because China has a strong central government, able to institute conformity even at the level of the smallest village.

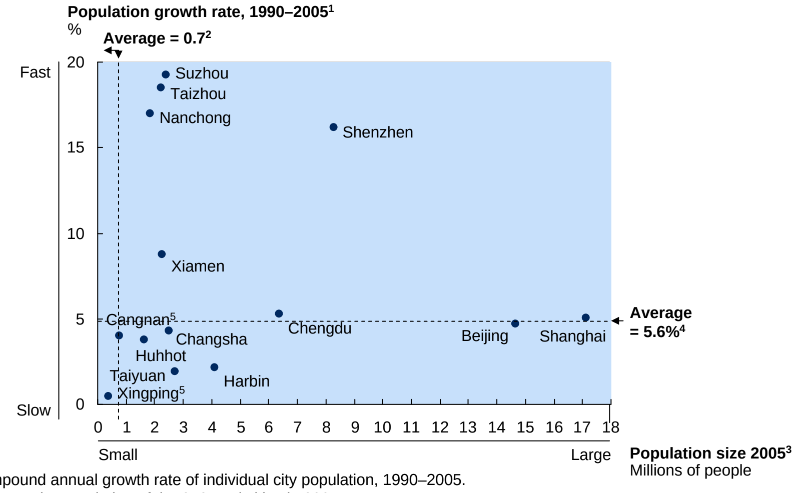
This is only partly true, as the decisive actors in China's urbanization, especially in the past 15 to 20 years, have been the city governments themselves.

Localities retain most tax revenues. Local governments can make decisions on everything from industry subsidies to retail licensing, subject mainly to "negative control" by Beijing. Traditionally Beijing has relied on, and indeed incentivized, the entrepreneurial nature of local bureaucrats to identify and pursue growth opportunities. This means that each city faces different urbanization opportunities and challenges.

To help us find out more about this, we selected a group of 14 case cities and visited each in turn. We chose this group, after discussion with several Chinese academics and urbanization experts, out of 858 cities on the basis of a range of size, speed of growth, and geographic spread, and because they represent different urbanization experiences that would allow us to disaggregate the forces at work (Exhibit 3.1). On the basis of in-depth research, coupled with visits to each city and many interviews with government officials and private-sector leaders, we were then able to organize the cities into three "horizons," each marking a phase of urbanization and a different approach to it, providing a frame of reference for our analysis.

Exhibit 3.1

MGI selected 14 representative cities depending on their size and speed of growth from 1990 to 2005



1 Compound annual growth rate of individual city population, 1990–2005.
2 Average city population of the 858 total cities in 2005.
3 Individual city populations in 2005.
4 Compound annual growth rate of the total populations of 858 total cities from 1990 to 2005.
5 Xingping and Cangnan data are from 2000 to 2005.

Source: Census 1990; Census 2000; Census 2005; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Our visits reinforced our view of urbanization as a locally driven phenomenon. We noticed, for example, how pressures caused by pollution, congestion, and land scarcity can be more or less critical, depending on the development stage and the development path followed by each city. Urbanization is local—policy choices enacted at the level of individual cities, under the overall guidance of the national government, have strongly influenced China's urban growth.

CHINA'S CITIES CAN BE GROUPED IN THREE HORIZONS, BASED ON DIFFERENT APPROACHES TO URBANIZATION

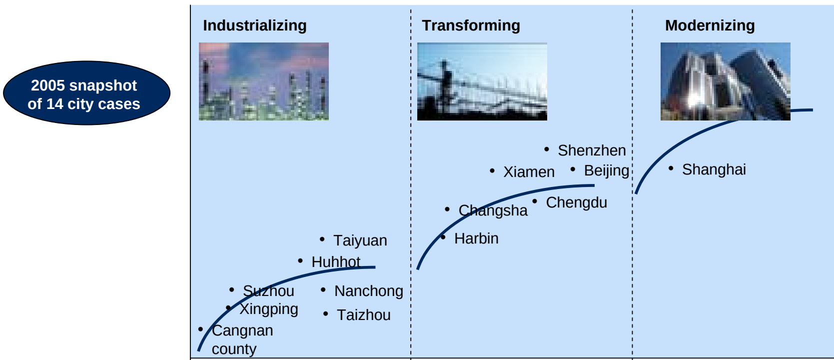
Every city we visited denoted different priorities and a different use of policy levers to achieve its targets—overall a different approach to urbanization. This "urbanization approach" varies especially within cities at different degrees of development. We grouped cities with similar behaviors into three horizons in order to better understand which are the microlevers that have influenced urbanization in the past and could therefore play an important role in determining how China's urban expansion plays out in the future (see "MGI's three urbanization horizons"). We assume these three horizons as representative not only of the 14 cities we visited, but of all Chinese cities.

MGI's three urbanization horizons

Our horizons framework presents a qualitative picture of the evolving emphasis of city governments in their handling of urbanization, homing in on the different approaches cities have taken to a range of levers that we observe have influenced urbanization in a particular direction (Exhibit 3.2). We characterize Horizon 1 as "industrializing," Horizon 2 as "transforming," and Horizon 3 as "modernizing."

Exhibit 3.2

Chinese cities follow an urbanization growth path with three distinct phases



		Industrializing	Transforming	Modernizing
Averages for China	Population	1 million–2 million	2 million–15 million	15 million+
	Time in stage	10–1,000 years	15–20 years	NA
	Per capita GDP	<$2,000	$2,000-$6,000	$6,000+
Averages for United States	Population	100,000–200,000	200,000–500,000	0.5 million–8.0 million
	Time in stage	200 years	75 years	50 years+
	Per capita GDP	<$20,000	$20,000–$40,000	$40,000+

Source: McKinsey Global Institute analysis

It is important to note that we do not base our categorization of cities into the three horizons on the basis of purely quantitative metrics such as the size of its GDP or population. While such statistics are a factor—for instance, a city that spends less on pollution control or, conversely, more on social provision may accordingly receive a lower or higher score on "quality of life"—they do not define to which horizon a city belongs. Similarly, while a city does not qualify for a particular horizon on the basis of its size, it tends to be the case that larger, richer cities tend to be more developed and therefore belong to a more evolved horizon.

Nor do the three horizons lend themselves to direct international comparisons—our classification of cities depends entirely on our observations of the 14 cities in China rather than in the context of, say, a modern-day Phoenix, Arizona, or London half a century ago. Nevertheless, we use some international comparisons in the modernizing horizon to establish benchmarks to which Chinese cities in this bracket of evolution can realistically aspire.

In summary, movement through the horizons is a qualitative evolutionary curve, and all cities can aim to become modernizing regardless of their size.

Horizon 1—industrializing

We believe that some 65 percent of China's urban population today lives in Horizon 1 cities, which we define as "industrializing." In this horizon, broadly speaking, cities are in the early phases of industrialization with an emphasis on labor-intensive, production-line manufacturing. At this stage, city leaderships—supported by central government—tend to focus on boosting GDP and reducing poverty and unemployment, subject only to minimum standards in terms of environmental and social performance. We classify 3 (Xingping, Suzhou—Anhui Province—and Nanchong) of the 14 cities we studied in depth as being in the early stages of Horizon 1 (Exhibit 3.3). These cities that lie at an earlier point in the curve of development focus largely on moving citizens out of poverty. They tend to pull those policy levers that maximize growth in order to lift living standards—driven by the national targets for growth handed down by central government and the accompanying incentives for success. To maximize growth, the dominant focus of these cities is on attracting and nurturing business investment. We classify another 3 of our cities (Huhhot, Taiyuan, and Taizhou) as being in the later stages of industrialization (Exhibit 3.4). These cities are starting to exhibit many qualities of transforming cities ("Horizon 2")—particularly in their use of land and their infrastructure investments. However, on certain key dimensions, particularly urban planning and quality of life, they still behave as Horizon 1 cities.

Exhibit 3.3

Early-industrializing cities are focused on attracting business to promote growth

NOT EXHAUSTIVE, INDICATIVE

(X) Horizon of city behavior by each lever

City	Land	Infrastructure	Urban planning	Industries	Networks	Talent/labor	Quality of life	Overall horizon
	City behavior/performance on each lever*							
Xingping	(1) Lowest-level standard price for industrial land (120 renminbi/m²)	(1) 54% of government infrastructure investment in basic roads and bridges	(1) Special economic zones within 5 km of city center	(1) Manufacturing largest sector of economy (49%)	(1) Sales office in Xi'an and Xianyang to encourage economic ties	(1) 80% of labor force are former local farmers	(1) Per capita income (2,300 renminbi**) barely above China poverty line (2,150 renminbi)	1
Suzhou (Anhui Province)	(1) Standard land price very cheap (144 renminbi/m² vs. 228 renminbi/m² Horizon 1 average)	(1) 49% of government infrastructure investment in basic roads and bridges	(1) "Today many factories are still near the city center." —city official	(1) "Just go ahead with your investment and we'll do the rest." —city official	(1) Foreign-direct investment less than 1% of city GDP; investment mainly from region	(1) Government seeking work opportunities for citizens outside of city due to labor oversupply	(1) Per capita investment on education and healthcare less than 500 renminbi	1
Nanchong	(2) Extensive land sales (60% of government revenue in 2005)	(1) "We are seeking to improve rail and road to drive urbanization." —city official	(1) Urban planning focused on 3 special economic zones near city center	(1) Specialized in 4 basic industries: textile, auto parts, petrochemical, and agro product	(1) Sales office in Chengdu and Chongqing to encourage economic ties	(1) Majority of labor force (60%) are still local farmers	(1) Per capita income low at 3,200 renminbi** compared to China's poverty line of 2,150 renminbi	1

* Based on field interviews supplemented by desk research conducted in 2007.

** In 2000 constant renminbi.

Source: Field visits; McKinsey Global Institute analysis

Exhibit 3.4

Late-industrializing cities evolve on several dimensions, becoming similar to "transforming" cities

NOT EXHAUSTIVE, INDICATIVE

(X) Horizon of city behavior by each lever

City	Land	Infrastructure	Urban planning	Industries	Networks	Talent/labor	Quality of life	Overall horizon
	City behavior/performance on each lever							
Huhhot	(1) Big land discounts for all industries (80%+ off standard land price of 288 renminbi/m²)	(2) Increased electricity supply by over 70% in past five years	(1) "We don't have complex urban planning. We want to let the city grow." —city official	(1) Financial sector underdeveloped (e.g., <1% of GDP)	(1) Rail and highway freight on par with Horizon 1 average	(2) "We have talent from 19 higher-learning institutions—it's not an issue here." —city official	(1) Investment in pollution prevention only 0.2% of GDP	1
Taizhou	(2) Limited land discounts (e.g., only 30% to high-tech industry)	(1) 48% of government infrastructure investment in basic roads and bridges	(1) Many factories still close to center, but city has moved some and is planning new economic zones farther away	(2) Emerging financial sector (6% of GDP)	(1) Large port servicing region Rail and highway freight only 1/3 of Horizon 1 average	(2) "Migrants come from far to work here in basic jobs, but it is tough to attract talents." —city official	(1) Green space per capita less than half that of Horizon 2 average (9 vs. 23 m²/person)	1
Taiyuan	(1) Offer as much as 70% on land discounts to businesses	(2) Public transit use already at 121 per capita annually (vs. average of 37 in Horizon 1)	(1) Planning new special economic zones 15 km from city center Current zones still 5 km to city center	(2) Emerging financial sector (5% of GDP)	(2) As coal center of China, nearly 200 million tonnes of freight pass through annually (3 times Horizon 1 average)	(2) Over 95% of population *Hukou*-based; limited migration	(1) Invest only ~500 renminbi per capita on health care and education Pollution level from coal highly visible during city visit	1

Source: Field visits; McKinsey Global Institute analysis

Horizon 2—transforming

Horizon 2 is a "transforming" phase of urbanization. We estimate that some 25 to 30 percent of the Chinese urban population lives in this type of city today. Although GDP growth remains a priority, city leaders emphasize specialization of industry even more intently, services start growing, and planners start looking beyond pure GDP, toward improving basic living standards. Typically constraints on the provision of resources such as water and electricity, as well as pollution and congestion, intensify in this phase, in line with mounting urban and industrial growth. These cities have an average population of anything between two million and eight million people, are moving beyond a pure industrial agenda, and are transforming into more developed urban entities. GDP growth remains a priority, of course, but these cities start to look at longer-term sustainability and competitiveness. They begin to address some of the pressure points that began to rise in the industrializing stage, and quality of life is noticeably higher. Of our 14 cities, we categorize 6 as transforming. Of these, we place 2—Harbin and Changsha—in the early phase of this horizon (Exhibit 3.5) and the remaining 4—Chengdu, Xiamen, Shenzhen, and Beijing—in the latter stages (Exhibit 3.6).

Exhibit 3.5

Early transformers start focusing on long-term sustainability

NOT EXHAUSTIVE, INDICATIVE

X Horizon of city behavior by each lever

City	City behavior/performance on each lever: Land	Infrastructure	Urban planning	Industries	Networks	Talent/labor	Quality of life	Overall horizon
Changsha	2 "Land sales are a major source for funding urban development." —local government official	2 Higher-than-average public transit use (230 uses/ person/year) 88% of government infrastructure on inner-city roads	2 Factories forced out of city and relocated in new economic zones 25 km away	2 Services 66% of GDP	1 International airport and port Decent level of rail and highway freight (between Horizon 1 and 2 average)	2 45 universities/ colleges, 76 private educational institutions to provide talents	2 At 25 m^2 per capita, 2nd-highest green space coverage among 14 case cities	2
Harbin	2 Limited land discounts (e.g., only 30–50% to high-tech industry)	2 46% of construction investment in increasing water and gas supply	2 In 2004, used "blank-sheet" planning to move factories inside city area to new industrial zones	1 Limited financial sector (2% of GDP)	1 International airport and port Decent level of rail and highway freight (between Horizon 1 and 2 average)	2 Government investing in local universities in effort to increase number of graduates to meet skilled-labor-shortage issues	2 High level of spending on pollution prevention (2.6% of GDP vs. 1.5% of GDP average for Horizon 2)	2

Source: Field visits; McKinsey Global Institute analysis

Exhibit 3.6

Late transformers include some of the major Chinese urban centers on the verge of becoming world-class cities

NOT EXHAUSTIVE, INDICATIVE

X Horizon of city behavior by each lever

City behavior/performance on each lever

City	Land	Infrastructure	Urban planning	Industries	Networks	Talent/labor	Quality of life	Overall horizon
Chengdu	2 Land sales account for 39% of government revenue in 2005	2 64% of government infrastructure investment in inner-city roads	2 Relocating factories in new eastern special economic zone	2 Attracting high-value-added IT services industry with national software platform	2 31 weekly international flights 3rd-highest freight volume in China	2 33 universities, 40,000 annual graduates Talent-retention issues	2 High spending on education/ health care (900 renminbi/ person / year) High congestion	2
Xiamen	2 Land discount offered only to high-tech and tourism industries	2 2nd-highest public transit use among 14 case cities (278/person/ year)	2 Moved all factories off of the island	2 High-tech companies contribute 56% of industry sector GDP	2 Significant international airport and port; strong ties to Taiwan (foreign direct investment)	2 Talent shortage due to competition from neighboring cities	2 Investing 2.5% of GDP on pollution cleanup	2
Shenzhen	2 Only high-tech and other high-value-added industries get land discounts	2 More than doubled electricity supply since 2001	2 Tore down all factories in city center over past 10 years in favor of services/ high tech	3 Financial sector 10% of GDP	2 Top 5 port in the world 37 weekly international flights	2 Only 9 local colleges High turnover and talent shortage	2 Highest per capita income but lowest investment in pollution prevention	2
Beijing	2 Land dis-counts only for selected industries/usages (e.g., Olympics projects)	3 Huge investment (35% of construction) in subway system	2 Moved all factories outside of city proper	3 Financial sector 13% of GDP Services 70% of GDP	3 2008 Olympics 2nd-highest freight and airport traffic in China	3 Strict *Hukou* requirements Large oversupply of labor and talent	2 High spending on education per capita Severe air pollution and congestion	2

Source: Field visits; McKinsey Global Institute analysis

Horizon 3—modernizing

We term Horizon 3 as a “modernizing” stage—a modernizing city is on its way to being a truly 21st-century modern metropolis. Belonging to Horizon 3 does not imply a certain population size, level of per capita GDP, and international recognition. There are plenty of cities around the world that have high per capita income levels of $30,000 or more and have populations of upward of half a million that we would consider truly modern, 21st-century urban centers. These figures are beyond China today. What distinguishes modernizing cities in the Chinese context is the way that they employ the range of policy levers at their disposal to develop their urban profile. While GDP growth remains a key focus, a modernizing city looks more long term in its planning with a view to sustainability. Delivering a good quality of life including more social provision—as citizens become wealthier, they demand no less—becomes a core priority, as do encouraging an even higher share of services and building international recognition. Achieving global status is clearly within their trajectory. Among our 14 case cities, Shanghai is the only city we place in this category. Shanghai differentiates itself from the rest of our case cities in several respects (Exhibit 3.7). Beijing comes close. China’s capital city acts as a modernizing city in many respects—its industrial policy, its advanced regional and international networks, its abundant infrastructure, the highest per capita spending on education in China, an oversupply of skilled labor—but will need to recognize and address pollution and congestion problems to become a full modernizer. Other cities that we did not study in depth, including Dalian and Guangzhou, may also qualify. Nevertheless, we estimate that a handful of Chinese cities at most are currently "modernizing."

Exhibit 3.7

Shanghai is the one example of a modernizing city among MGI's 14 case cities

NOT EXHAUSTIVE, INDICATIVE

(X) Horizon of city behavior by each lever

	City behavior/performance on each lever							
City	**Land**	**Infrastructure**	**Urban planning**	**Industries**	**Networks**	**Talent/labor**	**Quality of life**	**Overall horizon**
Shanghai	(3) Land used strategically to develop art or entertainment zones such as Expo Shanghai	(3) City has made large-scale investment in subway system, providing 100 stations in a decade	(3) Shanghai's urban plan includes its metropolitan region Concepts of sustainability evidenced by building restrictions, increasing green space, etc.	(3) Developed financial sector (10% of GDP)	(3) Huge international airport and port Many events to raise international brand: Formula 1 racing, 2010 Expo, 2007 Special Olympics, etc.	(3) Large supply of talent from extensive university system High requirements for migrants due to large supply of migrant labor	(3) 1,400 renminbi per capita spent on education/ health care (vs. 900 renminbi average for Horizon 2) Concrete actions to limit congestion (e.g., license-bidding system)	3

Source: Field visits; McKinsey Global Institute analysis

CITY POLICIES AND BEHAVIOR EVOLVE AS THEY URBANIZE

During the process of urbanization, different sets of urban policy come into play. Based on interviews during our field visits to Chinese cities and the emphasis and priorities that city leaders and local businesses relayed to us, we have identified four policy areas—"pillars of urbanization"—under which all key policies fall. More precisely, these pillars embrace not only policy inputs and their implementation but also the outputs of such policies. Essentially these four pillars allow us to describe in a thematic way the challenges and levers of cities' management.

The four pillars are land and spatial development, the economy and funding, people development, and resources. Within these, we have identified a number of subcategories that allow us to look at different aspects of cities' handling of urbanization in more detail. These are land policy, infrastructure, urban planning, industrial strategy, networks, labor and skills, and quality of life. Again, we have arrived at this framework for our analysis based on a bottom-up approach that takes centrally into account the way policy makers and businesses on the ground conceive the major element of their management of urbanization.

- **Land and spatial development.** Land has played a unique role in China's rapid urbanization thus far because of the unique property rights system in place. Cities have been able to sell land—bought cheaply in the first place—to investors at preferential rates, a significant driver of industrialization and expansion. As cities have used land as an incentive to businesses, so, in turn, they have attracted more migrant workers seeking new companies and factories. The sale of land has allowed China's cities to be proactive in funding and building infrastructure. The freedom that China's cities have had to acquire land—and subsequently sell it for development—has been one of the key ingredients of China's urbanization story and distinguishes China from other countries such as India. Indeed, we believe that the tool of land acquisition is one of the primary reasons China has been able to urbanize without creating massive slums.[26] Our research finds that in 2005 China had 29,637 million square meters of "constructed" or built-upon land—an increase of more than 150 percent over the 11,608 million square meters of constructed land in 1990. At the same time, sales of acquired land account for roughly (and unofficially) 10 percent to 50 percent of local governments' revenues. There is no doubt that without this source of revenues China's urbanization would not have been so rapid, although we should acknowledge that this phenomenon has also led to depletion of arable land, urban sprawl, and social tensions. In order to mitigate these pressure points, in 2005 the central government instituted a set of minimum prices for land sales for industrial purposes, trying to make it more difficult for cities to sell land too cheaply. However, even today, cities continue to routinely offer other types of preferential terms on land to incoming businesses. In their rush to growth, many early-industrializing cities have not set much store by urban planning, but this tends to change as cities move from the industrializing to the transforming phase of urbanization. Three subcategories are relevant to this pillar—land policy, including acquisition and sale; the building of infrastructure; and urban planning.

- **The economy and funding.** The second pillar embraces economic development policies pursued by China's cities and how cities fund urbanization. One subcategory in this pillar is industrial strategy, which describes cities' efforts to develop their local economies, notably through attracting business investment, preferably shifting to high-value-added industries as cities develop (e.g., with the creation of SEZs). The second major subcategory is networks, which analyzes how cities are attempting to leverage synergies and complementarities with neighboring cities—and later on in the urbanization process with international

26 Population control and land reform are two other important factors.

communities—in order to foster economic development. China's cities are very often in stiff competition with each other in attracting not only business investment but also talent, and financing of urban development can be tight particularly for small and medium-sized cities. One response to these challenges has been for cities to seek deeper economic ties with neighboring cities, sometimes in hub-and-spoke clusters with a larger urban center in their region (we can see high-profile examples of this clustering in the cities of the Yangtze and Pearl River deltas), which is proving to be a sustainable and effective model of urbanization for China.

- **People development.** This pillar describes city efforts to manage the huge influx of people they have seen over recent years and the policies they are pursuing to ensure that they have a large enough pool of basic and skilled labor to "feed" the staffing needs of new industries and businesses. Between 1990 and 2005, we estimate that 103 million people physically migrated from rural to urban areas. By the end of the 1990s, there were more than 10 million new urban residents every year. A large proportion of these migrants are of working age—for instance, almost 90 percent of migrants to Shanghai. The main subcategory in this pillar is labor and skills. Because of the "acquisition" of large pools of formerly agricultural workers through land expansion, basic labor has not been an issue. Skilled labor has. How are China's cities making sure that they overcome talent shortages that have often been a roadblock to new business investment, particularly higher up the value chain? The other policy dimension that comes into play in this pillar is quality of life and social services. How are cities approaching the needs of their growing populations in terms of social provision such as education and health care? And how committed are cities to extending such services to migrant populations? The two aspects of this pillar are intimately interrelated—the more effective cities are in ensuring a certain quality of life for urban residents, the more success they are having in attracting sufficient skilled labor to fuel economic development.

- **Resources.** During our city visits, we witnessed the relentless search for new energy and water sources by local governments, and the massive buildup of infrastructure to deliver them, particularly in midsized cities. How are cities managing to secure sufficient resources for their rapidly expanding populations and industrial base, and how are they managing the construction of the necessary infrastructure to supply water and electricity? The infrastructure dimension is relevant here. But the management of growing resources demand is also a quality of life issue. Many cities are grappling with severe and rising pollution as the result of energy-intensive industrialization—and many policy makers whom we interviewed emphasized policies to mitigate pollution as the prime managerial challenge in their efforts to deliver a certain standard of living for their populations.

The policy levers we identified are options that cities might choose to use to promote their development, and it is these choices that tend to define to which horizon each city belongs and the outcomes of urbanization. A city with lower pollution or higher social benefits will receive a higher score on our quality of life metric, but such statistics are only part of the story. A city's determination to tackle pressures such as pollution or a lack of social cohesion also weighs in the balance.

We were then able to compare the different cities belonging to the same horizon in terms of their policy direction and their execution capabilities, the overarching aim being to identify the key policies influencing urbanization at each stage of growth and to evaluate alternative approaches to urbanization.

An important point is that cities tend to change their approach to the policy levers as they develop and evolve through the horizons according to their changing priorities (Exhibit 3.8).

Exhibit 3.8

Cities use different policy approaches as they move along the urbanization curve

	Industrializing	Transforming	Modernizing
Emphasis of local government	• A sole focus on GDP at all costs; central government allows city to focus on economic development	• GDP growth still priority; implicit/passive approach to central government regulations with respect to non-GDP factors	• GDP still main focus, but explicit actions taken toward improving quality of life and pursuing sustainable growth
Levers that define each development phase			
Land	• Land acquisition for urban expansion and attracting businesses	• Land acquisition increasingly commercial and as a source of revenues	• Dense planning due to land scarcity
Infrastructure	• Investment in basic infrastructure (e.g., roads)	• Increased infrastructure investment in public transit/power/water	• Large infrastructure expansion/optimization (e.g., mass transit)
Urban planning	• Industrial zones located near city center	• "Blank-sheet" urban planning	• Concepts of sustainable urban development
Industries	• Specialization often used to grow, but all industries welcome	• Further industrial specialization • Emergence of services	• Development of services (e.g., financial sector) and domestic market focus
Networks	• Strengthening of economic ties to nearby cities	• Focus on provincial/domestic connectivity	• Focus on national/international connectivity
Basic and skilled labor	• Enough basic labor locally to meet demand • Less demand for skilled labor	• Migrants meet basic-labor demand • Skilled-labor shortage	• Requirements/standards for migrants and skilled labor
Quality of life	• Focus on moving people out of poverty • Limited focus on environment	• Social benefits emerge • First measures to limit pollution and congestion (e.g., additional roads)	• Quality of life part of city planning

Source: McKinsey Global Institute analysis

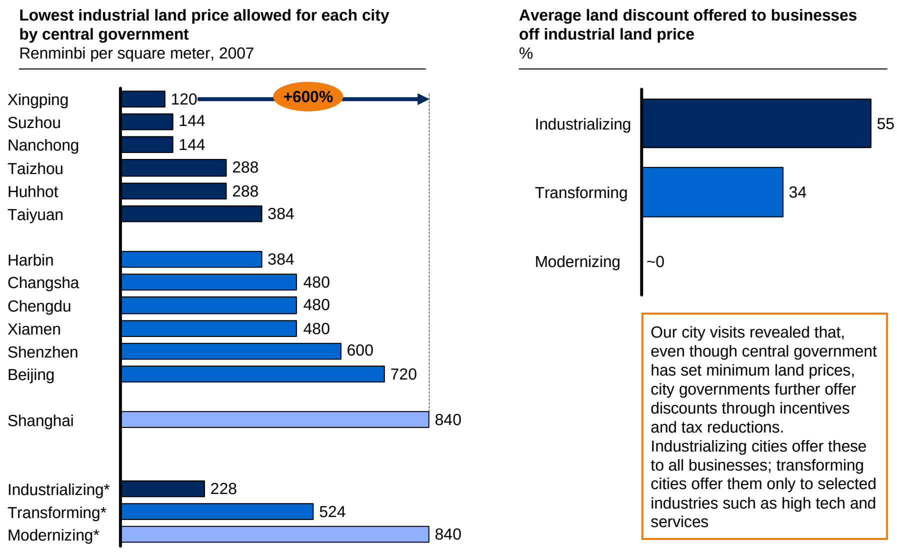
We now turn to a detailed description of how industrializing, transforming, and modernizing cities evolve their deployment of the policies that impact urbanization and how their behavior develops across the dimensions we have identified.

Land

When cities are industrializing, land prices have tended to be very low as cities focus exclusively on boosting GDP. In Xingping, for instance, the "official" price for industrial land is only 120 renminbi per square meter. While recent laws have prohibited the use of discounts beneath certain prices dictated by the central government, our city visits revealed that many industrializing cities still effectively use discounts by offering tax breaks or financing support to investors, and they tend to offer such concessions to all businesses with little discrimination (Exhibit 3.9).[27] As a result of these practices, land acquisition, particularly in industrializing cities, has been highly aggressive. Some industrializing cities may sometimes use proceeds from land sales as a source of revenues to fund urban development, but this strategy is not prevalent at this stage of urbanization.

Exhibit 3.9

Industrializing cities offer land at a discount to attract business



* Averages.
Source: China's industrial land-price regulation; field interviews; McKinsey Global Institute analysis

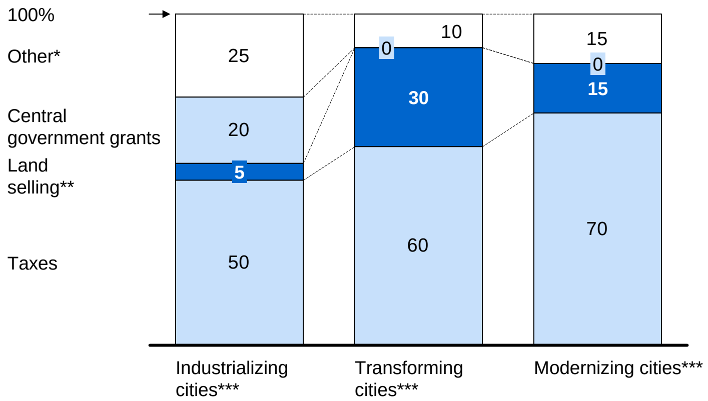
27 Ministry of Land and Resources of the People's Republic of China, *Notice on the Issuance and Implementation of the National Standards for the Minimum Transfer Prices of Land for Industrial Purposes*, December 2006 (www.lawinfochina.com/Law/displayModeTwo.asp?id=6029&keyword=).

In transforming cities, the emphasis of land policy shifts. The cities continue to use land acquisition to attract investment but to a lesser extent than industrializing cities. By this stage of urbanization, the urban sprawl inherited from an earlier lack of planning means the available land for development is becoming scarce. Transforming cities start to sell land commercially in this phase of development (e.g., converting central land previously assigned to industrial use into more valuable residential or commercial areas), providing a valuable source of funding for rapid, continuing infrastructure expansion. In Chengdu, land sales accounted for 39 percent of total government revenues in 2005. Discounts offered before government restrictions came into play were less deep than in industrializing cities. For instance, Harbin offered discounts to a maximum of 50 percent for high-tech industries and less for other potential investors, while Xiamen, a more developed city, offered discounts exclusively to high-tech and tourism industries. The notable change in transforming cities is that their acquisition of land becomes a much more commercial proposition—more formal real-estate markets emerge—and a major source of funding for urbanization. Land sales have accounted for on average 30 percent, but as much as 60 percent, of local government revenues in transforming cities (Exhibit 3.10).

Exhibit 3.10

Land sales have accounted for a big portion of government income

Local government income breakdown
%, 2005



* Including judicial fees, agricultural spending, social security, government subsidies, special project funds.
** Based on field interviews.
*** Averages.
Source: China Urban Construction Statistical Yearbook; interviews; China Statistical Yearbook; literature search; McKinsey Global Institute analysis

In modernizing cities, land, which by this stage tends to be in short supply, is no longer a function of industrialization but a resource to drive dense growth and a tool used to enhance the overall appeal of a city. Shanghai is more services oriented in its emphasis, its aspirations having moved on from pure production to a more consumption-led economy. The city promotes land development not only to foster business but also to create a well-rounded, high-quality living environment that will continue to attract the best talent, including foreign enterprises. The city does so through the provision of green space, arts and entertainment venues, and retail areas, often in collaboration with the private sector.

Infrastructure

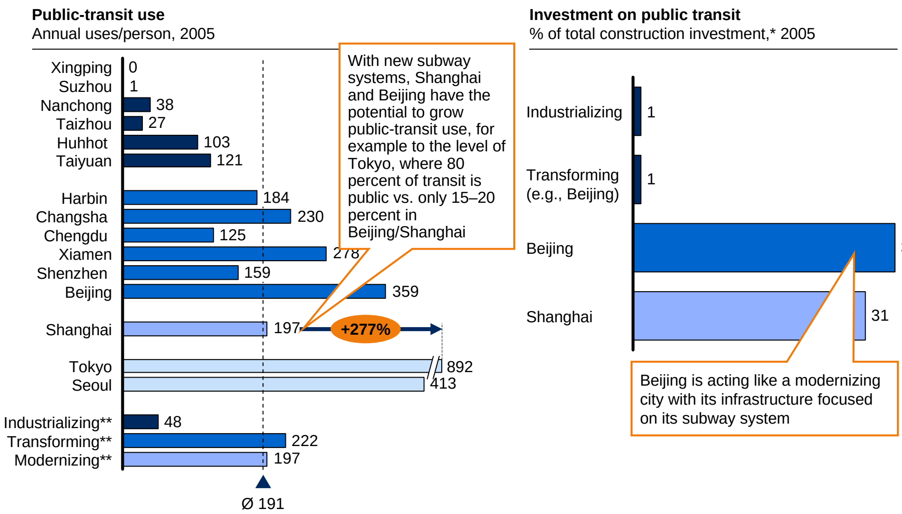
In the early stages of industrialization, cities spend a large proportion of their available finance on basic infrastructure such as roads, bridges, power and telephone lines, and water distribution needed to support development. In 2005, for example, investment in basic infrastructure accounted for 54 percent of total infrastructure investment in Xingping and 48 percent in Taizhou. Progress has been remarkable in some cases. Huhhot, for instance, has increased its electricity supply by 70 percent from 2000 to 2005.

As cities move along the evolutionary scale, investment in infrastructure accelerates but also mutates from basic infrastructure funding to reactive, "catch-up" investment used in tackling shortages generated by booming urbanization and industrialization that started during the industrializing phase. Many transforming cities are beginning to feel the pinch in terms of key resources such as water and energy, and they need to make large investments in ensuring adequate supply. Harbin, for example, devoted 46 percent of its 2005 infrastructure investment to increasing the city's water and gas supply, and Shenzhen has had to more than double its electricity supply since 2001. At the same time, expanding populations need improved public transport to avoid a buildup of productivity-sapping congestion and to facilitate their travel to workplaces that may be located increasingly far from the city center. A city will initially build up its bus system and then move to investing in mass-transit systems. In 2005 Changsha spent 88 percent of its infrastructure budget on inner-city roads, while Beijing has earmarked 35 percent of its 2005 infrastructure spending for the expansion of its subway system.

In the modernizing phase of urbanization, cities' infrastructure investment moves on from the basics to delivering greater efficiency for citizens in mass-transit systems amid often-significant traffic congestion (Exhibit 3.11). Modernizing cities also tend to supplement investment in transport with demand-side management, particularly to limit the ownership and/or use of private cars in the urban center (e.g., Shanghai) with the aim of ensuring that the city functions well. Shanghai is investing substantially in new lines and extending the length of its current subway, already regarded by many as the best in China. But there is still more to do to put Shanghai on a par with other modern international cities; for instance, its public-transit use as a percentage of total transit is still only roughly one-quarter that of Tokyo.

Exhibit 3.11

In transforming and modernizing cities, public transit becomes a key priority



* Construction investment excludes building construction.

** Averages.

Source: Field interviews; China City Statistical Yearbook; China Urban Construction Statistical Yearbook; National Census 2005 Japan, "Transportation in Greater Tokyo (http://en.wikipedia.org/wiki/Transportation_in_Greater_Tokyo#cite_ref-JR_ridership_11-0); Seoul metropolitan government; McKinsey Global Institute analysis

Urban planning

All Chinese cities are required to have an urban planning institute that considers the layout of the urban area and ensures that basic zoning exists in all cities.[28] That said, industrializing cities do not tend to put a priority on planning, focusing instead on whatever it takes to attract business. Industrial zones jostle with residential areas close to the center where it is easy for businesses to operate, despite the fact that this layout tends to exacerbate pollution, congestion, and crowding that worsens as cities grow.

Transforming cities begin to develop genuine urban planning, often starting from scratch after the ad hoc urbanization earlier in their development. All the transforming cities we studied have moved factories out of the urban center to new economic zones, leaving the core of the urban area to residential living and services, often with defined new city centers (Exhibit 3.12). For instance,

28 China issued an Urban and Rural Planning Law in October 2007.

Shenzhen has torn down all the factories in its city center over the past decade in favor of service industries and high-tech enterprises.

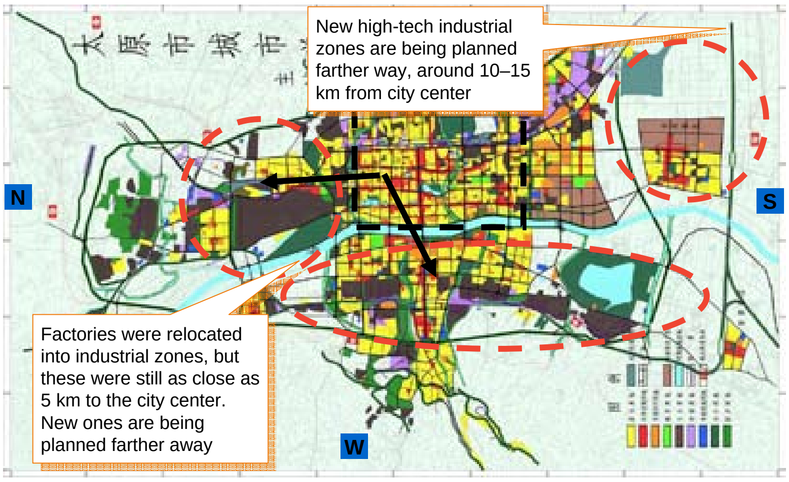
Exhibit 3.12

As cities become "transformers," industrial zones are being moved farther from the city center

ILLUSTRATIVE

City center
Industrial zone
Factory relocation

Transition from Horizon 1 to Horizon 2 example
City plan of Taiyuan, 2006–20



Source: Field interviews; Taiyuan Urban Planning Bureau; McKinsey Global Institute analysis

At the modernizing stage of urbanization, the city gives up its prime role as land developer and starts working closely with the private sector to develop the overall appeal of the metropolis. They begin to move increasingly to a sustainable mode of development, incorporating policies such as building restrictions; self-sufficient zoning in which relatively self-contained areas develop that include educational, entertainment, health care, and other facilities; and the creation of dedicated entertainment and art areas and green spaces. Multiple city centers can emerge to ease pressure on a single built-up area. Satellite cities develop through enhanced regional cooperation. Shanghai (as well as Beijing) has removed all heavy industry to the city's outskirts, and its urban plan has moved beyond the confines of the urban center to take in the metropolitan region. The city now has not only a busy international airport and a huge port but also an internationally recognized brand.

Industrial strategy

Cities in the throes of early industrialization tend to specialize in a handful of industries—such as mining and agricultural products—in order to leverage competitive advantages. Labor-intensive manufacturing dominates this stage of growth, and the share of industry in total city GDP increases while the share of agriculture declines. Late in this first phase of urbanization, however, services begin to emerge. For instance, 5 percent of Taiyuan's GDP and 6 percent of Taizhou's now come from financial services.

During the transformational phase of urbanization, cities try to move up the value chain by specializing in certain industries, often choosing those areas in which they have scored successes. Transforming cities tend to be proactive in enforcing shifts in the kinds of industries that they attract, switching from offering incentives to all manufacturers to giving incentives to only a few instead. The share of higher-value-added industry rises—i.e., more than half of industrial GDP in Xiamen comes from high-tech companies. Transforming cities are also increasingly active in efforts to attract FDI, with the additional benefits of multinational corporation know-how and operational skills, rather than basic investment. In some cities, services have become a prominent part of the local economy mix quite early on (Exhibit 3.13). In Changsha, for instance, services already account for 66 percent of the city's GDP.[29] Financial services tend to develop more weight later in this phase of urbanization. Harbin, an early transformer, has a very small financial services component accounting for only 2 percent of GDP; in Beijing, much further along the urbanization curve and on the brink of being a modernizing city, financial services make up 13 percent of GDP.

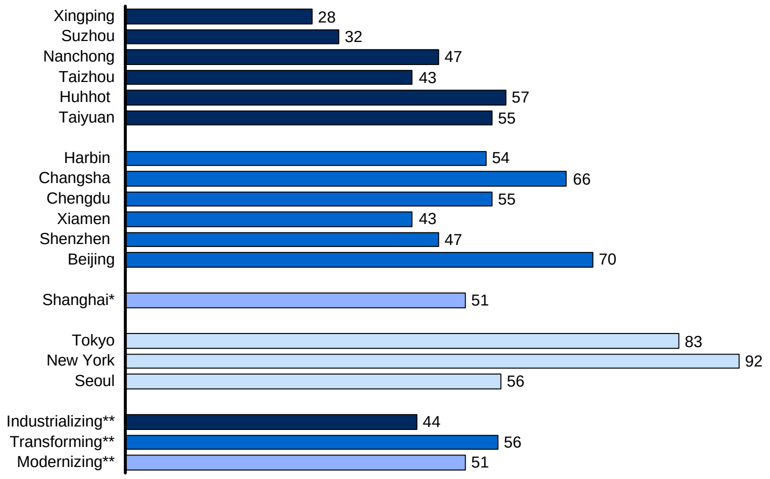
In modernizing cities service sectors have become highly developed and will usually include a fairly substantial financial sector (Exhibit 3.14). Financial services account for 10 percent of the GDP of Shanghai. These shares rank highly within China, but they are still behind international cities such as Tokyo (14 percent of GDP) or financial center New York (34 percent of GDP). Modernizing cities also tend to shift their focus to their domestic market in terms of both business and consumption.

29 Changsha's high services component in GDP is explained by its citizens generally higher propensity to consume and strong government-led initiative to develop the city as a services center. Media and recreation services, for instance, have developed rapidly in recent years and grew faster than the industrial sector.

Exhibit 3.13

Services become part of the mix as industrializing cities evolve into transforming cities

Services sector % of GDP, 2005



* Because many manufacturing factories still lie within Shanghai, the city's services share of the economy is still quite small vs. other Chinese cities and especially against international benchmarks.

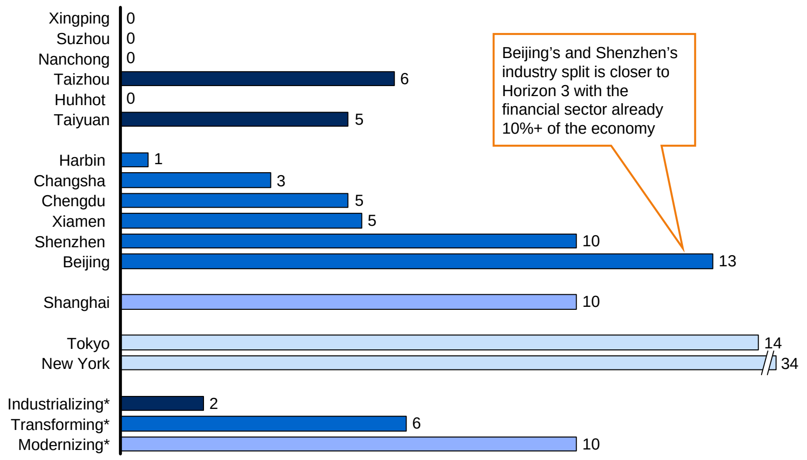
** Averages.

Source: Field interviews; Economist Intelligence Unit; China Statistical Yearbook 2006; Seoul Statistical Yearbook 2006; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Exhibit 3.14

Financial services start emerging in transforming cities and expand in modernizing cities

Finance sector % of GDP, 2005



* Averages.

Source: Field interviews; Economist Intelligence Unit; China City Statistical Yearbook; China Statistical Yearbook; Bureau of General Affairs, Tokyo Municipal Government; Statistical office of South Korea; McKinsey Global Institute analysis

Networks

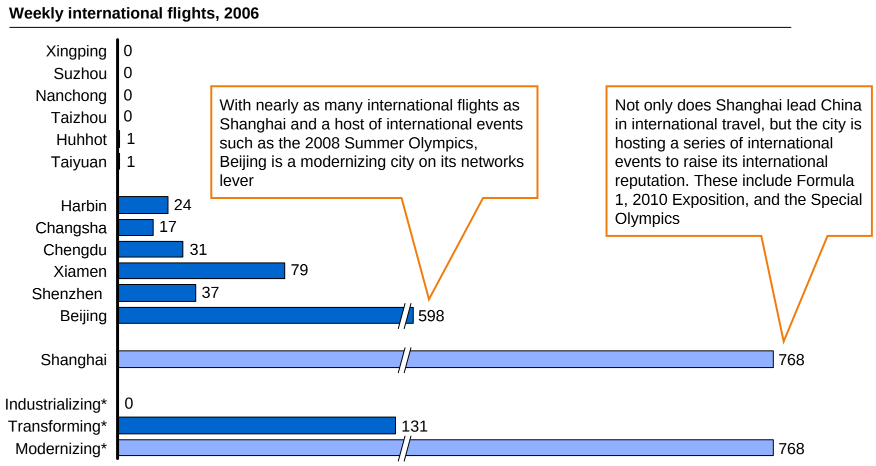
Effective leaders of industrializing cities put considerable effort into strengthening ties with nearby cities—both hubs and spokes. They build economic ties through setting up investment offices and communicating regularly with business and political leaders, as well as through investing in infrastructure in roads and railways to create more robust links between neighboring cities. Xingping is in the early stages of industrialization and already has a "sales office" in Xi'an and Xianyang to encourage economic ties between these cities.

Over time, a transforming city begins to establish more effective regional and even international networks, typically working to form a collaborative cluster with other cities and towns in its area. It is commonplace for a transforming city to develop a unique position in its regional cluster, becoming a transport hub, education center, services center, or natural resources provider, for instance. The city government will expand its economic and infrastructure linkages throughout its region and at this point will tend to start attracting FDI. Early-transforming cities such as Changsha and Harbin both have international airports and have relatively substantial volumes of rail and highway freight, but they still fall far short in terms of their networks compared with late-transforming cities. Chengdu, for instance, has 31 weekly international flights and the third-highest freight volume in China (Beijing has the second highest), while Shenzhen is one of the top five ports in the world.

Once a city is in the throes of modernization, it will tend to widen its strategic sights. Based on Shanghai, the sole modernizing city of our 14 case studies, and Beijing, which is a modernizing city on many dimensions, we see that cities at this stage of urban development have formed considerable international connections in terms of both transportation and business. International air travel becomes significant (Exhibit 3.15). As future modernizing cities emerge, the most important transportation linkages may well be within China itself as incomes rise and domestic consumption ensures that China itself becomes a burgeoning and huge market. International air connections will expand, but the most important international networks may well be economic in nature as cities conduct their business globally. Foreign investment and the offices of overseas companies become a more substantial component of the city economy. Modernizing cities show a desire to build their profile internationally by, for instance, hosting major events that publicize what the city has to offer. Shanghai's networks—with the city's large presence of Fortune 500 companies as well its hosting of numerous international events (Formula 1, the Tennis Masters Cup, and the 2010 Exposition to name but three)—are world class.

Exhibit 3.15

International connections (including logistics and events) increase as cities move along the urbanization curve



* Averages.
Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Labor and skills

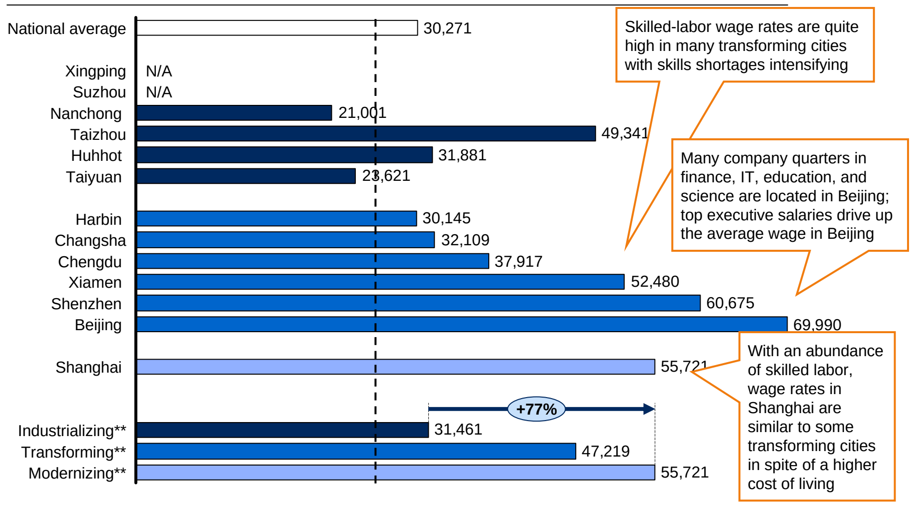
Industrializing cities do not tend to suffer from labor shortages (Suzhou, for example, suffers from an oversupply and is seeking opportunities for its citizens to work outside the city) because they can usually draw on huge pools of local farmers willing to come to work for higher wages in the urban area. In Xingping and Nanchong, farmers account for 80 percent and 60 percent of the workforce, respectively. At this stage, there is little demand for skilled labor, except for a limited number of managerial positions in manufacturing companies. Filling these positions can be a problem as local talent seek jobs in more advanced cities that can offer them better options and higher wages; frequently, talent from these cities that attend school in the major institutions in Beijing or Shanghai do not return to their home cities.

As their businesses grow and diversify, transforming cities tend to have a more difficult time finding the right people to fill the menu of jobs on offer. Migrants typically can fill the demand for basic labor; finding enough skilled labor is much more difficult, despite the high number of university graduates in China. Many transforming cities complain about skilled-labor shortages. Despite being a city in the late stages of transforming and having a dynamic industrial force, Shenzhen has only nine local colleges. But even Chengdu, with 33 universities and 40,000 graduates a year, faces problems—it simply can't keep enough of its graduates in the city as they travel in search of higher salaries and higher standards of living. Skilled wage rates are proportionally higher in many transforming cities than in modernizing ones (Exhibit 3.16), but it is not enough. Transforming cities try to overcome skilled-labor shortages by increasingly investing in higher education and by offering special incentives to attract qualified people to work in the city amid fierce competition for talent among cities—particularly from Beijing and Shanghai, which graduates clearly favor. Harbin, for example, is heavily investing in local universities to expand the pool of qualified graduates. Increasing numbers of cities are considering granting *Hukou* status to graduate workers relocating for work reasons.

Exhibit 3.16

Transforming cities see growing skills shortages push up skilled-labor rates

Skilled labor average wage*
Renminbi, 2005



* Unskilled labor includes mining, manufacturing, construction; skilled labor includes finance, IT, and science.
** Averages.
Source: China City Statistical Yearbook; McKinsey Global Institute analysis

Modernizing cities have the opposite problem to that faced by transforming cities: a surplus of labor, although it remains the case that these cities have to earmark resources to ensure balanced jobs growth through such policies as controlling housing rents. Shanghai and Beijing (which ranks as a modernizer on this metric) are highly popular among people seeking interesting jobs with relatively high wages and have large numbers of homegrown graduates; they also have a large number of unskilled migrants seeking jobs. This means that these cities have the relative luxury of being able to pick and choose the right people by setting standards to be met by both skilled and nonskilled migrants. Both Shanghai and Beijing impose strict *Hukou* requirements, as they can afford to allow only the best-qualified migrants to work in the city. To attract personnel skilled in financial services, Beijing, for example, gives *Hukou* quota priority to employees of financial institutions. Shanghai has actually put in place a *Hukou* scoring system designed to give residency only to migrants with a certain level of skills.

Quality of life

Rapid urbanization across industrializing cities has resulted in some less-than-desirable outcomes including urban sprawl due to the low priority given to planning; mixed residential and industrial districts that do not sit well together; shortages of resources such as water and electricity as cities' infrastructure investment fails to keep up with their growing populations; vast areas of "yellow" or unused developed land; and polluted air and water. Despite these pressures, industrializing cities that are "going for growth" and concentrating on providing for their citizens' basic needs tend to give quality of life a low priority. As an example, Taiyuan spends only around 500 renminbi per capita on health care; Huhhot devotes only 0.2 percent of GDP to pollution prevention.

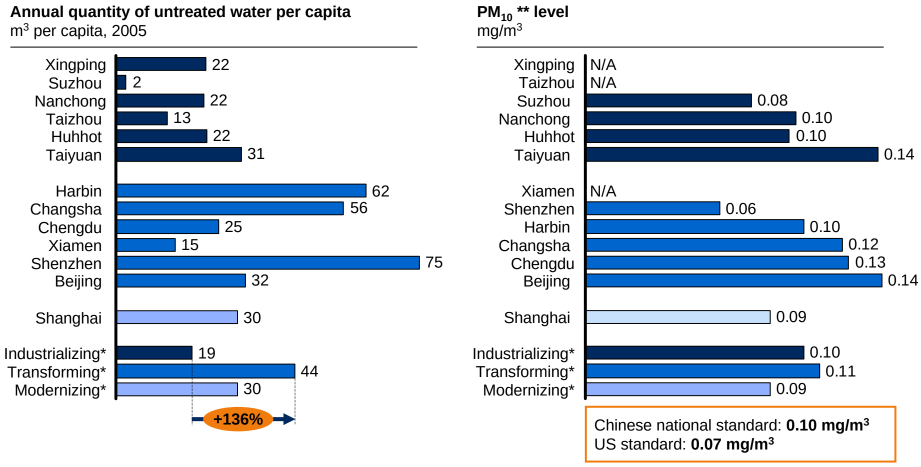
When a city is transforming, citizens largely have incomes that place them firmly above the poverty line, and they seek to improve their basic living standards and levels of consumption of such necessities as food, shelter, and clothing. Cities turn their attention to providing a basic level of social services such as education and health care that their citizens increasingly demand. In the later stages of this urbanization phase, cities exhibit the first tangible improvements in quality of life, for instance spending more per capita on health and education. But if we look at indicators of quality of life in general, these still tend to fall short because of the twin problems of pollution and congestion, which compromise the daily lives of urban citizens (Exhibit 3.17).

Transforming cities usually have environmental regulations in place, and some begin serious attempts to tackle pollution (Exhibit 3.18). Harbin, an early transformer, spends 2.6 percent of its GDP on pollution prevention compared with the 1.7 percent average in this phase of urbanization. Xiamen is spending 2.5 percent on cleaning up pollution. Changsha has the second-highest area of green space of all the 14 cities we examined. For others, an emphasis on GDP growth continues to override concern about quality of life. Shenzhen has the highest per capita income of our 14 case cities but the lowest investment in pollution prevention. Chengdu spends a relatively generous 900 renminbi per capita on education and health care but has a severe pollution problem. Even a highly developed city such as Beijing has struggled to cap rising pollution. Congestion remains a major headache in many transforming cities—perhaps inevitable in cities that are adding millions of people in only a few years—despite huge investment in public transport.

Nevertheless, if these transforming cities are to make the next leap forward and become modernizers, they will need to find effective ways of tackling congestion and pollution—two notorious negative outputs of urbanization.

Exhibit 3.17

Pollution worsens in transforming cities and improves in modernizing urban centers



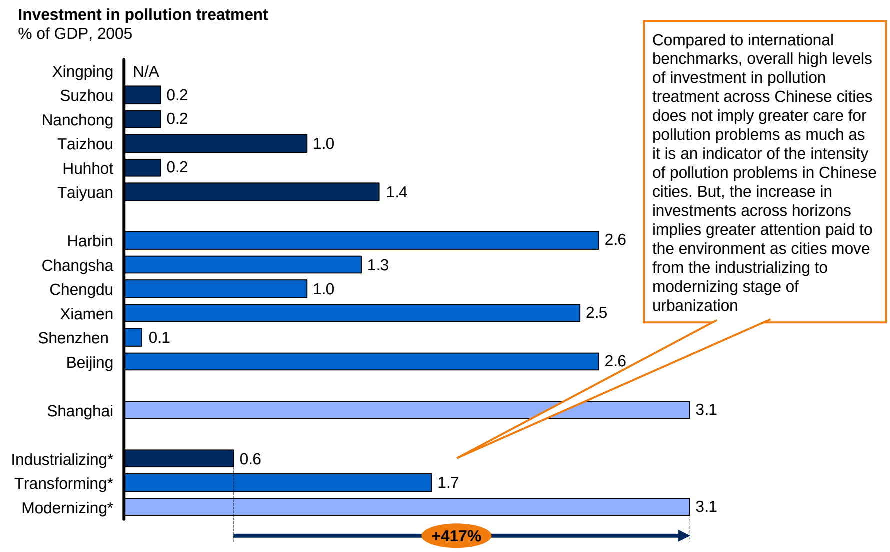
* Averages.

** PM refers to particulate mater, which are tiny particles of solid or liquid suspended in a gas. PM_{10} is used to describe particles of 10 micrometers or less 10 micrometers or less. Human activities, such as the burning of fossil fuels in vehicles, power plants and various industrial processes generate significant amounts of aerosols.

Source: Field interviews; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; China Zoning Economy Statistical Yearbook 2006; Ministry of Environment, South Korea; McKinsey Global Institute analysis

Exhibit 3.18

Transforming cities begin tackling pollution, and modernizing cities step up these efforts



* Averages.

Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

For modernizing cities, raising the quality of life becomes an explicit aim of urban planning and development and influences the policy approach in many areas including the choice of industrial mix, zoning, taxation policy, and the provision of social services. These cities tend to impose building restrictions, increase the amount of green space, invest heavily in efforts to prevent—not just treat—pollution, and foster culture and entertainment to satisfy citizens who demand all the characteristics of a truly modern city. Shanghai spends 1,400 renminbi per capita on education and health care compared with the average for our transforming case cities of 900 renminbi (Beijing also spends large amounts on this provision). Shanghai is continuing to gradually increase social benefits through health insurance and pension provision. To become a true modern city to compare with international examples such as London or New York, Shanghai needs to make more progress in providing all citizens, including migrants, with sufficient social benefits.[30] The city also imposes building restrictions and has increased green space by 50 percent over the past seven years to further improve the city's quality of life. Shanghai has also been relatively effective in tackling pollution and congestion (more so than Beijing) but needs to do more. Compared with other highly developed cities around the world, Shanghai no doubt has room to improve as a city, but it has come a long way in a short period.

HOW WILL URBANIZATION EVOLVE TO 2025?

China's cities will continue to urbanize over the next 20 years, whichever stage of evolution they are at today, but all will face increasing competition for resources, investment, and skilled labor. Certain patterns of urbanization will likely remain relatively unchanged, including urban planning, for instance: today's industrializing cities will inevitably tear down factories near the city center as they become transformers and will eventually need to move toward "dense" land planning as land and resources become more scarce.

But increasing government regulation of land acquisition coupled with a decreasing land availability likely implies that today's industrializing cities will not be able to rely as heavily on land acquisition to attract investment and today's transforming cities will need to find sources of income other than land sales. Growing resources shortages—in water and energy—as well as intensifying pollution issues will also command greater attention from cities across all

30 Shanghai has already made more effective progress than other cities in providing social benefits. In 2004, for example, Shanghai issued a "small-city social security benefit" to provide pensions, medical care, and so on to residents living in former rural areas that once surrounded the city.

horizons. Congestion may well intensify in many transforming and modernizing cities. A shortage of both skilled and basic labor may become more broad-based across industrializing and transforming cities.

What policies are likely to be effective to mitigate these problems will to an extent depend on what shape of urbanization plays out in China over the next 20 years. In the next chapter, we describe our trendline projections for urbanization to 2025 and four alternative urbanization scenarios—two of which we might characterize as dispersed and two as concentrated patterns of urban expansion.

4. Where is China's urbanization heading?

China is today in the throes of a deep transformation that will see the nation's dynamism and economic growth reside overwhelmingly in its cities. Over the past 17 years, more than 100 million people have moved from the countryside to China's rapidly expanding urban centers in an unprecedented demographic shift. This process is set to continue over the next 20 years, driven largely by migration, and will likely proceed in spite of the current global slowdown.

The proportion of the Chinese population living in cities has already doubled in 25 years to about 44 percent in 2005. MGI estimates that this level of urbanization will rise to about 64 percent by 2025. In short, two-thirds of China's population will live in cities by then. Although the speed of China's urban expansion will not be out of line with other Asian countries' experiences at similar stages of their urban development, because China's population is so large, the scale of its urban expansion will be unprecedented. By 2030, China's urban population is on track to reach one billion people.

In addition, the recently announced rural land-use reform policy (announced on October 12, 2008) is likely to mark a critical turning point in China's economic and social development, and boost urbanization even more.[31] Under this new policy, which grants farmers more generous land-use rights and rights to lease their allocated land to others, MGI expects a further migration spurt to take place.

Urbanization and China's rapid economic growth in recent years have been closely linked, and China's urban centers will come to dominate the nation's

31 At the time of writing this report, the central government had still not announced the full details of the policy.

economy even more than they do today. China's cities already account for 75 percent of China's GDP; by 2025, that figure will have risen to more than 90 percent. The continued growth of urban China is on such a large scale that it will have an impact across the world—in terms of its contribution to global GDP, its demand for global natural resources, and the new markets that it will create.

If current trends continue, the pressures created by rapid urbanization will intensify. Urban China's demand for energy and water will roughly double over the next 20 years compared with today. Pollution will be severe. Today almost 60 percent of China's river water is already below international potable standards, and urban water pollution could quintuple by 2025. Congestion is already compromising the smooth running of cities, and it could get worse—Shanghai could outstrip its road capacity by a factor of three. Fifteen or more percent of China's available arable land could be lost to continuing urban expansion.

While we examined current trends and used these to econometrically estimate urbanization in Chinese cities through to 2025, we also wanted to understand how urbanization could vary from trend. Our motivation in doing so was twofold. We wanted to dive beneath variations in national growth rates to understand the implications of different urban growth models on China's urbanization. Further, we wanted to contribute to a long-running policy debate within China on the optimal urban-development model and whether this should focus on big, medium, or small cities.

We therefore identified four alternative urbanization scenarios that could develop in the next 20 years. Two of these are more concentrated forms of urbanization, while the remaining two are dispersed forms more closely aligned with how China might evolve if historical trends were to continue.

The rest of the chapter presents our trendline projections, laying these out side by side with projections associated with the two dispersed scenarios of urbanization, which we describe in detail. We draw out the key implications of these shapes of urbanization so as to better inform our understanding of the pros and cons of models of urbanization that favor the growth of midsized and small cities.

TRENDS INDICATE THAT URBAN CHINA WILL REACH IMMENSE SCALE BY 2025

If current trends continue, China's urban population will expand from 572 million in 2005 to 926 million in 2025 (Exhibit 4.1). To put the sheer scale of this dynamic into perspective, this increase of more than 350 million Chinese city dwellers is larger than the entire population of the United States today. Of these 350 million additional urbanites, more than 240 million will be migrants moving from the countryside to rapidly expanding cities.

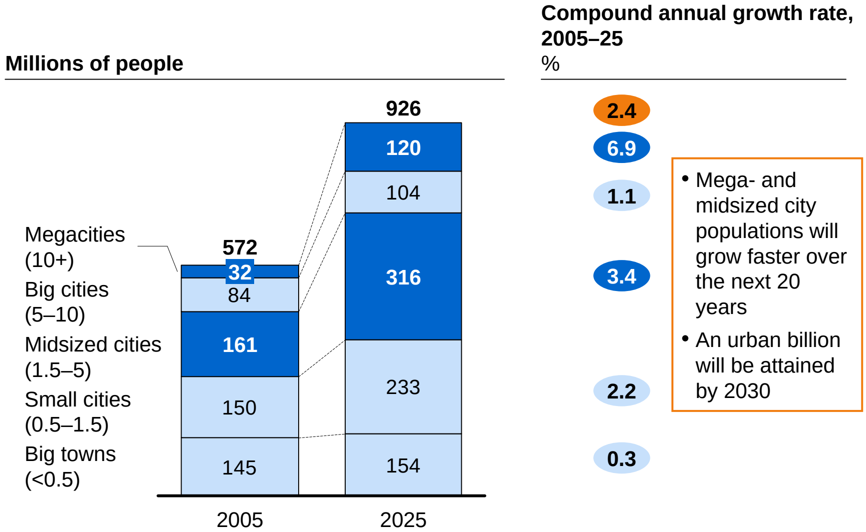
MGI's trendline projections see China's urbanization continuing to follow a dispersed pattern of growth, with accelerated growth of many small and midsized cities scattered across inland eastern to coastal China and from north to south. All will grow in parallel, although the eastern seaboard has had a head start on the rest of the country, and cities in this region have pulled ahead of the rest of the country in terms of their economies. All China's cities will be competing and jostling for resources and will focus largely on maximizing GDP growth.

Exhibit 4.1

China is moving toward an urban billion by 2030

Population by city size

TRENDLINE FORECASTS



Note: Numbers may not sum due to rounding.

Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

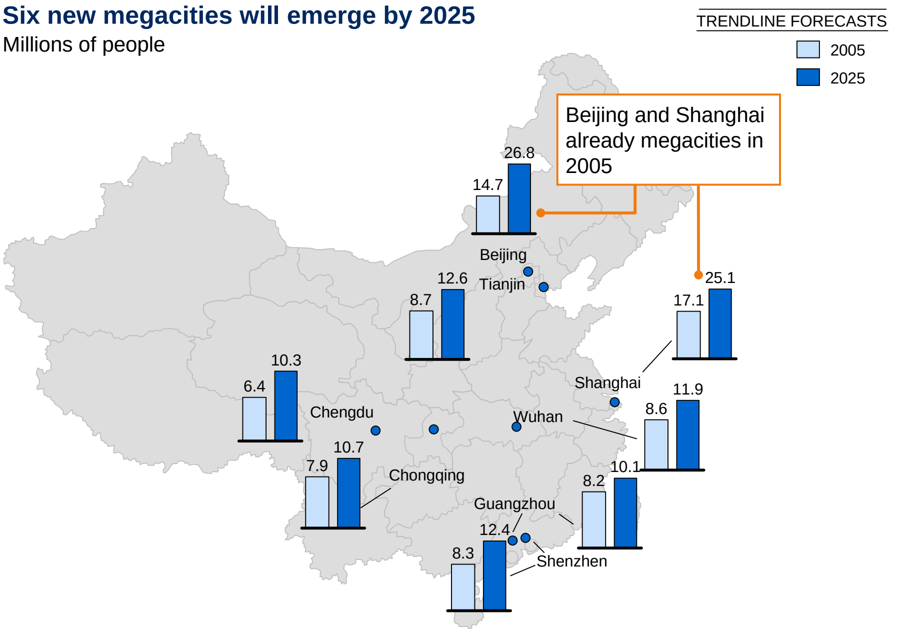
A function of China's large population, the nation's urban landscape will have an unprecedented number of cities that are large by any comparison. In 2005, China had 858 cities. This number will reach 939 by 2025. Of these 939 cities, 221 cities will have more than 1 million inhabitants—compared with 35 in Europe today—and 23 of these cities will be home to more than 5 million people, according to MGI's trendline projections. Over the past 15 years, two Chinese megacities with populations of more than 10 million have emerged. Over the next 20 years, six more such cities will emerge (Exhibit 4.2). Of these, two—Beijing and Shanghai—will have populations of more than 20 million.

Urban GDP and urban middle-class disposable incomes and consumption will climb steeply

In 2005, urban GDP stood at 12 trillion renminbi. Using an urban GDP growth estimate in the forecast period of 8.5 percent, MGI projects that urban GDP could pass the 60 trillion renminbi mark by 2025—an increase of about five times compared with the level in 2005.[32] Such an increase in urban GDP would be larger than the total current GDP of Japan and would account for 20 percent of global GDP growth between 2005 and 2025.[33]

Exhibit 4.2

Six new megacities will emerge by 2025
Millions of people



Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

In per capita terms, urban GDP could increase from 21,000 renminbi in 2005 to above 66,000 renminbi in 2025, a threefold increase. This projection suggests that China is on course to meet its bold new target—unveiled by President Hu Jintao at the 17th Congress of China's Communist Party in 2007—of quadrupling China's per capita GDP by 2020 (from 13,000 renminbi in 2000 to 51,200 renminbi in 2020).

32 MGI revised its long-term GDP estimate for China to 7.2 percent from the previous forecast of 7 percent that MGI used in *"From 'Made in China' to 'Sold in China': The rise of the Chinese urban consumer,"* November 2006 (www.mckinsey.com/mgi). This increase reflects the latest information we had as of March 2007. Already conservative by most measures, we did not feel it necessary to revise this long-term figure given existing conditions as this report goes to publication. Even accounting for the market downturn, China's long-term real GDP growth rate, by consensus estimates, is likely to hold at around this level.

33 Global Insight, February 17, 2008.

Between 1990 and 2005 China's urban consumer market, with its large and growing middle classes, accounted for 26 percent of overall GDP growth. MGI's extensive analysis of Chinese income and consumption patterns out to 2025 found that China is in the process of developing a massive, largely urban middle class and that urban China will become an important consumer market with global scale with aggregate consumption almost twice, and disposable income over two times, those of Germany by 2025.[34] Our new findings in this report indicate that by 2025, China—dominated by its urban areas—will become the world's second-largest consumer market, overtaking Japan in real dollar terms.

A combination of rapidly rising incomes and moderating savings rates will lead to a strong surge in spending.[35] MGI sees urban consumer spending growing more than fivefold in real terms from 4.7 trillion renminbi ($574 billion) in 2005 to 25.1 trillion renminbi ($3.9 trillion) in 2025.[36]

MIGRATION WILL BE THE DOMINANT DRIVER OF URBANIZATION

The nature of China's urban growth will be dramatically different over the next 20 years from how it has been in the past 15 years. There have been two major drivers to China's urbanization thus far—land acquisition and migration. However, in the period ahead, land acquisition is set to be less important, and migration will become the dominant catalyst for continuing urban expansion (Exhibit 4.3).

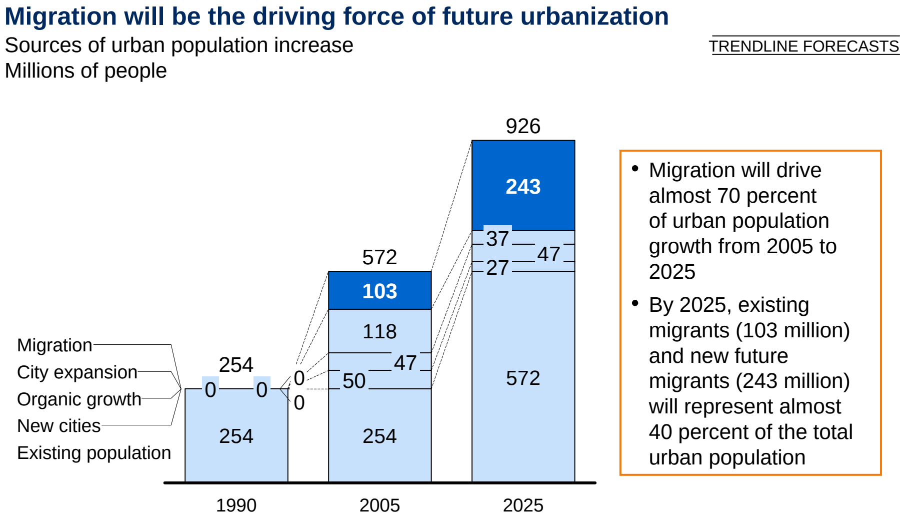
Between 1990 and 2005 Chinese cities grew primarily by incorporating neighboring pieces of land and their resident populations into their jurisdictions. More people became urbanites through land expansion during this period—118 million by our estimates—than through the 103 million added to city populations through migration from rural areas. Cities often financed infrastructure improvements, increased services, and paid for other costs linked to growth by buying newly incorporated farmland and later selling it for development at much higher prices. However, land acquisition will not figure in such a large way in future years. A large number of cities are, in any case, running out of land into which to expand, and new government controls on land acquisition in response to social unrest among displaced farmers will also mitigate the impact of this factor on city population growth.

34 Data for Germany is from Global Insight, 2007.

35 *"From 'Made in China' to 'Sold in China': The rise of the Chinese urban consumer,"* McKinsey Global Institute, November 2006 (www.mckinsey.com/mgi).

36 A detailed analysis of consumption patterns at city level will be illustrated in an upcoming MGI report.

Exhibit 4.3



Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Spurred on by the attractiveness of urban wage levels, the major driver of urban expansion in the years ahead promises to be migration, and our trendline model confirms this. We expect that rapid urban development coupled with what is acknowledged as surplus populations in rural areas given the generally low (but increasing) rural productivity will together act to boost migration by an additional 240 million people in the next 20 years. The mass movement of people we are about to see will eclipse even the substantial migration of the past.[37] China will have about 350 million migrants in urban centers by 2025.

With continued economic growth, job creation in cities will be huge. MGI estimates that urban China will have about 470 million jobs in 2025, compared with almost 300 million in 2005. Migrants will tap into this increasing demand for employment, bringing the proportion of mobile population in the cities to above 40 percent. Driven by the high share of job growth in these cities and their rapidly aging officially resident populations, most of this migration will take place in mid- and larger-sized cities where migrant populations will constitute a greater proportion—around 50 percent—of their populations by 2025; in many cities, migrants will account for more than half of total populations.

37 For details of MGI's definition of migration, please refer to the appendix in chapter 2.

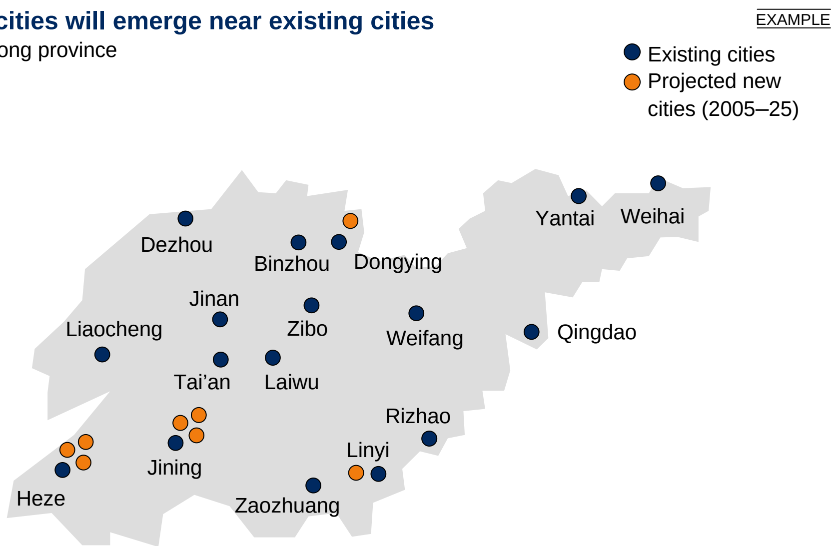
NEW CITIES WILL CONTINUE TO FORM ON THE MARGIN BUT NOT ON THE RECENT SCALE

China will continue to see the emergence of new cities through 2025 but on nothing like the scale that we have seen over the past 15 years. Between 1996 and 2005, MGI estimates that there were 195 additional urban centers that "behaved" as cities according to government criteria prevailing in 1996 but that the government did not designate as such. Some of these "unofficial cities" have so far eluded the radar screens of most businesses, but they offer promising sources of future growth. For instance, Cangnan, a county in Zhejiang Province officially not classified as a city, grew at a compound annual growth rate of 19 percent between 2000 and 2005 and by 2005 boasted a population of more than 750,000.

By 2025, we expect 81 more urban centers to develop the characteristics of cities, with a cumulative population of approximately 27 million, or about 7.5 percent of the urban population increase during this period, compared with the 50 million from new urban centers in the 1990 to 2005 period, or close to 16 percent. Moreover, most will be located within a 50 kilometer radius from existing cities, reflecting the tendency of these future cities to develop in close proximity to larger cities (Exhibit 4.4).

Exhibit 4.4

New cities will emerge near existing cities
Shandong province



Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

FOLLOWING CURRENT TRENDS, URBANIZATION WILL BE DISPERSED, WITH LESS-DEVELOPED REGIONS SLOWLY CATCHING UP

In our trendline analysis, China's eastern region, home to the nation's largest cities, some of which are the hubs at the center of China's most dynamic urban clusters, will remain dominant in terms of prosperity and growth generation. However, China's interior will increase its share of GDP considerably from 18.6 percent today to 24.6 percent in 2025. Western China will also increase its share of real GDP from 14.0 percent in 2005 to 16.1 percent in 2025. Both regions will post more rapid economic growth—at compound annual rates of more than 9 percent—than will the eastern seaboard.

This effect arises out of the fact that China's current urbanization path will show a pronounced expansion in the number of midsized cities across the country. Although China today has two megacities—Shanghai with a current population of close to 18 million and Beijing with 14.7 million—and a number of prominent hub-and-spoke systems, notably those in the Yangtze River Delta and Pearl River Delta, many midsized cities are growing in parallel and will become more and more relevant in the national landscape. Currently numbering 69, midsized cities, which account for 28 percent of GDP, will grow in number to 115 by 2025, accounting for 34 percent of GDP. The closest international comparisons to the current dispersed urbanization that is taking shape in China (although on a different scale) are arguably the United States and Germany, both of which have a decentralized, federal power structure.

Indeed, governance plays an important role in how urbanization develops around the world. China's dispersed pattern of growth partly reflects China's policy in recent years of encouraging the entrepreneurism of its city leaders and explicitly incentivizing them to promote rapid economic growth, industrialize, attract business investment, and build urban infrastructure. Cities are competing with each other not only for business investment but also for a share of China's labor pool and particularly skilled labor as they seek to climb the economic value chain. A net result of this has sometimes been duplication or redundancy of infrastructure (airports, for instance).

It is important to note that a future dispersed pattern of urbanization will not mean a decrease in population or GDP in the current major cities. In fact, the reverse is true. Our trendline projections show that Shanghai and Beijing will remain China's dominant economic powerhouses. With Shanghai's projected GDP of 3.9 trillion renminbi and Beijing's of 3.5 trillion renminbi in 2025, they will still dwarf the 1.3 trillion renminbi GDP that we project for third-placed Wuhan in 2025.

THE SHAPE OF URBANIZATION MATTERS, AND SEVERAL OPTIONS ARE OPEN AS THE PROCESS CONTINUES

We base our trendline estimates of urbanization on the policy framework and forces that are currently influencing the pattern of urban expansion. These projections should not be interpreted as the "most likely"; rather, we calculate these trendline forecasts of population growth and productivity in each of China's 858 cities using historic data on urbanization patterns and a consensus view on how GDP would trend over the next 20 years.

Current policy is not the only factor that will influence the potential outcome of urbanization in China. New policies at both the national and local levels and where new urbanites (migrants) will choose to live could influence the final outcomes of urban shapes in China. While our analysis indicates that the current trend of urbanization will lead China toward a dispersed pattern, with an increasing number of people moving toward midsized cities, this is not the only possible future for China.

We extensively surveyed the literature to understand possible urban shapes and experiences of other countries, and we interviewed many academics and policy makers so as to reach a more nuanced understanding of the options open to shape China's urban future. Based on these, we identified a set of scenarios, all of which China is debating at the national level. We looked for cases of countries that have produced an approximation of the urbanization pattern underpinned by each of these scenarios and examined how these shapes evolved over time (for instance, we examined how the urban shape of Tokyo evolved compared with other cities and over what time horizon). We then used these international comparisons to help us construct models of each scenario that allowed us to forecast city-level populations and how flows of populations to various-sized categories of cities might take shape.[38] We used these scenario projections of population and GDP distributions to produce secondary estimates of critical urban "pressure points" that are most likely to be felt under each scenario. All in all, we studied ten dimensions, all of which we discuss in this and the remaining

38 It is important to note that in building our scenarios we are not "moving citizens away" from where they currently live, we are rather simulating different options for where the new urban residents will end up living.

chapters and which we detail in volume II, chapter 3 of this report.

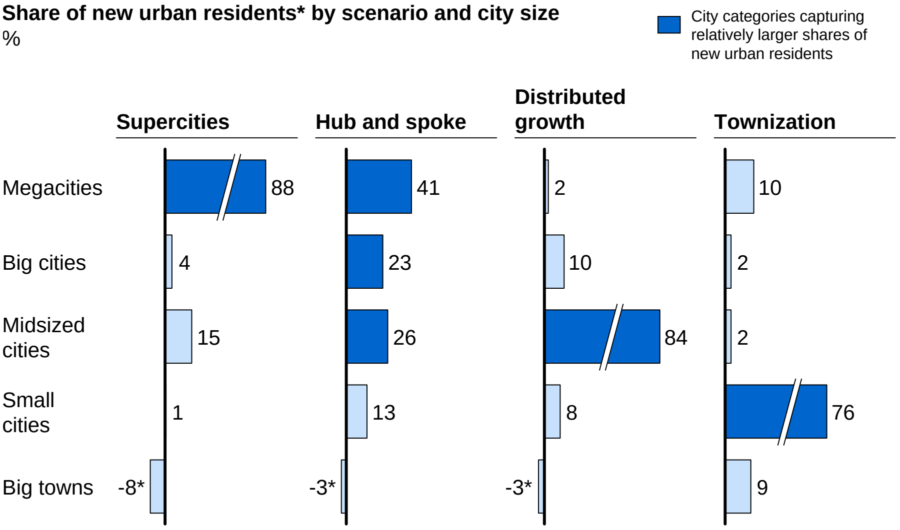
Our analysis and research helped us define four extreme urbanization scenarios. Two of these—"hub and spoke" and "supercities"—are scenarios that would generate forms of urbanization that are more concentrated compared to the current trendline. Two others examine patterns that would have an even more dispersed character than the current trend, with small and, in particular, midsized cities capturing an even greater share of growth. We call these two scenarios "distributed growth" and "townization." We discuss each of these scenarios in greater detail in this chapter.

Other nations around the world have experienced variations of these options. Their urbanization shapes have developed serendipitously through a complex interaction of economics and history and are now strongly influencing different economic and social evolutionary paths for these countries. Each of the four scenarios that we detail in this and the next chapter favor a certain category of city—for example, the supercities scenario is skewed to favor in a relative sense very large cities with populations of 20 million or more and cities that have the potential to reach this size; townization, on the other extreme, would favor the growth and rapid expansion of smaller cities (Exhibit 4.5).

Exhibit 4.5

Depending on where the migrants will flow, the urban shape will be different

Share of new urban residents* by scenario and city size
%



* >0 percent represents an increase of residents, while <0 percent represents a decrease (outward migration toward larger cities).
Source: McKinsey Global Institute analysis

Two concentrated urbanization scenarios

As introduced, a concentrated pattern of growth could arguably take place in two different ways. Even on current trends, elements of both are already present in China's urbanization landscape.

Hub and spoke. This model comprises city clusters with one or two cities playing the central "hub" role and with several neighboring city "spokes" closely linked to the hub(s) through well-developed transportation connections and, more important, very deep economic ties. South Korea, for instance, has a well-established cluster system around Seoul. In the United States, Arizona is at the heart of a high-tech and biotech cluster, and Orlando is the focal point of an entertainment-based cluster in Florida. Many cities in the Benelux form a cluster around Antwerp with its world-scale port as the focal hub.

China already has some major hub-and-spoke systems—the Yangtze River Delta centered on Shanghai, and the Pearl River Delta centered on Shenzhen, Hong Kong, and Guangzhou. Hub and spoke is a plausible urbanization shape representing a conceptual midpoint between dispersal across the country into midsized cities and concentration in a small number of supercities. Our simulation of a hub-and-spoke model would see the strong development of 11 urban "networks" of cities, linked by strong economic ties, with an average population of 27 million today and that average rising to 60 million by 2025 (Exhibit 4.6). These 11 clusters would together account for almost three-quarters of the urban population. Three of the clusters in this scenario would have populations of almost 100 million people in 2025, ranking them among the world's top 15 "countries" in terms of population. As of today, all 11 clusters have already conceptualized plans to operate in a coordinated manner, in some cases cutting across provincial lines, but most of them are still far from the level of integration of the Yangtze River Delta and Pearl River Delta clusters.

In this scenario, the clusters will together account for more than 80 percent of urban GDP, becoming the critical drivers of the national economy. Economically, each cluster forms a tightly linked unit, typically focused on one or two hubs as points of their confluence.

Over the period to 2025, this scenario sees population growth concentrated in the clusters, particularly in the spokes as hubs plateau and decelerate. Population split between hubs and spokes is quite volatile across clusters,

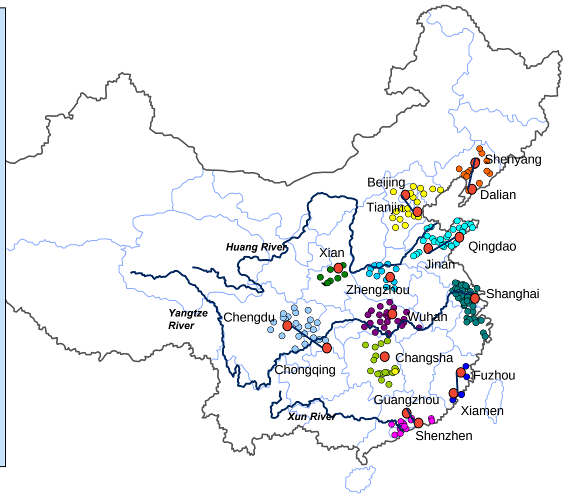
Exhibit 4.6

Hub and spoke would see China's 11 networks of cities integrating and growing rapidly

Economic regions

Hubs

Regional hubs	Number of cities in region
Beijing/Tianjin	28
Shenyang/Dalian	22
Qingdao/Jinan	35
Xian	8
Zhengzhou	23
Shanghai*	58
Chengdu/ Chongqing	31
Wuhan	27
Changsha	20
Xiamen/Fuzhou	14
Guangzhou/ Shenzhen**	23



* Yangtze River Delta Cluster.
** Pearl River Delta Cluster, with strong linkages to Hong Kong.
Source: McKinsey Global Institute analysis

averaging a rough 30:70 hubs-to-spokes population ratio. Midsized spoke cities, therefore, become the biggest beneficiaries of growth, while small and medium-sized cities that are not part of clusters are "left behind," a number of the former in particular suffering from net losses of population and slower economic growth unless they find appropriate high-quality niches to fill, such as tourism.

Supercities. This represents a highly concentrated model of urbanization with a small number of truly world-scale megacities with populations of 20 million–plus. International examples of supercities include Tokyo, New York, and Mexico City.[39] In this urbanization model, the expansion of midsized cities would decelerate, while smaller cities would halt their development almost entirely.

China today has no supercities, although if current trends continue, Shanghai and Beijing are well on the way to becoming large enough to be counted as such by 2012. Our simulation of a supercities scenario shows that there would be 15 cities with populations above 10 million, with 11 of them each

39 Although New York and Mexico City are not strictly supercities, each having populations of slightly below 20 million, they are close enough to the 20 million threshold to serve as valid comparisons.

containing 25 million to 35 million people by 2025. In total, these 15 cities would have a combined population greater than the population of the United States today. Supercity governments would control enormous swaths of land and large budgets. Indeed, each city would have similar resources to entire countries—Shanghai would be almost as large in population terms as Spain today. These supercities would account for around half of China's GDP and become the global-facing, high-productivity engines of China's economic growth and power.

The finite capacity even of supercities combined with the slower development of China's broader base of midsized cities would imply a lower overall urbanization level than in other scenarios. We estimate that China's urbanization level under this scenario would be some 63 percent by 2025.

DISPERSED URBANIZATION SCENARIOS (INCLUDING TRENDLINE) WOULD DISPLAY STRONG GROWTH BUT ALSO INEFFICIENCIES

In the remainder of this chapter we focus on the potential effects in China if the current dispersed urbanization trend continues or becomes more extreme, following the pathways modeled by our distributed growth and townization scenarios. We will present the potential impacts of concentrated urbanization models in the next chapter and compare and contrast their advantages and disadvantages with dispersed models.

China's current model of urbanization would, without doubt, deliver prosperity to the nation's citizens, reducing poverty and propelling urban incomes higher. We would see investment in mass transit and in accelerated construction of the urban infrastructure, including buildings, on a massive scale. However, MGI's analysis shows that this pattern of urban expansion would also deliver less-than-optimal economic outcomes (e.g., productivity gains) due primarily to the large share of people and economic activity in less efficient midsized cities.

Two dispersed urbanization scenarios

We now turn to a description of the two alternative dispersed urbanization scenarios. These scenarios—distributed growth and townization—are more similar to our trendline projections, but there are some notable differences in terms of the trajectory of key variables, including GDP growth and population, and in terms of their impact on key aspects such as the economy, construction, transportation, and arable land, as well as on the main pressure points of urbanization including energy demand, pollution, and congestion. Distributed growth in particular could easily play out in China with limited changes to the current policy structure.

Distributed growth. This scenario envisions the continuation of today's urban growth pattern, but with a heightened emphasis on midsized cities and currently underdeveloped regions. In this scenario, we could see an accelerated growth of a large number of cities with populations of 1.5 million to 5 million, spread throughout China. Lead growth engines would largely comprise today's small and midsized cities as well as cities in the inland provinces where we would see an almost doubling of their trend growth. Today's mega and large cities continue to develop but at a much cooler pace, essentially flatlining in terms of migration.

In one sense, basic local governance issues are less challenging in this scenario as individual cities continue to be the focal point of urban development and policy making. There is less friction between urban and rural as well as between city and national levels. However, national policy becomes ever more difficult to implement as China can no longer consider a wide range of cities as "marginal," and a large central bureaucracy is required to manage them. The current struggle to impose environmental limits on cities in an atmosphere of intense intercity competition is just one example of the governance challenge in this scenario. In addition, it is unclear if the wide swath of midsized cities has the ability to tackle the coming pressures of urbanization successfully—a topic to which we will return in chapter 5.

Townization. In this scenario there is a deliberate boost of urbanization of the grassroots of China, with the parallel growth of many small cities with populations of between 500,000 and 1.5 million. While there is no "pushing" of the existing population back to rural areas, migration is on a reduced scale with many rural counties being "converted" into cities and their economies deliberately developed at a rapid pace. As a consequence, while the overall urbanization level would not change, the number of cities would increase significantly to almost 1,000 (and likely higher after counting new county seats as cities).

This model of urbanization would involve many hundreds of small cities developing all over China. Of the four scenarios that we examined, this seems to be the least likely to occur, although it is still debated among policy makers. Our research showed that it is very rare for existing urbanization patterns to reverse and for big cities across the country to slow down significantly. A parallel investigation into potential shocks that could derail urbanization and/or shift people back to small cities reveals that no disasters, wars, or epidemics have had a significant impact on urbanization in the past; at worst, these developments have had only temporary effects. We looked at events of differing magnitudes through history from around the world that had led people to abandon big cities—the Spanish flu of 1917, the bombing of Tokyo in 1945, and the terrorist attacks of 2001 on New York. We found in all cases that the growth of cities eased back temporarily but then resumed; in none of these cases did we see a wholesale reversal of urbanization. Arguably, China had attempted to follow this path before in the early 1980s with collectively owned township and village enterprises (TVEs), but these have not, as we have discussed, been lastingly successful due to a lack of scale.

GDP will increase rapidly, but extremely dispersed urbanization could slow growth

According to our trendline forecasts, urban GDP will quintuple by 2025, reaching more than 60 trillion renminbi. In case of a shift toward more dispersed urbanization (e.g., townization scenario), the growth would still be remarkable, but it would be slightly slower (about 54 trillion renminbi by 2025). Numerical evidence in Chinese cities shows that the economic structure of cities is the overwhelming driver of performance—much more so than the individual characteristics of new workers in the city. This conclusion arises out of sensitivity analyses run on the historical and forecast performance of China's cities, under which MGI increased the cities' rate of in-migration to evaluate the resulting impact on per capita GDP.[40] The results showed that for many Chinese cities, changes in population lead to relatively small changes in per capita GDP. For instance, MGI finds that a one million increase in the population of a Chinese megacity decreases per capita GDP in the long run by only around 0.4 percent, all else being equal.

40 Please see volume II, chapter 2 for a detailed description of the MGI China City model (CCM) system.

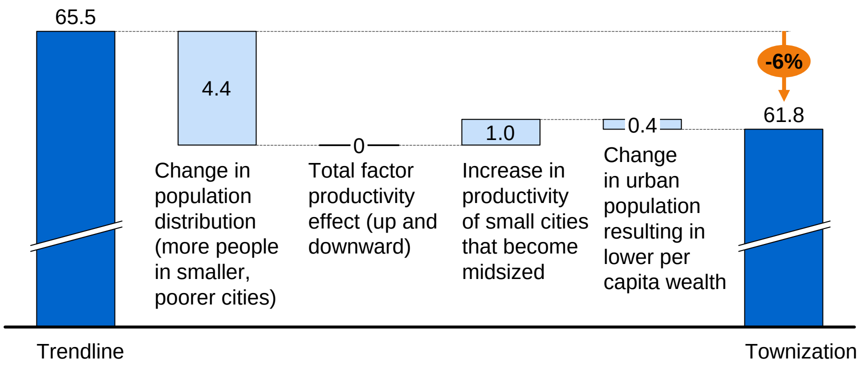
Hence, the dispersed scenarios' lower GDP growth would be due in large part to the fact that people would be living and working in smaller, "less successful" cities, and therefore not capturing the full economies of scale and scope available to larger cities. For example, under a townization scenario, population living in smaller, less efficient cities would depress per capita GDP by as much as 6 percent compared to trendline (Exhibit 4.7).

Exhibit 4.7

A higher share of the population in poorer cities drives lower per capita GDP under townization

Shift in urban wealth between trendline and townization

Urban per capita GDP, 2025, renminbi thousand, 2000



Note: Numbers may not sum due to rounding.

Source: McKinsey Global Institute analysis

Dispersed growth would drive a strong increase in urban fixed-asset investment, particularly in construction

Over the past ten years, almost 50 percent of China's overall GDP growth has come from urban fixed investment with an annual expenditure of 6.4 trillion renminbi in 2007. This trend is set to continue on a massive scale.

China's cities will devote a cumulative 300 trillion renminbi to fixed-asset investment between 2005 and 2025, with outlays increasing from an annual rate of 5 trillion renminbi to more than 24 trillion renminbi—accounting for 93 percent of total Chinese fixed investment in 2025. Our trendline projections show that the share of investment in megacities will rise from 11 to 25 percent, largely due to heavy investment in cities that are transitioning from midsize to megasize. The investment share of midsized cities will increase from 32 to 36 percent. A number of large economic clusters will account for the lion's share of fixed-asset investment with just 11 economic regions with megacities at their center accounting for about 60 percent of the total number.

To fuel its growth, urban China will account for around 20 percent of global energy consumption and up to one-quarter of growth in oil demand between 2005 and 2025. This will in turn drive the need to build between 700 and 900 Gigawatts of new power capacity from 2005 to 2025.

Building construction will be a huge piece of the investment jigsaw. China's construction boom will continue. Under our dispersed urbanization scenarios, urban China could build almost 40 billion square meters of floor space over the next 20 years, requiring the construction of more than 20,000 new skyscrapers (buildings of more than 30 floors), the equivalent of slightly more than one Chicago a year. In total, urban China would build between four million and five million new buildings between 2005 and 2025.

In dispersed urbanization, outside of the larger cities, services would be less important as a share of GDP

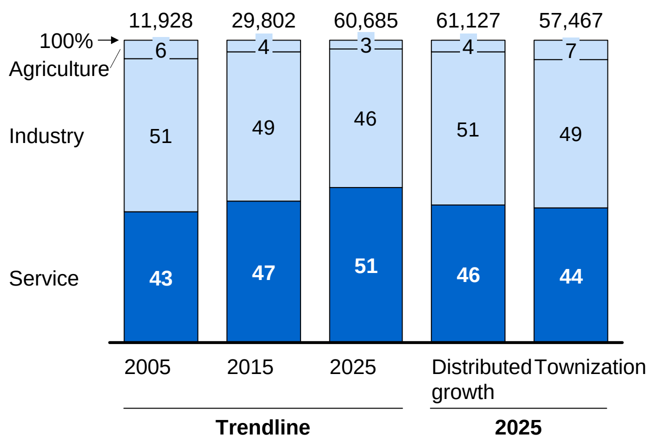
In dispersed urbanization scenarios, people would largely live in less productive, midsized cities. Cities would continue to have a higher share of industry in GDP, and services would be more limited than in more concentrated urbanization. Continued competition among cities in terms of GDP growth would fuel duplication and inefficiencies and would weaken interprovincial trade.

Industry would continue to be the key driver of GDP growth in urban China in our trendline and dispersed urbanization scenarios. Services would gain in prominence but would be limited mostly to larger cities. In our trendline scenario, services will account for 51 percent of urban GDP in 2025 compared with 46 percent from industry, and there will be little variation from these shares in distributed growth and townization (Exhibit 4.8).

Exhibit 4.8

Service share of GDP will be lower in dispersed urbanization scenarios

GDP composition by sector, %, renminbi billion, 2000



Note: Numbers may not sum due to rounding.
Source: National Bureau of Statistics; McKinsey Global Institute China National model; McKinsey Global Institute analysis

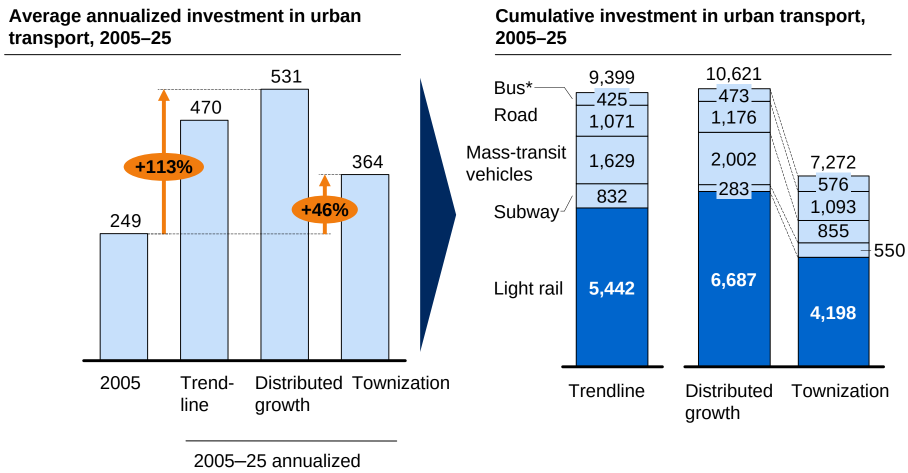
Our trendline projections show a variety in the mix of GDP in different city size categories. For instance, services will continue to predominate in China's megacities, accounting for 59 percent of their GDP in 2025 in services. Big cities will shift from a roughly equal share of services and industry with 49 percent each to a slightly greater 52 percent share of services versus 47 percent for industry. As for midsized cities, they will shift from a heavy focus on industry with an average of 52 percent in 2005 to a more balanced picture in 2025 with services making up 49 percent of urban GDP in these cities on average and industry accounting for 48 percent.

Dispersed growth would drive an unprecedented boom in mass-transit construction but also face major funding issues

China's investment in building its urban transportation infrastructure increased by nearly 50 percent in 2004–06 alone, and we project that spending in 2025 could more than double the 2005 level depending on the urbanization scenario (Exhibit 4.9).

Exhibit 4.9

Annualized investment in urban transport could more than double by 2025
Renminbi billion, 2000



* Current estimate based on net addition to fleet, could increase due to fleet replacement.
Source: China Urban Statistical Yearbook; McKinsey Global Institute analysis

The bulk of investment so far has been in building roads, but, despite these capital outlays, congestion in many Chinese cities has noticeably deteriorated. China's government has responded to this challenge by pushing for a large expansion of public mass-transit systems. Our research shows that in all urbanization scenarios except for townization, more than 100 cities would have to build rail systems—light rail and subway—for the government to meet its targets. Urban China would need to pave up to five billion square meters of road (five billion is the gap between demand and supply) and up to 31,000 kilometers of metro rail. A distributed form of urbanization would require the most road space, buses, and rail transportation with an annualized investment requirement from 2005 to 2025 of more than 530 billion renminbi a year.

One of the key issues in dispersed urbanization scenarios would be that small and western cities, in particular, would be likely to find it hard to attract the necessary funding to finance the construction of this plank of the urban infrastructure. These cities have substantial investment needs, and yet today they receive a disproportionately small amount of capital. For instance, central loan commitments for western cities are only 3 percent of total infrastructure spending. Put another way, direct central funding at 2005 levels would be enough to cover only the purchases of urban buses of western cities in the next 20 years. Small and midsized cities suffer from four interlocking barriers to capital: inadequate local funds because many small cities in western and central China transfer most of their tax revenues upward, poor planning and execution skills, local risk aversion among local banks, and the blurred role of infrastructure providers. With increasing needs for capital, this situation could turn out to be critical in the future.

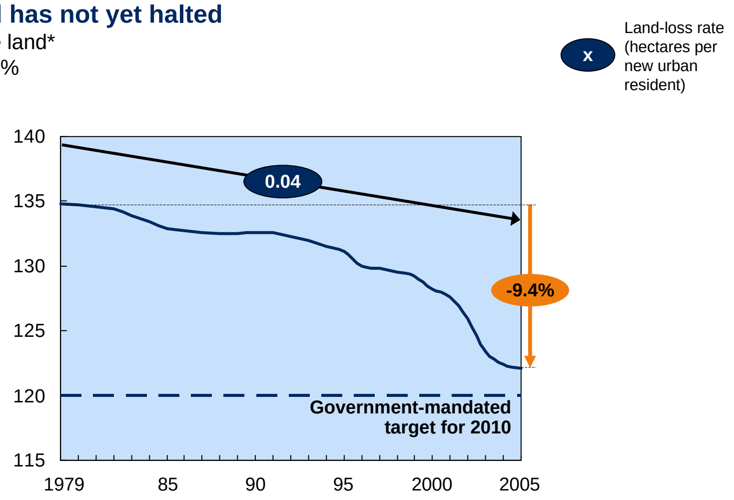
DISPERSED URBANIZATION SCENARIOS WOULD SEE MAJOR PRESSURES INTENSIFY

If China's urbanization proceeds along current lines, many cities will face major pressure points, all of which will intensify in time and potentially pose an unmanageable task for city mayors. In this section, we summarize, for the trendline and other dispersed urbanization patterns, the pressures on spatial development and land use; on the supply and demand of natural resources such as water and energy; on the environment; on the availability of talent and the multiple challenges of managing a huge ongoing influx of migrant workers; and on the difficulties that many cities will face in securing sufficient public funding for the provision of social services and the continuing need to develop the urban infrastructure.

Land and spatial development. As China urbanizes, it has been losing premium land available for cultivation of crops such as wheat, maize, corn, and rice at a remarkably steady rate of some 0.04 hectares per new urban resident, and there is widespread public concern both about the displacement of farmers as cities grow and about whether rapid urbanization will severely compromise China's self-sufficiency in food in future years. China's arable land per capita peaked in 1965 at 0.19 hectare, but this had fallen to 0.1 hectare by 2003. Since then, China has lost a further 10 percent of its available arable land due to urbanization and is now very close to the government-mandated national minimum in 2010 (Exhibit 4.10). The loss of arable land would be significant under trendline assumptions (about 15 percent compared with today), but an even larger loss could occur in distributed growth and townization scenarios—at 20 percent and 22 percent, respectively, to 2025—with serious impact on food production. China would cross the government's red line of 120 million hectares well before 2010. Even if China were to increase grain yields by 10 percent, this would not be sufficient in distributed growth and townization scenarios to prevent a net loss of grain production. Another factor that can go significantly wrong in dispersed urbanization scenarios is urban sprawl and a continuation of redundant infrastructure we described earlier. With so many cities competing to grow, land expansion would likely translate to urban sprawl, and even as central authorities try to control this, it will likely become a significant enforceability issue.

Exhibit 4.10

China has sustained heavy arable land losses since 1979—and this trend has not yet halted
China total arable land*
Million hectare,** %



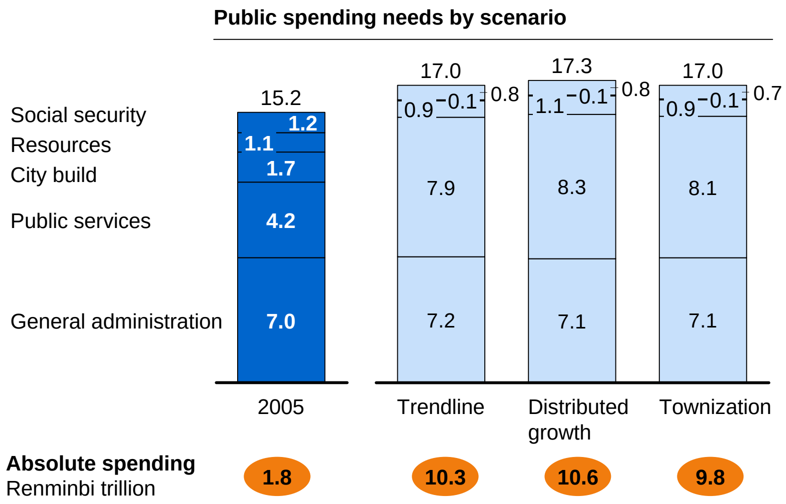
* 1996 saw the first systematic survey of arable land in China.
** 1 hectare = 10,000 square meters = 0.01 square kilometers.
Source: China Land & Resources Almanac; Global Insight; McKinsey Global Institute analysis

The economy and funding. At the same time as they are expected to finance extended social provision to migrants (as mentioned in the most recent Party Congress), China's cities will need to fund the continuing buildup of infrastructure (as well as finding sufficient resources to tackle pressures such as pollution and congestion). The cumulative funding requirement for China's urban system will be between 250 trillion renminbi and 290 trillion renminbi by 2025. To give an idea of scale, this is equivalent to more than 20 times China's 2005 GDP. Relative to GDP, urban spending would be highest in dispersed urbanization scenarios with the highest share in distributed growth at 17.3 percent (Exhibit 4.11). Although urban GDP will grow rapidly to 2025, many cities will experience a severe financial squeeze, particularly as they will no longer be able to rely on land sales as a source of revenues. At the same time, midsized cities' spending requirements will grow considerably. Taking Taizhou (a city of 2.5 million in Zhejiang Province) under distributed growth as an example, we project that the city's spending needs would increase at an annual rate of 13 percent from 2005 to 2025, driven by large increases in education, health care, and administrative costs. We assume that total health care spending would remain stable at around some 5.5 percent of GDP while the government's share of this spending would rise to 25 percent–plus, as absolute costs for government-funded health care elements and other services increase (e.g., doctors in some clinics, capital expenditures). In this scenario rising GDP, also growing at an annual rate of 13 percent, should virtually match this projected increase in spending. However, this means that even with very rapid GDP growth such cities would have little space to compensate for declining revenue from land sales. Moreover, if GDP growth were to decline slightly, then funding pressures could become acute. For example, under the trendline scenario, spending will rise from 19 percent of GDP to 21 percent of GDP, implying the need for an increase in taxes or for further central government transfers to cover the deficit.

Exhibit 4.11

Public spending would increase as share of urban GDP in case of dispersed urbanization

% of urban GDP, renminbi, 2000



Note: Numbers may not sum due to rounding.
Source: McKinsey Global Institute analysis

This funding pressure in midsized cities will make the infrastructure challenge even more acute. China's spending on infrastructure rose by almost 50 percent in the short period from 2004 to 2006. Although such spending has risen as a share of China's total GDP, this investment still makes up only a fraction of total Chinese GDP, suggesting that the country can continue to afford making these capital outlays. However, while in aggregate terms China should have more-than-sufficient capital to finance its infrastructure construction, smaller and midsized cities—especially in the west—in particular will face financing pressures. This issue could become critical, according to trendline and dispersed urbanization scenarios. As an example, the largest annualized investment from 2005 to 2025 would be in a distributed growth scenario—at about 530 billion renminbi a year. A distributed form of urbanization would require the most road space, buses, and rail transportation, but such networks may struggle to be economically viable because of a lack of scale. A townization scenario would require huge infrastructure investment to connect legions of small cities effectively and, in this case too, subscale network economics imply that transport and communications would take a much larger share of GDP than in other scenarios. Smaller cities would have substantial investment needs and are already struggling to receive a disproportionately small amount of capital.

People development. In the past five years, China has seen substantial growth in the number of graduates it is producing—in this period, the number of universities has risen by 11 percent per annum and student numbers by 6 percent a year. However, these skilled people are not evenly distributed around the country. Cities are already in the midst of intense competition to attract the skilled workers that they need if they are to continue to move up the value chain. Dispersed urbanization scenarios and what is shown by trendline estimates would see a higher need for skilled graduates in midsized and smaller cities, exacerbating the current issue: midsized cities would likely see a worsening of the shortage of graduates (and general labor), while in townization, today's shortage of graduates in small cities and big towns is likely to become extreme, and attracting graduates would not be easy. These cities would have to find imaginative solutions, including tailored housing, training, and employment packages, in conjunction with the private sector if necessary, to attract the graduates that they need. Quantity and distribution are not the only challenging issues—business is expressing serious concern about the quality of graduates. MGI research found that companies would employ only 10 percent of qualified Chinese engineers and only 3 percent of generalist graduates. In addition, China has a number of specific skills gaps, including a shortage of project engineers and lawyers, for instance, and dramatically fewer professionals than other countries, which could compromise the country's transition to becoming an advanced modern economy. To tackle this range of problems, China is already debating whether it needs to reform its exam system, improve teacher training, offer new vocational training, and the like.

In terms of general labor, China will create upward of 450 million jobs in all scenarios, and, because of a declining "natural" workforce in cities (partly due to the low birthrate), demand for migrants to fill these new jobs will step up. MGI estimates that urban China will need between 170 million and 190 million new workers under dispersed urbanization scenarios, and migrants would meet this demand. Migrants would make up more than 55 percent of the workforce in cities with populations of between 500,000 and 1.5 million—compared with only about 25 percent in the past. Different urbanization scenarios would have widely varying labor balances with highly localized pressures. While in townization the labor market should be nearly balanced, under distributed growth and trendline, urban China, particularly midsized cities, would likely face labor market pressures characteristic of "shortage"—that is, with upward wage pressure as the market seeks to clear.

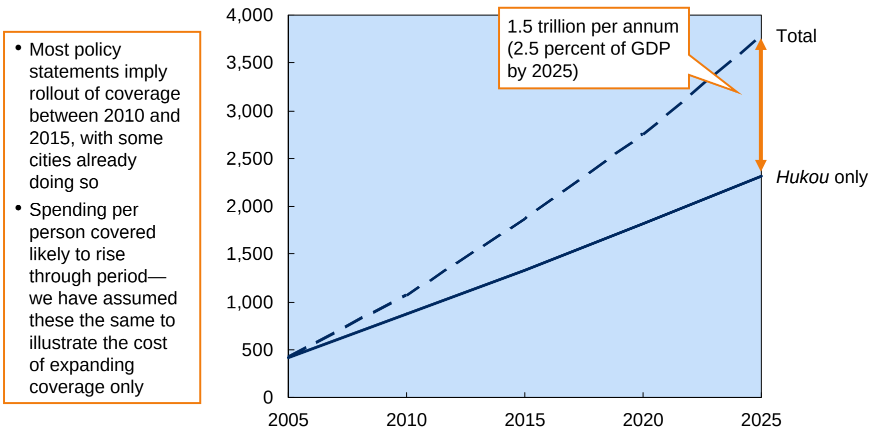
More important, coping with an influx of migrant workers will put severe pressure on city budgets given China's commitment to extending social coverage, over time, to the huge and growing urban mobile workforce. Most policy statements imply that China intends to roll out coverage of social services to include migrants between 2010 and 2015, a process that will not only be costly but will potentially cause tensions between official urban residents and an influx of mobile workers who, in many cities, will account for more than 40 percent of the population. MGI estimates that the cost of this extension of social coverage will reach an additional 1.5 trillion renminbi by 2025—about $215 billion at today's exchange rate or almost 2.5 percent of urban GDP (Exhibit 4.12).

Exhibit 4.12

Extending social provision to migrants would significantly boost required public spending

ESTIMATE

Spending on urban public services*
Renminbi billion, 2000

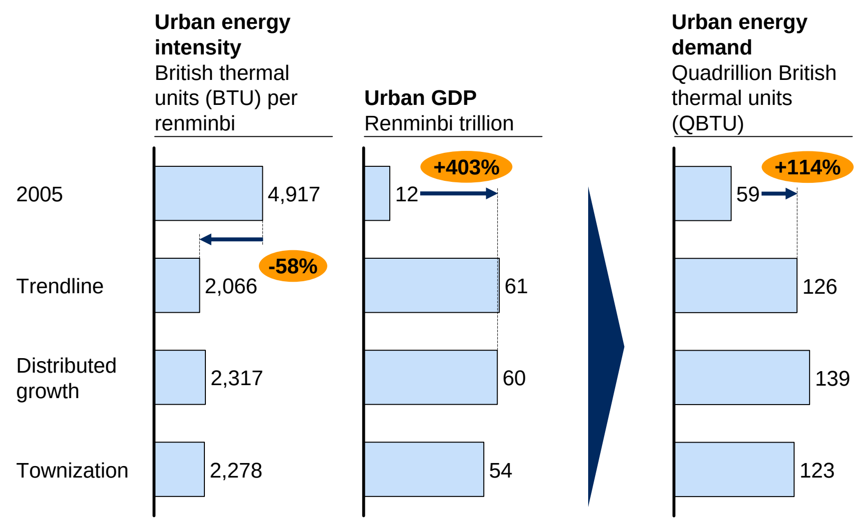


* Education, health care (government spending), maintenance, and sundry services.
Source: Literature search; McKinsey Global Institute analysis

Energy. If current trends continue, China's energy demand will more than double by 2025, with a quintupling of urban GDP requiring an increase in energy consumption more than compensating for a fall in energy intensity of almost 60 percent (Exhibit 4.13). Trend projections and dispersed urbanization scenarios would display relatively inefficient energy use. Energy demand growth would vary enormously in different-sized cities, and cities would need to take projected demand into account to ensure that they don't suffer from over- or undersupply. As examples of the variations that we project, energy demand growth in cities with populations of between 5 million and 10 million is marginally stronger in our trendline projection, with almost no variation between scenarios for this size of city. For cities with populations of between 1.5 million and 5 million, energy demand growth is markedly stronger in distributed growth than in other scenarios. In terms of China's fuel mix, if China's cities were each individually to retain their relative fuel demand profiles, with some gains in fuel-use efficiency based on local trends, then coal would remain dominant, although its share would decline. Under these assumptions, urban China overall would see a near doubling in its coal demand to 2025, but there would be variations in demand for coal of nearly 20 percent between different urbanization scenarios with the highest demand seen in a distributed growth scenario. This is because midsized cities in particular have a relatively higher dependence on coal-fired power, whereas larger cities employ a more varied mix of natural gas and renewables. Both capital availability—e.g., larger cities can afford big nuclear projects—and local skills and the political will to shift power sources drive these differentials. Urban China will also see significant growth in demand for oil from 6.9 million barrels per day in 2005 to almost 12 million barrels per day in 2025, accounting for up to one-quarter of additional global oil demand in this period.

Exhibit 4.13

China's energy demand will more than double by 2025
Renminbi, 2000



Source: McKinsey Global Institute analysis

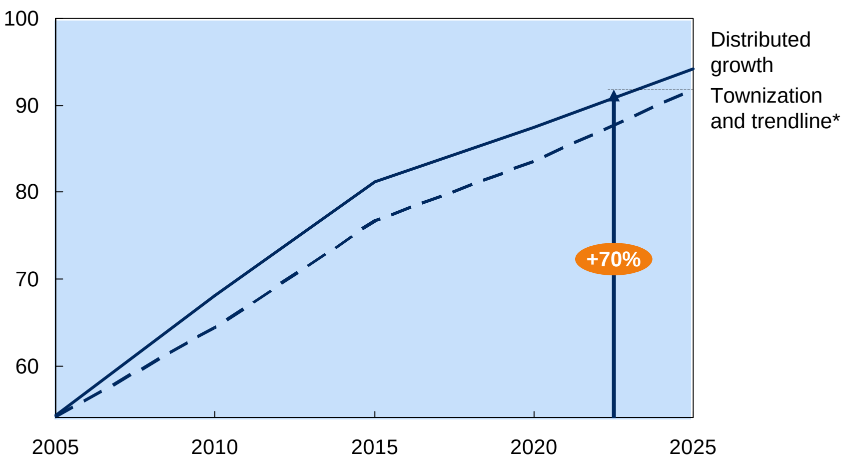
Water resources. China is a water-poor country, and, moreover, its water resources are poorly distributed. Southern China has six times the available water than the north. Today China's citizens use relatively modest amounts of water in aggregate, largely because of the country's low urbanization level (urban residents tend to consume three times the amount of water per capita vs. rural inhabitants); in 2005, agriculture accounted for more than 70 percent of total demand for water, while industry and residential consumers each accounted for only 13 percent. However, as China continues to industrialize and urbanize, this situation is starting to change. Between 2004 and 2005, industry accounted for 66 percent of the rise in demand for water, and urban residential use is also expanding rapidly. We forecast residential demand increasing almost three times over the next 20 years to well above half of total urban water demand. We estimate that under the townization scenario, total urban water demand would increase by more than two-thirds by 2025 (Exhibit 4.14). It is important to note that, although urban demand would still be only a fraction of China's overall water resources (for example, as of 2025, total urban demand could reach 489 billion cubic meters, while supply is about 2,700 billion cubic meters), there will be large distribution problems and severe water stress in some regions, and China will need to invest heavily to ensure that water is available where it is necessary. Under dispersed scenarios, we estimate that China could spend 800-plus billion renminbi on new urban water-supply infrastructure between 2005 and 2025 (excluding the currently planned massive water-transfer projects). Beyond building the necessary infrastructure, it will be crucial for China to tackle rising urban water demand by improving the efficiency of its use and meeting the national target of a 7 percent annual increase in efficiency over the next 20 years.

Exhibit 4.14

Urban water demand soars under all scenarios, doubling in the case of supercities

Total urban water demand under different scenarios

Billion m^3



* Trendline roughly matches the townization scenario.

Source: China Water Resources Bulletin; China Urban Construction Statistical Yearbook; McKinsey Global Institute analysis

Pollution. MGI used its simulation models to estimate the pollution challenge at the city level, focusing on air pollutants such as NO_x, SO_2, and PM_{10}.[41] Our analysis finds that the ratio between emissions of a pollutant and the growth in its primary driver, for example, between SO_2 and GDP—a ratio that we loosely label "efficiency"—is a far larger determinant of pollution outcomes than different urbanization scenarios. It is clear that the enhancement of efficiency in terms of emissions will be a crucial "no-regret" move for China's cities under all scenarios. National-scale pollutants would be the most critical under current trends and under dispersed urbanization scenarios in general. Emissions of other pollutants, whose impact is largely local, would likely be more severe in concentrated urbanization, given the concentration of volumes in smaller physical areas and the resulting higher local concentrations.[42] MGI also looked at water pollution, which is most severe in China's smaller cities, largely because they treat a great deal less wastewater than do larger urban centers. The gap is quite dramatic—megacities treated 68 percent of their wastewater in 2005 compared with only 34 percent in "big towns." A major part of the problem is that it is much more difficult for China's Ministry of Environmental Protection (MEP) and other central enforcement agencies to track activities beyond a few megacities. In addition, the concentration of chemical oxygen demand (COD) water pollutants has historically been higher in smaller cities that tend to be the home to smaller-scale industrial enterprises including China's TVEs. As a result, water pollution would be most serious in a distributed growth scenario because of a combination of low treatment rates and a higher share of industrial enterprises. This pressure point could be limited only by increasing the wastewater-treatment rate in small cities: if small cities were to reduce their wastewater-treatment rate by 15 percent through, for instance, building more wastewater-treatment factories, these urban centers could cut COD discharges by 32 percent. However, at current fees for wastewater discharge, this would be more expensive than simply continuing to discharge. It is therefore clear that an adjustment of incentives is necessary.

41 Nitrogen oxide, sulfur dioxide, and particles of 10 micrometers or less.

42 Emissions of NO_x would be highest in a supercities scenario, while a hub-and-spoke scenario would generate most PM_{10}. See chapter 5 and volume II for detail.

IS THERE AN ALTERNATIVE?

If China keeps following current trends or ends up following an even more dispersed urbanization pattern, urbanization will continue to be a major component of China's economic success. However, it will create funding, pollution, and employment challenges for many cities, with the potential for significant setbacks and volatilities. Moreover, the parallel expansion of a very large number of cities in competition with each other for GDP growth, investment, and talent could lead to duplication in infrastructure, for instance, and, as a consequence, funding. A dispersed urbanization shape would also pose administrative and enforcement headaches at the national government level. Oversight of such a large number of cities would require a large, dedicated bureaucracy, and enforcing regulations and standards, not least pertaining to environmental policy, would become very difficult.

So the question arises whether China could pursue a different shape of urbanization that would promote greater efficiency and ease the management challenge. Could a more concentrated path of urbanization meet both these requirements? We turn to this question in the next chapter.

5. The opportunity of concentrated urbanization

The question China faces is not whether it should continue to urbanize—only by doing so will the country meet its economic growth expectations—but how to minimize the potentially large negative effects of urbanization while continuing its economic boom.

China has long debated the optimal shape of urbanization. Should Beijing promote a particular type or size of urban centers, or should it leave the dynamic of urban expansion to forces that are naturally at work at the local level? This discussion will now become even more critical given the heightened scale of urbanization we expect to see over the next 20 years.

We have established that, based on historical trends, China's urbanization could follow a dispersed pattern, and, while this will generate positive outcomes, this scenario will throw up serious challenges. The ensuing pressures will particularly be felt by those least able to withstand them, including migrant workers and smaller cities. Managerial demands not only on city mayors but also on the national government will be acute.

Chinese policy makers have considerable power to influence how urbanization plays out in the years ahead, but there are two questions they will need to answer. First, by shifting urbanization away from the relatively dispersed pattern of the current trend and toward a more concentrated shape, can China achieve superior economic outcomes and mitigate the intensifying pressures of urbanization? Second, is such a shift possible? Having examined two alternative, more concentrated shapes of urbanization, modeling their resulting impact across a range of important dimensions, MGI believes the answer to both questions is yes, although concentrated urbanization will involve some significant trade-offs.

Our analysis finds that concentrated urbanization could increase per capita GDP by up to 20 percent over dispersed urbanization and what we can expect following current trends. As a percentage of GDP, public spending would be lower—at 16 percent of GDP in concentrated urbanization by 2025 compared with 17 percent in dispersed urbanization. However, there will be trade-offs, including more severe peak pollution, congestion, and localized water shortages (Exhibit 5.1).

Exhibit 5.1

Each urbanization scenario has its pros and cons

NOT EXHAUSTIVE

	Concentrated urbanization scenarios		Dispersed urbanization scenarios	
	Supercities	**Hub and spoke**	**Distributed growth**	**Townization**
Economy	**Highest per capita GDP**	2nd-highest per capita GDP		**Lowest per capita GDP**
Arable land	Low rate of loss—only 8% of total over 20 years	**Lowest rate of loss of land**	High land loss—20% of total over 20 years	**Highest land loss—22% over 20 years**
Floor space	**2nd-highest build rate**	**Highest build rate by far**	**3rd-highest build rate**	
Urban transport	**Severe congestion issues—cars use up to 2–3 times city road capacity**	Greatest subway-, road-investment requirements	**Highest investment needs by far by 40–50%**	Lowest investment needs
Intercity transport	Highest waterborne traffic (port cities becoming supercities)		Greatest cargo generation in western cities	~6,000 km of additional national highway
Energy	High demand but **most efficient energy use**; nearly the lowest coal demand	**Highest energy demand—total and per capita; greatest oil demand**	**Least efficient energy use per unit of GDP; greatest coal demand**	**Lowest energy demand, but least efficient**
Water	Highest urban water demand (90% more than 2005)			**Lowest water demand**
Pollution	**Severe NO_x emissions challenges**	**Highest PM_{10} emissions**	Widespread NO_x and CO_2 issues	Severe **water pollution** challenges
People	70% of megacity population will be migrants		**Shortage of graduates in midsized cities**	Severe graduate **shortages**
Govt. finance	**Lowest public spending vs. GDP**	Lowest public spending vs. GDP	Highest public spending vs. GDP	**Highest public spending vs. GDP**

Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

It is already evident that it is China's larger cities that have packed a more powerful economic punch. Without doubt, history, location, economies of scale, and broad preferences granted by the central government (for example, SEZ status) have contributed to these cities' relative successes compared with others. But that is not all. During our visits to cities, we observed three critical factors that point to why larger cities have more advantageous conditions for economic success: their ability to attract talent, their ability to attract investment, and network effects they engender.

It is important to note that MGI bases this evaluation on a comparison of historical and potential performances of cities within China. China's urbanization is unique, and we would not necessarily hold it relevant to other countries. Not all megacities (and potential megacities) of the world are success stories; nor do all midsized and smaller cities face severe challenges. However, in aggregate, and for various historical and local reasons, large concentrated cities in China are performing more effectively than smaller cities, and our projections indicate that this pattern could hold true in the future.

The evidence on thinking among China's leaders on whether more concentrated urbanization would be a desirable option to pursue is mixed. It is certainly the case that, in the mid-1990s, China's policy makers tended to favor a highly dispersed model with a very large number of small cities springing up and growing all over the nation. However, discussions in various policy papers since then appear to indicate that this model has become less popular. More recently, the notion of city clusters—similar to hubs and spokes and a moderate model of concentrated urbanization—has gained in popularity on the back of the success of existing clusters on China's eastern seaboard. On the other hand, we detect a degree of nervousness about the idea of a small number of supercities emerging to rival Tokyo, London, or New York because of the perceived difficulties of managing such huge population centers and the infrastructural, social, and environmental pressures that they would present.

In this chapter, we present our analysis of the potential impacts of concentrated urbanization. To move in this direction, China would need to make policy shifts at the national level, and we lay out the policy levers that would be effective if China were to opt to shift the dynamics of urbanization in this direction.

CONCENTRATED URBAN PATTERNS YIELD HIGHER OUTPUT AND EFFICIENCY THAN DISPERSED URBANIZATION

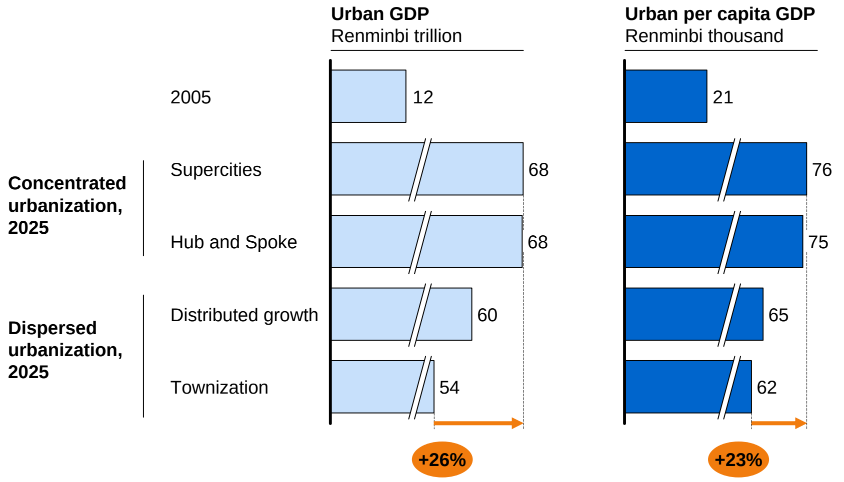
Each shape of urbanization presents a largely distinct set of opportunities and challenges. Both of the two concentrated urbanization scenarios that we analyzed—supercities and hub and spoke—would yield many positive implications linked to higher productivity and efficiency.

Highest per capita GDP. Both scenarios would produce about 20 percent higher per capita GDP than trendline and more dispersed urbanization scenarios (Exhibit 5.2). Driving the higher GDP outcomes of more concentrated urbanization scenarios is the migration of people to wealthier cities as they search for higher incomes, and scale effects and higher productivity as cities increase in size. MGI projects urban per capita GDP would be 75,000 renminbi in 2025 in a hub-and-spoke scenario and somewhat higher at 76,000 in a supercities scenario. These projected levels compare with a trendline value of about 65,500 renminbi.

Exhibit 5.2

Concentrated urbanization scenarios would generate the highest per capita GDP

Renminbi, 2000



Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

As mentioned, the main driver of the higher GDP in concentrated urbanization is higher productivity tied to scale. Multiple studies have demonstrated that scale produces clear productivity gains of some 10 to 15 percent for each doubling in population—and the same negative amount if a city halves in size. We see a 16 percent gap between per capita urban GDP in our trendline projection and supercities scenario. There are four factors at play. Two boost per capita GDP. The first comes from the migration of people to wealthier cities in search of employment. The second is from scale effects resulting in an additional net increase in per capita GDP in midsized cities as they evolve toward becoming larger cities. An additional two factors work in the opposite direction to depress per capita GDP, although not enough to overwhelm the first two factors. The first of these comes from a decrease in output due largely to the lower educational attainment—and therefore lower productivity—of migrant workers; second, the congestion and local pollution that tends to come with scale can decrease productivity by up to 15 percent.[43]

More efficient use of energy. A hub-and-spoke model of urbanization would produce the highest overall energy demand, some 13 percent above the demand we would see if current trends hold, largely because of the increasing energy demands of transportation between hubs and spokes. However, concentrated

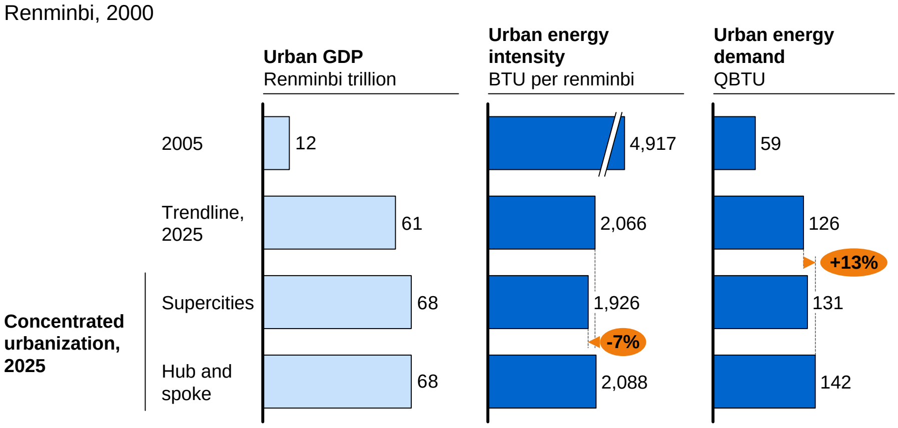
43 See volume II, chapter 3 for a more detailed explanation and description of these factors.

urbanization scenarios could have almost 10 percent higher energy efficiency—the level of output achieved from the amount of energy consumed—than under trendline (Exhibit 5.3). The types of industry in the largest cities tend to be more energy efficient—services and electronics, for example, rather than steel and textile mills. In addition, people tend to live and work in smaller spaces in big cities, requiring less energy for heating and lighting, for instance. Moreover, energy-saving initiatives such as insulation are easier to implement in relatively few bigger buildings than a larger number of smaller ones. Public transportation is more efficient in concentrated urban centers—transportation systems to move 20 million people around one city are more cost effective than if the same number of people is spread across five cities, as long as transportation networks are well planned. Despite the greater energy efficiency of concentrated urbanization scenarios and high absolute levels of energy demand, it would be vital for cities in these urbanization shapes to be aggressive in promoting even higher energy productivity—which, by MGI calculations, could provide savings of as much as 21 percent under the right policies (see chapter 6).

Exhibit 5.3

Concentrated urbanization would entail higher energy consumption but also higher efficiency

Renminbi, 2000



Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

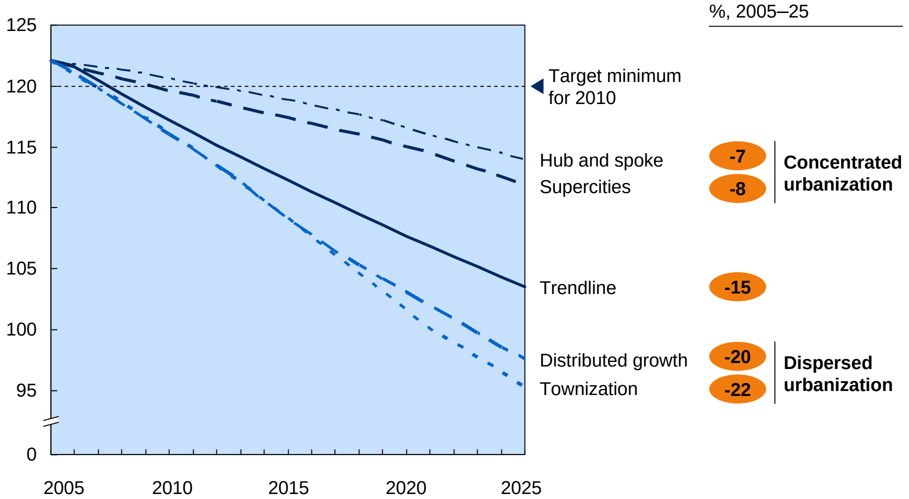
Higher foreign direct investment. FDI has landed disproportionately in larger cities and will likely continue to do so in the future. The establishment of a foreign-invested community reduces perceived investment risks, and the evidence shows that the presence of FDI increases labor productivity and spreads best practice and innovation. In addition, large cities tend to attract a disproportionate share of total financing for infrastructure, enabled by larger local equity pools, greater perceived creditworthiness, and access to a larger range of financing sources due to scale (e.g., large cities can more easily tap the bond market).

Lowest rate of loss of arable land. More concentrated models of urbanization could reduce the loss of arable land to only about 7 to 8 percent of the current total against a loss of more than 15 percent under trendline (Exhibit 5.4). MGI's analysis finds that with concentrated urbanization, China could maintain grain production at 2005 levels because the greatest attrition of arable land will be in less productive regions and because yields will continue to rise, although moderately. In supercities and hub-and-spoke scenarios, a modest gain in yields of 10 percent over the next 20 years would result in a 3 to 4 percent increase in production, whereas, as we discussed in chapter 4, a rise in yields of this magnitude would still lead to a net loss of grain production in dispersed urbanization scenarios.

Exhibit 5.4

Concentrated urbanization would contain loss of arable land most effectively

China total arable land
Million hectare



Source: China Agricultural Yearbook 2006; China State Council; McKinsey Global Institute analysis

More efficient mass transit. Concentrated urbanization scenarios would attain the necessary public-transport capacity at a lower cost than in dispersed scenarios. Moreover, MGI analysis suggests that cities in concentrated urbanization scenarios would have a better chance at being successful in their construction of the mass-transit capacity that they will require. This is because these cities enjoy a relatively greater flow of capital, enabling cheaper and often more flexible financing. In addition, these cities have the advantage of superior economics in public-transport systems that move larger numbers of people around smaller areas, producing much higher revenues per kilometer in subway systems, for instance.

China's cities are already spending heavily on city transportation, including both mass transit and roads, and between 2005 and 2025 the highest annual spending as a percentage of GDP would be under dispersed urbanization. The construction and investment requirement in a hub-and-spoke scenario would be significantly lower, at 21,500 kilometers of light-rail track with cumulative investment of some 4.5 trillion renminbi. In a supercities scenario, urban China would need to build 17,000 kilometers of new light-rail systems at an investment cost of 3.8 trillion renminbi (lower than the 25,000 kilometers and 5.4 trillion renminbi that MGI projects if current trends hold).

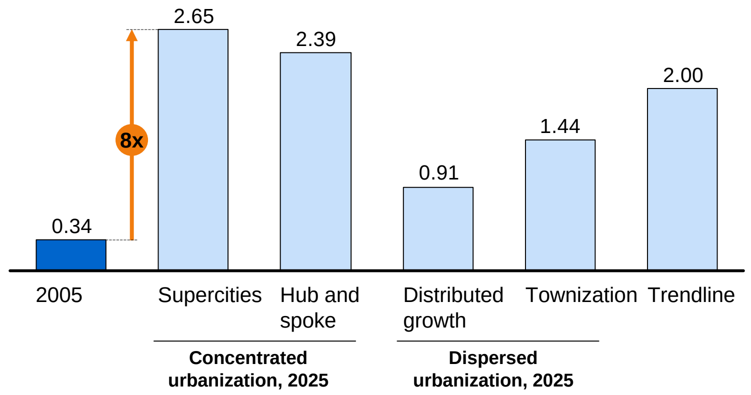
In contrast, pressure to build new subway capacity would be far higher in supercities and hub-and-spoke scenarios. In both shapes of concentrated urbanization, subway capacity would need to expand eight times by 2025 to meet demand (Exhibit 5.5). Moreover, regional variations in intercity transportation needs could be huge. In the Yangtze River Delta, for example, by far the most substantial intercity road, rail, and, to a lesser extent, water links would be necessary in the supercities scenario—indeed the requirement in the delta would be more than 50 percent higher than in a townization scenario, amounting to a cumulative 4 trillion renminbi in spending between 2005 and 2025 (Exhibit 5.6) in order to support an overall quadrupling of cargo volumes.

More effective control of national pollutants. Megacities that would develop in a supercities scenario would face extremely serious "local" peak pollution problems. However, as we have discussed, a distributed growth scenario would generate the greatest amount of emissions nationally as well as more severe water pollution than would be the case in concentrated urbanization scenarios (Exhibit 5.7). Our analysis shows that although peak pollution would be very serious in a supercities scenario, larger cities would be more effective at facing this challenge. Again, efficiency is a greater determinant of local pollution in our analysis than urbanization shape (Exhibit 5.8).

Exhibit 5.5

China would need to expand current subway system by eight times under supercities and hub and spoke

Subway demand in 2025, compared to 2005 supply
Thousand kilometer

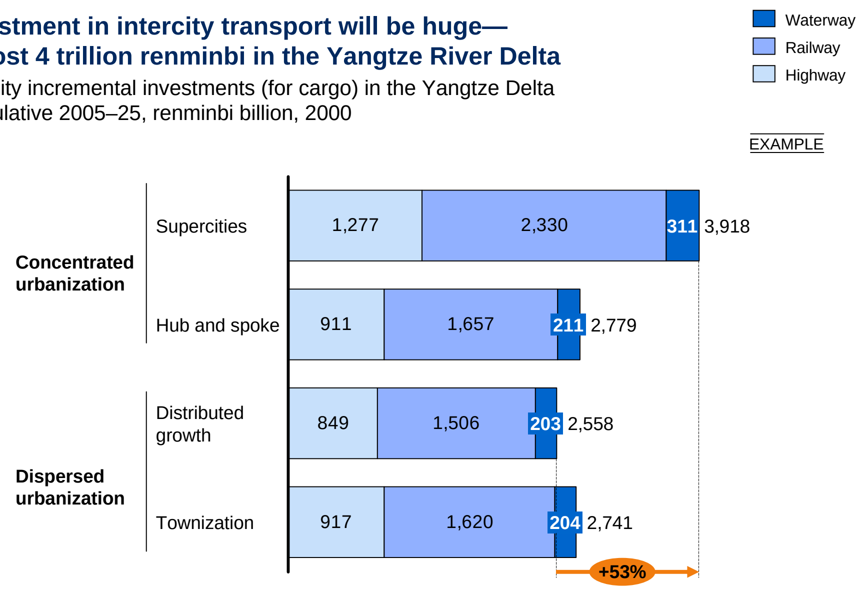


Source: Literature search; McKinsey Global Institute analysis

Exhibit 5.6

Investment in intercity transport will be huge—almost 4 trillion renminbi in the Yangtze River Delta

Intercity incremental investments (for cargo) in the Yangtze Delta
Cumulative 2005–25, renminbi billion, 2000

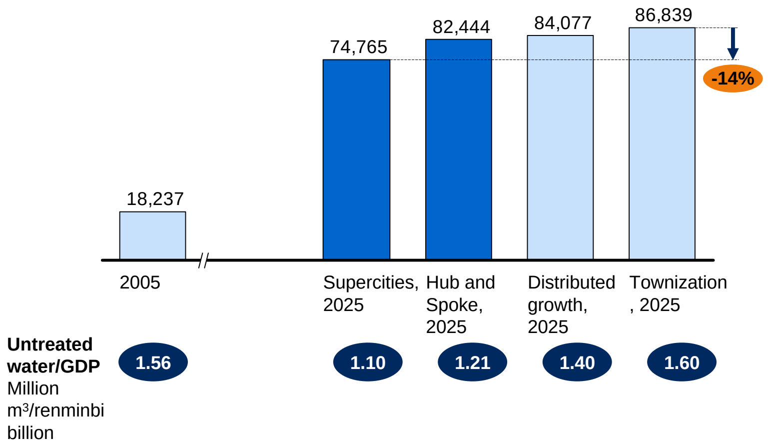


Source: National Bureau of Statistics; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Exhibit 5.7

Concentrated urbanization would guarantee lower urban water pollution levels

Volume of untreated wastewater discharged
Million m^3



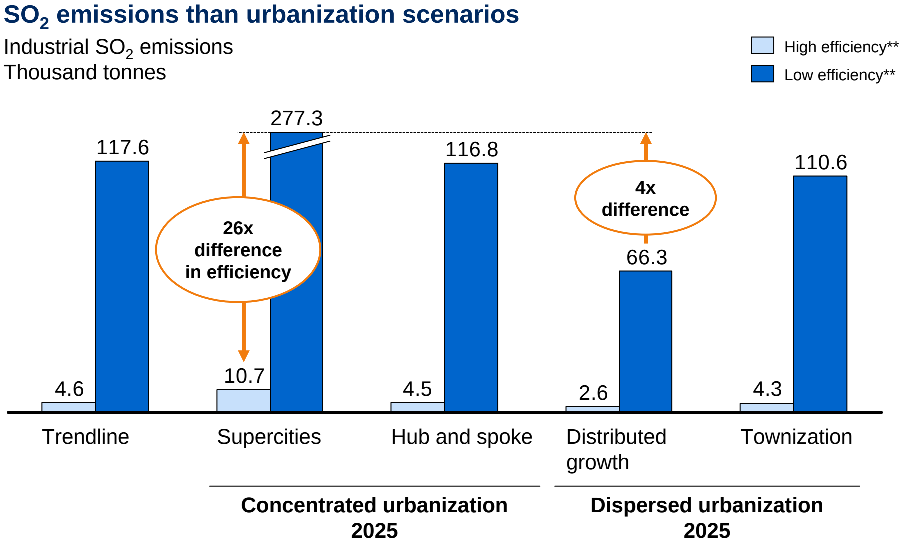
Source: China Urban Construction Statistics Yearbook; McKinsey Global Institute analysis

Exhibit 5.8

Efficiency* is a more important determinant of city-level SO_2 emissions than urbanization scenarios

SHENZHEN EXAMPLE

Industrial SO_2 emissions
Thousand tonnes



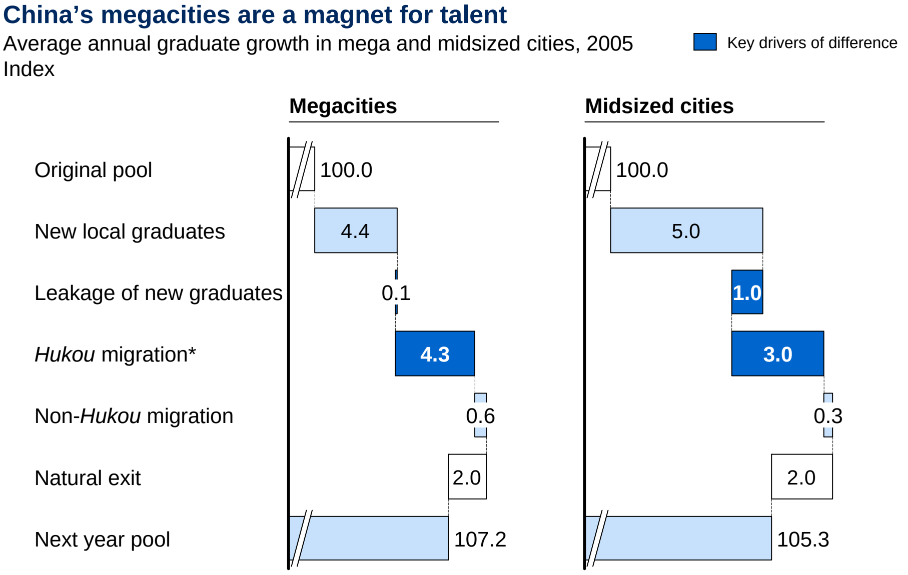
* "Pollution efficiency" measured as the ratio between the emission of a pollutant and GDP.
** Based on high and low efficiency levels of international cities, depending on emission standards.
Source: China City Statistical Yearbook; McKinsey Global Institute analysis

Available talent where it is needed. China's larger cities attract most of the skilled people that are available (Exhibit 5.9). Under concentrated urbanization scenarios, therefore, China would have the advantage of having an abundance of talent in centers that are the engines of economic growth, enabling a more rapid transition to higher-value-added activities. Shanghai is a good example to illustrate this trend. Shanghai has the skills and talent it needs to feed current growth. Many high school graduates from all over China come to the city for their college education every year, while Shanghainese students are reluctant to go to other cities. The city has access to 100,000 or more graduates from 60 higher-education institutions every year. One recent university graduate in Beijing told us, "All of China's graduates want to go to Beijing or Shanghai for jobs. That is why there is such an oversupply in these cities." And a leading academic said, "Everyone wants to move to Shanghai." As a result, more than one-quarter (28 percent) of Shanghai's labor force has a college education—double the proportion of a decade ago.[44] The city is also beginning to attract talent from overseas—the expatriate community is half a million strong—and growing. Migrants have also moved in large numbers to fill low-wage jobs in manufacturing and service industries. While talent will tend to concentrate in big cities, we expect a significant shortage of highly skilled workers in small and midsized cities. That trend is already clear today.

Exhibit 5.9

China's megacities are a magnet for talent

Average annual graduate growth in mega and midsized cities, 2005
Index



* Includes students from outside the city studying at a local institution and receiving a Hukou upon graduation.

Source: China Labor Statistical Yearbook; China City Statistical Yearbooks; Census 2005 1% Data; literature search; interviews; McKinsey Global Institute analysis

44 *Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancement for 120 Cities in China*, World Bank, Report 37759-CN, Washington, DC, 2006.

CONCENTRATION AND SCALE CREATE THEIR OWN PRESSURES, WHICH NEED TO BE TACKLED AT THE LOCAL LEVEL

The critical downside risks in concentrated urbanization scenarios—all of which will require high-quality city-level management skills—are congestion, pollution, a potential doubling of urban water demand, urban sprawl, and the challenge of handling huge concentrated influxes of migrant workers that threaten to place the social fabric under enormous strain. Although today China's largest cities have proved themselves remarkably adept at managing these pressures, continuing to do so in the future will require a much more concerted focus on the efficiency of development.

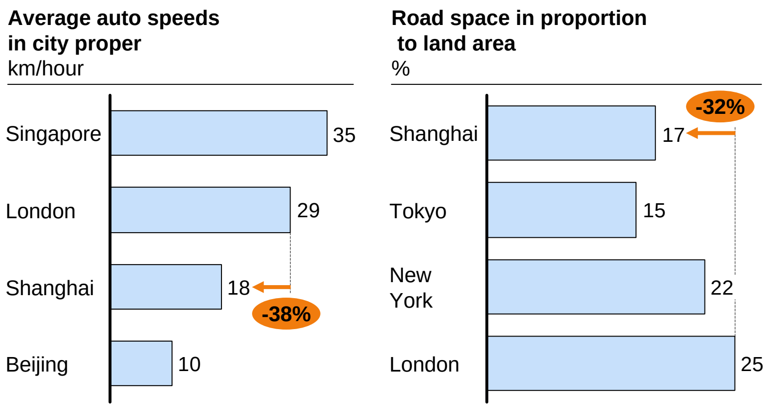
MGI believes that this effort should take place within a framework of "urban productivity" that would shift urban China from a primary focus on maximizing GDP growth to one that incentivizes the efficient use of inputs such as energy, water, and land; focuses on matching sufficient skilled labor to higher-value-added activities; and seeks to improve the efficiency in the provision of public services.

Congestion. A shift toward more concentrated urbanization in China would likely result in more intense congestion in those cities than would a dispersed urbanization strategy. While supercities and hub-and-spoke scenarios deliver higher GDP growth than more dispersed models of urbanization, congestion is also a hallmark of concentrated urban expansion and could, if not tackled, compromise the capacity of cities to continue delivering superior GDP outcomes. Not only does congestion compromise the quality of life of citizens in general terms, but it also curtails a city's labor productivity because it prolongs the time that people spend traveling to and from work. Regression studies show that those cities that are successful in combating congestion can reap a productivity upside of between 10 and 15 percent for each doubling of the population.

Shanghai is a useful case study for the pressures that would emerge in very large cities. Private car ownership in the city posted a compound annual growth rate of 35 percent between 2003 and 2006, rising from 167,000 vehicles to 410,000. Shanghai's average auto speed is 38 percent below that of London (Exhibit 5.10). The city is attempting to deal with congestion on multiple fronts, but MGI research finds that, even if all current plans are successful, car ownership in Shanghai will outstrip capacity in all scenarios and the city will need a further brake on car ownership of between 10 and 20 percent to bring congestion back to manageable levels. We will discuss what further policy actions might be effective in chapter 6.

Exhibit 5.10

Congestion is one of the key challenges for Chinese megacities
2005



Source: *The 3rd comprehensive transport survey of Shanghai 2005*; literature search; McKinsey Global Institute analysis

Local peak pollution. More concentrated urbanization would likely result in more severe peak pollution in the largest cities than would a dispersed urbanization strategy. We should note that basic efficiency (e.g., emissions per kilometer for cars) is the major determinant of local pollution outcomes, far more so than urban shape. Under any scenario many cities can attain high standards of pollution control if they reach high pollutant-efficiency levels. However, megacities in a supercities scenario would struggle to match local and global standards even at best-case efficiency levels. Shenzhen, Nanjing, and Hangzhou would all significantly exceed global safety standards for PM_{10}—and Shenzhen would far exceed China's standards (Exhibit 5.11). It would be a critical challenge for megacities in a supercities scenario to control local pollutants; if they do not, these pollutants would have a significant impact on citizens' health and therefore, ultimately, on these cities' growth prospects. The largest cities in China are already starting to tackle the problem, for example with the introduction of compressed natural gas (CNG) taxi fleets in Chengdu, and a range of measures in Dalian.[45]

Water resources. Water demand would grow most strongly in a supercities scenario that would see urban demand double, driven largely by much higher residential consumption due to increased wealth as well as the concentration of large populations in cities in more water-intensive areas (Exhibit 5.12). Residential consumption would be more than 25 percent higher in a supercities scenario than in our trendline projections. Total urban water use would rise

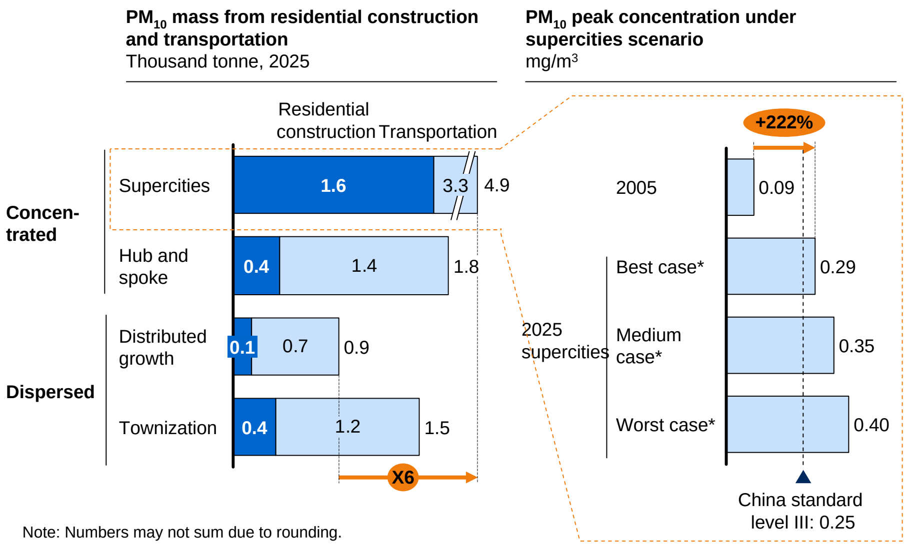
45 See chapter 6 for details on multiple urban productivity initiatives that China's cities are undertaking.

to 109 billion m³ and to 119 m³ per capita in a supercities scenario and to 101 billion m³ and to 108 m³ per capita in a hub-and-spoke model. This compares with 90 billion m³ and 97 m³ under trendline projections.

Exhibit 5.11

In a supercities scenario, megacities would face severe challenges in local peak pollution

SHENZHEN EXAMPLE

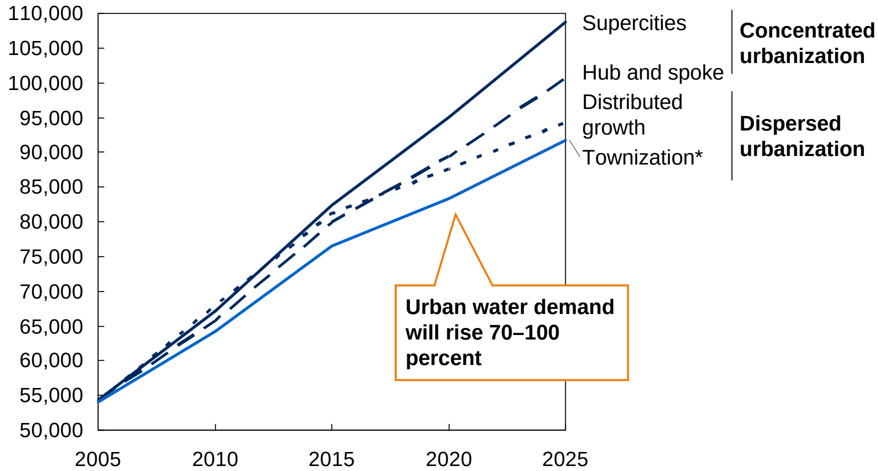


Note: Numbers may not sum due to rounding.
* Average PM10 emission per car (grams/kilometer) in 2025 assumed for best case 0.015; medium case 0.020; worst case 0.025.
Source: McKinsey Global Institute analysis

Exhibit 5.12

Urban water demand soars under all scenarios, doubling in the case of supercities

Total urban water demand under different scenarios
Million m³



* Trendline water demand tracks closely with demand in townization.
Source: China Water Resources Bulletin; China Urban Construction Statistical Yearbook; McKinsey Global Institute analysis

China is already investing heavily in its water-distribution system, including in the monumental South-North Water Transfer project at an estimated cost of 700 billion renminbi. Although this project should be sufficient to prevent the Tianjin-Beijing cluster from reaching crisis point in terms of demand outstripping supply, these cities, especially under concentrated urbanization scenarios, would still be using more than the sustainable limit of 40 percent of annual supply. Cities would also need to invest in the infrastructure to supply and distribute water locally. The most substantial investment would arise in the supercities scenario. These very large and rapidly growing urban centers would have to build extremely big and expensive water plants using complex processing equipment, longer pipeline connections to the original source of water, and more extensive areas of land.

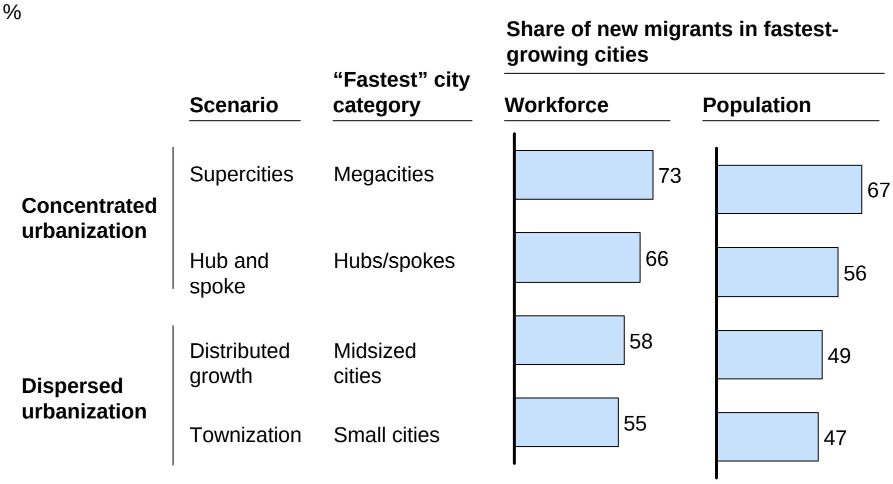
Urban sprawl. Containing urban sprawl will be a central issue for the urban environment. In general, real estate and capital investment remains similar in intensity under the scenarios even as it shifts in concentration, although there will be some time effects; for example, the housing boom ends earlier in hubs than in spokes. However, the challenge of sprawl would be particularly acute in a hub-and-spoke scenario in which the conversion of arable land would be the lowest of all the urbanization shapes that we have analyzed but in which construction rates would be very high as spoke cities, in particular, undertake extensive building—for instance, converting low-rise outlying suburbs into large residential complexes. A worst-case outcome would be the agglomeration of clusters into gigantic megalopoli with severe implications for the quality of life in those cities. In addition, we can anticipate that the high annual build requirements in a hub-and-spoke scenario would maintain and extend China's thirst for imported raw materials such as iron ore. For example, we project a significant difference in steel demand between concentrated and dispersed urbanization, equivalent to 15 percent of the global steel demand today in favor of concentrated urbanization.

Absorbing migrants. New migrants will account for very large shares of the workforce and population of the fastest-growing cities in all scenarios. However, the local challenge of absorbing this new workforce will be largest in a supercities scenario, which would see new migrants making up 73 percent of the workforce and 67 percent of the population in cities of 10 million plus, far larger shares than in dispersed urbanization scenarios (Exhibit 5.13).

Exhibit 5.13

New migrants will make up the majority of the population of fast-growing cities

Share of new* migrants in fastest-growing cities
%



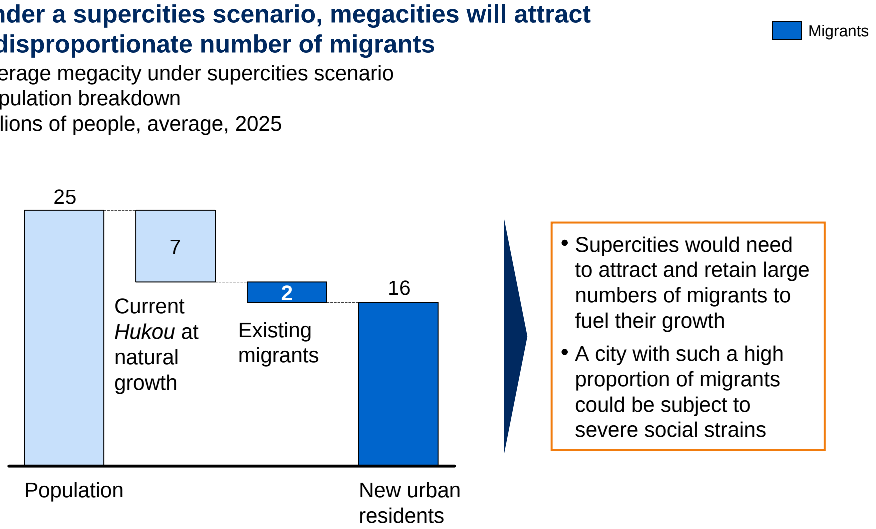
* Migrants from 2005–25, cumulative.
Source: National Bureau of Statistics; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

By 2025, in a supercities scenario, megacities would have average populations of 25 million people, of which only 7 million would be the naturally growing *Hukou* resident population and 2 million would be existing migrants. Some 16 million would be new urban residents (Exhibit 5.14).

Exhibit 5.14

Under a supercities scenario, megacities will attract a disproportionate number of migrants

Average megacity under supercities scenario
Population breakdown
Millions of people, average, 2025



- Supercities would need to attract and retain large numbers of migrants to fuel their growth
- A city with such a high proportion of migrants could be subject to severe social strains

Source: National Bureau of Statistics; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Bringing high levels of new migrants into the fabric of urban life will involve severe social and financial strains. As we noted in chapter 4, rolling out social services coverage to migrant populations at similar levels to existing *Hukou* populations will be expensive. We estimate that spending will rise to 1.5 trillion renminbi per annum by 2025, equal to 2.5 percent of GDP then. If we look at a city such as Shenzhen, providing education to migrant students at the same standard as *Hukou* students would require an estimated 176 percent increase in spending; in Shanghai, a 56 percent increase would be necessary.

Funding. Moving toward concentrated urbanization would guarantee that today's engines of China's growth—a set of dynamic clusters of cities—would be able to generate bigger economic surpluses and bring their effective financial deficits to near zero.[46] In a supercities scenario, for example, Shanghai's deficit in 2025 would be some 0.4 percent of GDP or 340 billion renminbi (from a deficit of about 2 percent today). Shanghai's public spending needs would multiply between 2005 and 2025, with a particularly large increase in administrative costs as the city would manage a large and rapidly growing population. However, GDP growth would grow almost six times over the same period, allowing the city's public spending as a share of GDP to drop from 18 to 16 percent in 2025.

While overall public spending as a percentage of GDP would be lower in concentrated urbanization (16 percent compared with 17 percent of GDP under trendline), the two concentrated urbanization scenarios would have markedly different outcomes for China in terms of the overall funding of urbanization.

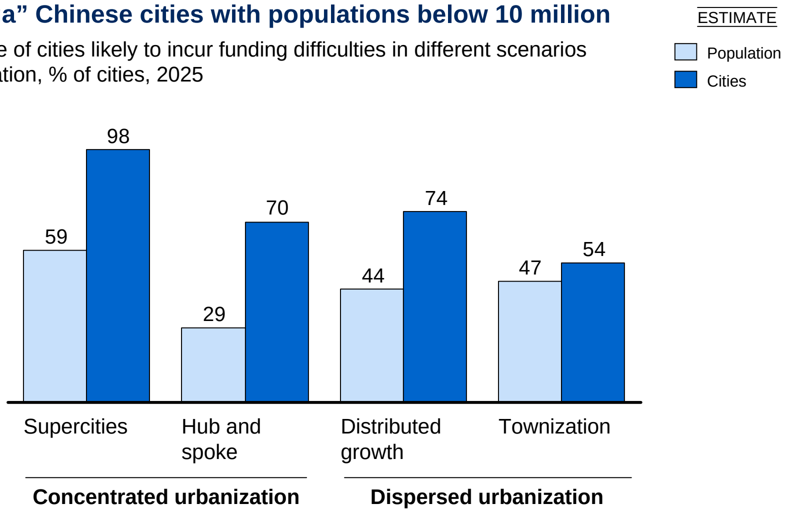
A hub-and-spoke scenario would be highly effective in mitigating the funding challenge by being able to pull financially struggling spoke cities closer to their more well-endowed hubs. Only some 30 percent of the population would live in "funding-at-risk" cities under this scenario. In contrast, the funding squeeze in a supercities scenario would be widespread and acute outside the major 15 cities: MGI finds that almost 60 percent of the urban population could live in "funding-at-risk" cities—that is, generally smaller and midsized cities running a significant budget deficit before central government transfers (Exhibit 5.15).

46 As a matter of policy, China's cities do not run fiscal deficits. However, all of them receive transfers from central government to close the gap between local revenues and expenditures. For convenience, we refer to the pretransfer fiscal balance as the cities' "deficits."

Exhibit 5.15

A supercities scenario could imply funding issues for all "non mega" Chinese cities with populations below 10 million

Urban share of cities likely to incur funding difficulties in different scenarios
% of population, % of cities, 2025



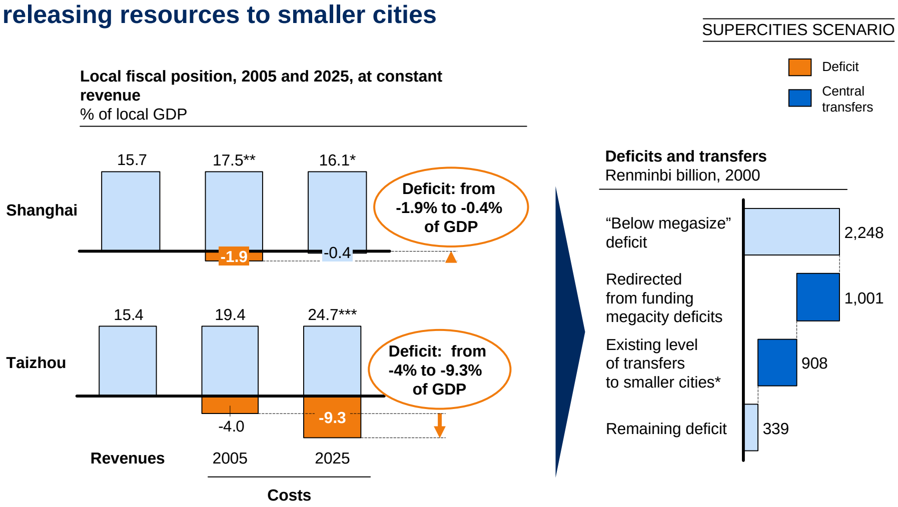
Source: McKinsey Global Institute analysis

Midsized cities' spending requirements would grow considerably, without being compensated by strong GDP growth. If we take as an example the city of Taizhou under a distributed growth scenario, we project that the city's spending needs would rise at an annual rate of 13 percent from 2005 to 2025, but rising GDP should virtually match this projected increase in spending. Under a supercities scenario, Taizhou would still face rapid spending increases, but, at 8 percent a year, these would be lower than under distributed growth. Nevertheless, GDP growth would only be 7.6 percent per annum in this scenario, implying public spending as a proportion of GDP would rise from 21.8 percent in 2005 to 24.3 percent in 2025, significantly widening Taizhou's pretransfer deficit.

Even in a supercities scenario, however, financial imbalance should be manageable for China. Because megacities would no longer need financial support, the central government could divert large enough transfers to non-megacities to almost cover budgetary gaps in these urban centers without increasing taxes. In such a situation, although the cities below mega size would run a deficit of 2.2 trillion renminbi, existing transfers to these cities (in the same proportion to GDP) would cover 0.9 trillion of this gap, and transfers redirected from megacities would amount to 1 trillion (Exhibit 5.16). Efficient public administration and other urban productivity measures could close the remaining 300 billion renminbi deficit.

Exhibit 5.16

In a supercities scenario, megacities would have no deficits—releasing resources to smaller cities



* Costs rise rapidly (9.7 percent per annum), but GDP rises even faster (10.2 percent per annum), allowing deficit reduction.

** Numbers do not sum due to rounding.

*** Transit/utility costs rise quickly at >15 percent per annum, and health care and administration spending rises 9 percent per annum, driven by rising input costs and GDP rising by 7.5 percent per annum.

Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

NATIONAL POLICY MAKERS CAN SHIFT CHINA TOWARD CONCENTRATED URBANIZATION

It is clear that shifting the trajectory of China's urbanization away from the current trend will require a transition to a new emphasis at the level of central government. Indeed, China is already showing some signs of refocusing. If we look at some recent trends, whether it's around the establishment of Chongqing as an independent municipality, the strategic siting of infrastructure, the development of a highway grid, the replacement of refineries or steel mills, or the drafting of strategic plans at cluster level, we do see the central government beginning to act in a way that suggests that policy makers now believe that the dispersed model of urbanization that has relied on the unleashing of local entrepreneurism has run its course and that China now needs a more strategic, concentrated form of urban development. There are signs that China's leadership is beginning to analyze which geographies would profit most from rapid urban growth, and which less so.

Central government can act as a catalyst to the development of a particular shape of urbanization and make a decisive difference in how urbanization plays out in China. The areas where relevant policy action can make a decisive difference in the shape of urbanization include:

- **Infrastructure investment.** The pattern of transport and other network infrastructure plays a major role in the distribution of growth and therefore in the overall shape of urbanization. Government can promote the development of a highway grid or a road system focused on megacities and/or hubs. Likewise, the strategic siting of heavy infrastructure such as refineries and ports, and the development of national educational institutions can make a big difference to regional economic development.

- **Preferential political treatment.** The central government has the option of determining different levels of local autonomy for cities to encourage a certain urbanization outcome. For instance, government could choose to grant more megacities municipality status, thus giving them more freedom to set their own development policies. The recent establishment of Chongqing as a directly reporting municipality is an example of this. Or the government could encourage certain cities that are already in close proximity to each other to coalesce into larger metropolitan areas within a single political unit. The downside of such policies is that they may introduce unhelpful distortions (for example, leaving behind some cities in the peripheries); as such, they would need careful monitoring to avoid unwanted risks.

- **Financial pressure.** Establishing national standards for the provision of services to all segments of the population, including low-cost housing and education for migrants, in and of itself will place a significant financial burden on smaller cities. Combined with the requirement that cities maintain balanced budgets, in effect this would make it challenging for smaller cities to pursue aggressive labor-intensive growth policies.

- **Land policy.** Greater enforcement and tighter restrictions on further acquisition of land by cities would have a greater impact on slowing growth in less-developed urban centers—most of which depend heavily on land sales to fund urban development—therefore channeling growth to larger ones while preserving arable land.

- **Incentives for China's city officials.** The current system explicitly promotes city-level GDP growth with the effect of favoring dispersed urbanization and its related inefficiencies. Changes to today's framework of incentives are difficult, and China would have to calibrate any reformulation effectively. Nonetheless, they are possible. For instance, to enhance the viable development of a predominantly hub-and-spoke scenario, it would be crucial to ensure that incentives took into the performance of each existing hub-and-spoke system in order to encourage the necessary intercity cooperation as well as the performance of individual cities.

CONCENTRATED URBANIZATION WOULD HAVE DISTINCT ADVANTAGES—BUT GOVERNANCE WOULD BE A CHALLENGE

Concentrated urbanization would have distinct advantages, not just in terms of its delivery of higher economic growth, but also in the effectiveness of its overall response to the serious strains that higher growth entails. Yet, this form of urbanization would also have distinct and urgent management challenges.

Hub-and-spoke clusters would have economic benefits but also downsides. To make these urban economic clusters develop into cohesive and efficient units, it would be necessary to clarify governance relationships among city governments within the cluster, because the quality of cooperation would determine the success or otherwise of the cluster. As several clusters spill over provincial boundaries as they expand, the role of provinces in city governance would be less clear. China would therefore urgently need to address issues for the unit as a whole, which raises the question of what "cluster" governance should look like. Depending on the size and scope of that government, the relationship between national government and city clusters would likely evolve.

In supercities, the challenge of delivering public services to populations of such size would give rise to big-city issues of management, delegation, and control in areas such as school districting, public health provision, and disaster management. Potential supercities would need to learn closely from the experience—and best practice—of cities such as Beijing and Shanghai in such areas. The sheer scale of governing very large cities means that China would need to deploy the best talent its public sector has to offer to the megacities of today—and the supercities of tomorrow.

Whether or not China's national government chooses to shift the trajectory of urbanization to a more concentrated urbanization pattern, there is much that city leaders can do to make their governance more effective and to boost the efficiency of urban expansion. In the next chapter, we flesh out an urban productivity agenda that city mayors can implement regardless of urban shape.

6. An urban productivity agenda for city leaders

China's dramatic urban expansion presents unprecedented managerial challenges. The addition of another 350 million to urban populations by 2025, of which 240 million will be migrants from the countryside, could push cities to a breaking point. We have described the pressure that urban China could see on natural resources including energy and water; the depletion of arable land; environmental degradation including urban sprawl, pollution, and congestion; labor market imbalances and skills shortages; and the social and financial pressures of incorporating huge floating populations into the fabric of city life.

Rather than addressing each of these problems individually, China should think of them as facets of a larger underlying challenge: how to increase "urban productivity" in order to create more livable cities while mitigating the intensifying pressures of urban expansion and simultaneously guaranteeing economic growth. In the previous chapter, we highlighted how a move toward concentrated urbanization would enhance city productivity overall. However, regardless of the urbanization scenario, it is possible to encourage the adoption of an urban productivity agenda for local governments—as we have established, the main actors driving urbanization in China. A national shift toward concentrated urbanization would alleviate some pressures, but many serious challenges would remain that would require cities to ensure the long-term sustainability of their urban development.

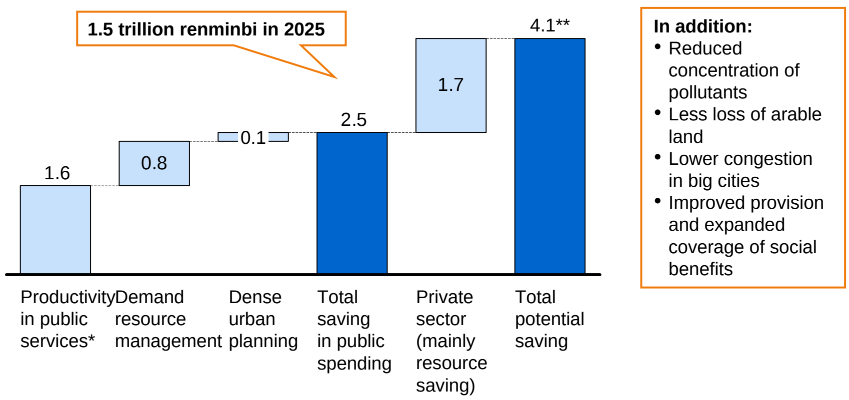
A program of boosting urban productivity, engaged in by both the private and public sectors, is necessary to move China away from the current focus on maximizing GDP growth in China's cities at any cost—with the inefficiencies, duplication, and strains that this has produced and will continue to produce—toward an approach that seeks to maximize the quality and efficiency of urbanization. The prime objective would be to incentivize the efficient use of inputs such as energy, water, and land; focus cities on matching sufficient skilled labor to higher-value-added activities; and improve the provision of public services. Urban productivity initiatives have the potential to reduce future funding pressures, producing outcomes that are both cost-effective and beneficial to the overall quality of urban life.

MGI estimates that, if China were to move in this direction, the opportunities would be substantial (Exhibit 6.1). Independent of the shape of urbanization, China would cut its public spending requirement by 2.5 percent of its GDP, amounting to 1.5 trillion renminbi a year in 2025; reduce SO_2 and NO_x emissions by upward of 35 percent; and halve its water pollution. In addition, savings from the private sector could produce benefits equivalent to 1.7 percent of GDP in 2025, mainly via reduced consumption of natural resources.

Exhibit 6.1

Urban productivity initiatives would reduce costs and increase quality of life

Reduction in urbanization costs
% of 2025 urban GDP



* Productivity gains in service delivery (9 percent of costs) and lean government administration (20 percent of 2025 projection).
** Numbers do not add due to rounding.
Source: National Bureau of Statistics; Construction, Labor, and Finance Yearbooks; McKinsey Global Institute analysis

China is in a privileged position to implement this set of initiatives. Cities have funds, strong power to implement effective policies, and the opportunity to adopt a greenfield approach to urbanization given that a great part of their growth and development is yet to come.

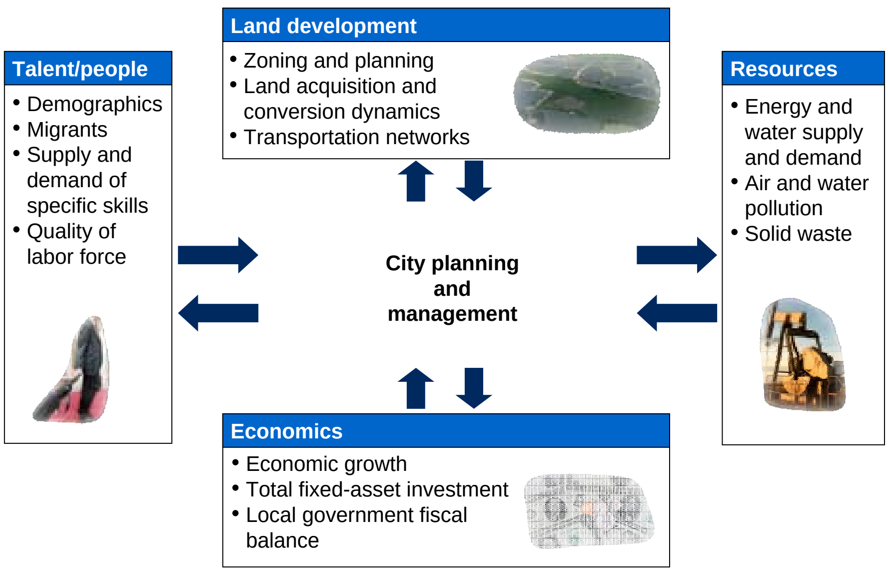
Some cities are already pioneering effective urban productivity policies. There is a major opportunity to expand, replicate, and coordinate these policies, as well as to measure their performance. If cities were to implement urban productivity policies across the board in a market as large as urban China, they would open up unprecedented opportunities for innovation in areas such as energy conservation, water recycling, and clean technology. Central government could aim to act as an "enabler" and "distributor" of city best practices, encouraging pilots and, subject to local conditions, aggressively promoting other cities' take-up of new solutions. By doing so, national government could help ensure that the broad swath of urban China, rather than only a few vanguard cities, adopts urban productivity measures.

In this chapter, we show how city mayors can pursue an effective urban productivity agenda at the local level across four major areas: dense land development; management of demand, rather than just supply, of resources; investment in labor and skills; and the enhancement of public-sector efficiency (Exhibit 6.2). Each of these cut across a host of the issues we identified in our assessment up to now. It is important to emphasize that a number of our recommendations are already in practice in cities in China. We have consolidated them and here describe examples of several existing experiments, placing them in the context of both Chinese and international best practices that are worthy of emulation by other cities.

Exhibit 6.2

A local urban productivity agenda would address the "four pillars of urbanization"

CONCEPTUAL



Source: Interviews; literature search; McKinsey Global Institute analysis

1. PLAN FOR INTEGRATED, DENSE DEVELOPMENT

The freedom that China's cities have had to acquire land—and subsequently sell it for development—has played a major part in enabling China to fund and build its urban infrastructure at such a rapid pace. Yet aggressive land acquisition has also caused horizontal development—urban sprawl—and the depletion of arable land. In the years ahead, China has the option of building denser, more productive cities. It is preferable that they pursue this aim within the framework of a comprehensive strategic land-development plan that, for instance, develops integrated, mixed-use areas and maximizes the effectiveness of transport infrastructure. Denser cities tend to produce lower demand for energy—in transportation, density can cut energy demand by up to 20 percent, or four quadrillion British thermal units (QBTUs) of energy savings per year. To promote dense development, cities can consider the following:

- **Strategically plan height as well as zoning.** New York City has long used floor-area ratios (FARs) to regulate building height, encouraging taller buildings and therefore density around key transportation nodes (Exhibit 6.3). Many Chinese cities instead set FARs on an ad hoc, project-by-project basis. This creates inefficiencies including the location of buildings on the outskirts of cities that are much bigger than those in the center and that do not enjoy optimal connections with the main city transportation systems. The increased, systematic use of FARs would help overcome such inefficiencies and major difficulties in implementing mass-transit solutions, which would help to mitigate congestion.

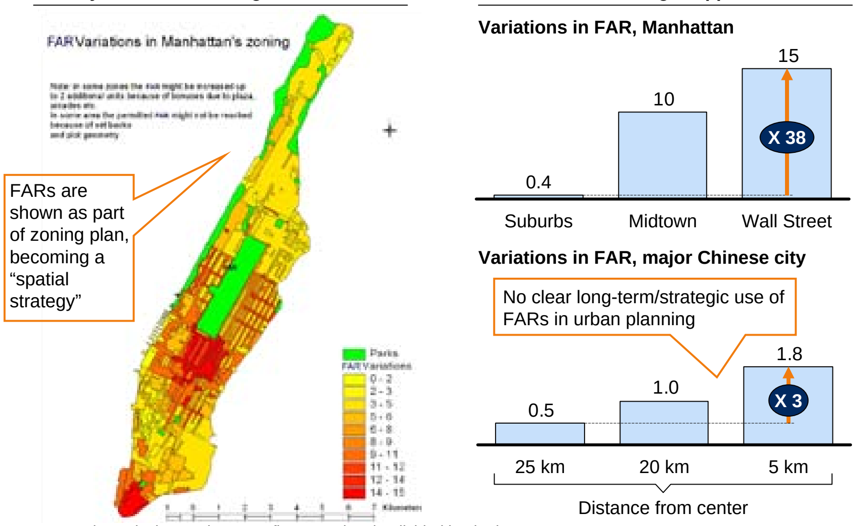
Exhibit 6.3

Smart use of floor-area ratios (FARs) in urban planning is a "no-regret" move

EXAMPLE

Integrating FARs* in strategic plans is a key tool in structuring cities

Chinese cities are typically following an ad hoc, not strategic, approach



* FAR is equivalent to the gross floor area in a lot divided by the lot area.
Source: Alain Bertaud, *Urbanization in China: Land use efficiency issues*; McKinsey Global Institute analysis

- **Plan for transit-oriented development (TOD).** Rather than planning mass-transit systems, bus routes, traffic lanes, zoning, and densities in isolation, cities could wrap these together into integrated plans, designing development around transit routes and thus allowing for efficient traffic flow and public-transport options. At the same time, cities can, around these nodes, promote self-sufficient and dense zones with housing, shopping, work, and entertainment all within a single area (e.g., the Roppongi Hills development in Tokyo). Such development has proved to be the most successful at cutting vehicle miles traveled, reaping the efficiency benefits of density.[47] Moreover, this type of urban planning has proved very popular with the high-quality talent that modern cities require. TOD if combined with the provision of clean-power electric vehicles would require cities to build power grids for transport. Doing so would be a prerequisite for any attempt to reduce demand for conventionally fueled vehicles.

- **Implement holistic anticongestion policies.** It is vital that cities tackle congestion, not just because it compromises quality of life in general terms, but also because it prolongs the time people spend traveling to and from work and therefore impacts labor productivity. If cities deal successfully with congestion, regression studies show that there is a productivity upside of 10 to 15 percent for each doubling of population. Shanghai has put in place a multipronged program to tackle congestion, including a license bidding system to control car ownership. The city plans to ban motorcycles in the urban center, control the share of taxis to 1 percent of all traffic, expand public transport to more than 25 percent of total transport use, and build a city and nine towns in the suburbs to spread economic activity out of the urban center. MGI's research finds that, even if all these initiatives are successful, Shanghai's traffic could outstrip its road capacity three times by 2025 without further policy action. As Shanghai develops into a city with more than 20 million inhabitants, city leaders need to implement even more aggressive measures. Shanghai could explore some ideas from other cities that are facing the same problems, such as restricting peak-hour car traffic; imposing further limits of up to 20 percent on car ownership through license control; adopting a more aggressive shift toward public transport, particularly rail; and taking more action to "get people out of the city" into satellite towns. All these initiatives combined could reduce congestion to manageable levels (Exhibit 6.4). Further policies that cities could consider—which Singapore has implemented successfully—include a vehicle quota system, allowing

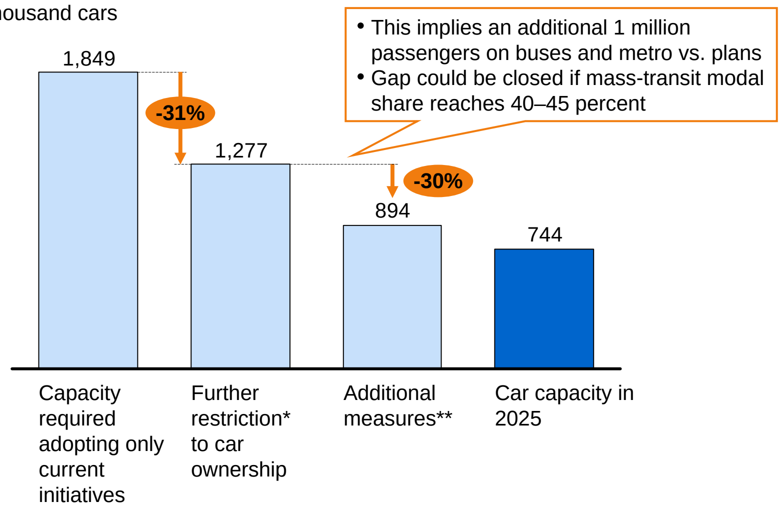
47 Christopher B. Leinberger, *Footloose and fancy free: A field survey of walkable urban places in the top 30 U.S. metropolitan areas*, Metropolitan Policy Program at Brookings, 2007.

the government to control the number of cars on the roads; vehicle taxes; electronic road pricing; and the use of a congestion charge. In addition, cities need to address the "soft" elements of the "hard" infrastructure, such as ensuring widespread adoption of subway travel, even among low-income consumers who display extreme price sensitivity, through, for instance, specific pricing schemes and education programs.

Exhibit 6.4

Current anticongestion measures in supercities are only a first step to making congestion manageable

Road requirement in city proper
2025, thousand cars



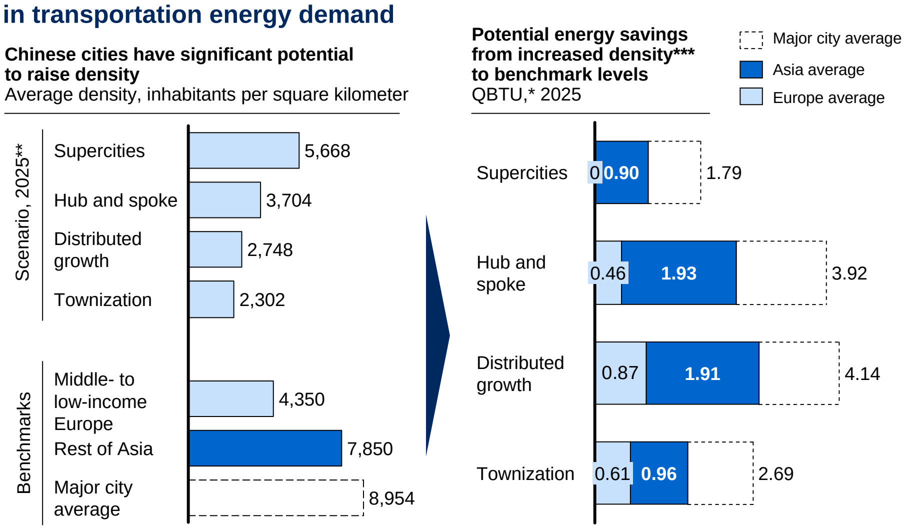
* At ownership growth assumed to be 80 percent of trend levels.
** For example, electronic road pricing.
Source: Shanghai Statistical Yearbook; McKinsey Global Institute analysis

- **Allocate zoning usage in the early stages of city development.** Given the rapid physical growth of Chinese cities, advanced urban planning is crucial. While every city has an urban-planning bureau, our case-city visits revealed that, particularly in the early stage of growth, the pursuit of growth often compromises urban planning. An example is the tendency to site industrial land in the city center. In the past, cities could change such planning decisions at a later stage by shifting the location of factories, for instance. However, given the growing size of cities, a narrowing supply of land, and rising wages, this approach may soon become uncompetitive. But if cities plan industrial zones rationally far in advance of city expansion, siting infrastructure strategically, they can institute long-term planning without compromising short-term growth. Similarly, the restriction of land in the city center exclusively to commercial and residential uses can actually facilitate the transition to services and higher-value growth. In the medium to long term, such a strategy is likely to boost growth more than the immediate benefits of a single factory.

If urban China were to promote denser development coupled with the smart deployment of transportation systems, the benefits would flow not only in the form of a better quality of life in the urban environment but also with "hard" impacts, such as deep cuts in transportation energy demand (Exhibit 6.5). International studies have shown that driving declines by between 20 and 30 percent for every doubling of residential density. Given the fact that the average density of the largest cities in China will be below that of other large Asian cities across scenarios, there is significant potential for further savings. Moreover, denser, better-planned cities are known to have higher concentrations of knowledge workers and are therefore more competitive in higher-value-added services (e.g., San Francisco, New York), although we have not quantified the potential effect on GDP.

Exhibit 6.5

Promoting increased density of development could cut up to 4 QBTUs* in transportation energy demand



* Quadrillion British thermal units.
** Of cities eligible for mass-transit construction (i.e., such that vehicle alternatives exist).
*** Net of increased energy demand due to rising steel production for denser construction; for cities with mass transit.
Source: Literature search; McKinsey Global Institute Global Energy Demand Model; McKinsey Global Institute analysis

In the long term, Chinese cities and the central government will need to settle some big debates involving painful trade-offs in the area of land policy. For example, what mix of quotas and pricing mechanisms should cities use to restrict inefficient land conversion? In effect, the "greenbelt" that surrounds London acts as a quota system that has protected the countryside but driven up housing prices in the city. An alternative that China is discussing is a pricing mechanism such as a flat land tax across the nation. The effects of such a tax would be wide ranging and require much more detailed investigation.

2. MANAGE DEMAND FOR, NOT JUST SUPPLY OF, RESOURCES

Cities could manage demand for resources rather than simply focusing on building the supply infrastructure needed to keep pace with demand. For example, boosting energy productivity—the level of output we achieve from the energy we consume—is largely a "pain-free," measurable, "low-hanging-fruit" option. China's cities would generate positive returns from future energy savings, freeing up resources for investment elsewhere.[48] Urban China has the opportunity to abate energy demand growth by 30 QBTUs, including the potential to reduce oil demand by just over four million barrels of oil per day. In tandem, China would be able to cut urban water demand by close to 40 percent by 2025.

Chinese cities have a major opportunity to boost energy productivity

MGI estimates that if urban China were to capture the full opportunity that is available—using available technologies with an internal rate of return of 10 percent or more—it would reduce urban energy demand growth from between 3.8 and 4.4 percent to between 2.4 and 3.1 percent.[49] The opportunity to abate energy demand growth varies modestly among scenarios from 20 to 22 percent. The lowest remaining potential—at 20 percent—is in a supercities scenario in which the denser urban planning of concentrated urbanization would offer slightly less scope to obtain gains from lower transit use (i.e., some of the "smart-growth" savings would already have been captured by the shift to concentrated urbanization). Across scenarios, the largest source of energy productivity comes in industrial sectors with an opportunity to cut 2025 energy demand by 11 percent. In power generation, urban China could cut 2025 energy demand by 2 percent by mandating the highest-efficiency plants. In the residential sector, another 5 percent could be shaved off 2025 demand through tightening efficiency standards in heating and cooling, improving the efficiency of appliances, and reducing the intensity of lighting.

48 For a full analysis of energy productivity and the investment needed to capture available opportunities globally, see *Curbing global energy demand growth: The energy productivity opportunity*, McKinsey Global Institute, May 2007; and *The case for investing in energy productivity*, McKinsey Global Institute, February 2008 (www.mckinsey.com/mgi).

49 For a full analysis of the abatement opportunity in China nationally, see *Leapfrogging to higher energy productivity*, McKinsey Global Institute, July 2007 (www.mckinsey.com/mgi).

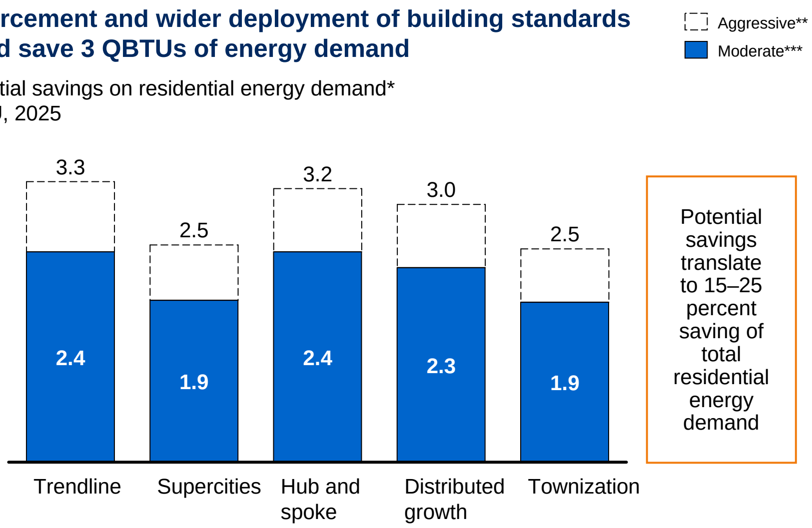
To reap the full benefits of higher energy productivity, standards and incentive programs backed up by rigorous national-level monitoring and enforcement will be important, together with effective policies and implementation at the local level. These are the major opportunities:

- **Defining and tightening building standards.** China has already begun to take the initiative on building standards, but these still lag some way behind international benchmarks, and, in any case, the implementation of existing standards in China has not been universal.[50] MGI finds that consistent enforcement of building standards and their wider deployment could abate 3 QBTUs of energy demand in 2025 (Exhibit 6.6). China will need to overcome several barriers to the adoption of building standards including a lack of skilled labor, an undersupply of the necessary technology, a lack of energy-efficiency awareness among consumers that leads to inertia about implementing higher efficiency, and a lack of financial incentives.

Exhibit 6.6

Enforcement and wider deployment of building standards could save 3 QBTUs of energy demand

Potential savings on residential energy demand*
QBTU, 2025



* Assuming universal implementation in new stock built from 2010–25.
** Assuming on average 70 percent of households are converted (based on current build shell standards).
*** Assuming on average 50 percent of households are converted from lower to higher efficiency.
Source: Joe Huang Yu, Siwei Lang, John Hogan, and Haiyan Lin, *An energy standard for residential buildings in South China*, Lawrence Berkeley National Laboratory; press search; McKinsey Global Institute analysis

50 Joe Huang Yu, Siwei Lang, John Hogan, and Haiyan Lin, *An energy standard for residential buildings in South China*, Lawrence Berkeley National Laboratory, July 1, 2003 (http://repositories.cdlib.org/lbnl/LBNL-53217).

- **Adopting higher-efficiency appliances.** Urban China could abate another 1 QBTUs of energy a year with the aggressive adoption of more energy-efficient appliances including air conditioners and refrigerators and the reduction of standby power requirements of many small appliances (for example, standby power use on a TV set in China is set at 3 watts compared with 1 watt in Australia). Both through national frameworks and local regulations, China could target annual efficiency increases of close to the 4.7 percent achieved by Japan's "top runner" program. Regulatory intervention will be necessary because investment in higher efficiency in many appliances has very long payback times in some of China's largest cities. However, the international evidence shows that economies of scale in the production of higher-efficiency technology quickly make such appliances economic.

- **Stepping up conversion to more efficient lighting systems.** China has already instituted an aggressive drive to convert to compact fluorescent lighting (CFL) that involves the setting of business standards—although these remain voluntary in residential buildings—as well as a certification system for high-quality CFL bulbs and financial support for conversion including bulk purchasing. China today produces 1.7 billion CFL bulbs a year. However, MGI finds that, given the high numbers of new buildings China is constructing, making residential codes mandatory could deliver substantial further energy savings of up to 3 QBTUs. Further, urban China could use its huge scale to accelerate the development of even higher-efficiency and safer (given concerns about mercury in CFL) light-emitting-diode (LED) lighting.

- **Converting to "clean" public fleets and favoring electric vehicles (EV).** The huge expansion of public vehicle fleets in China offers a substantial opportunity to abate energy demand through clean technology. An aggressive replacement program—taxis running half-and-half on CNG and hybrid, official fleets being converted in full to hybrid, and buses running on a mixture of fuels—would reduce urban transportation energy demand by some 1.4 QBTUs to 1.6 QBTUs by 2025. Some Chinese cities are already leading the way; Chengdu, for instance, is aggressively converting its fleets to CNG. At the same time, cities could aggressively boost their use of EV to achieve a drastic reduction in energy consumption and carbon emissions. Large cities can afford to build power grids designed for charging EVs and plan capacity sufficient to power these.

- **Deploying smart grid/metering and higher tariffs.** While local governments often do not directly control the choice of generating technology for their city—with independent power producers and national regulators typically making such choices—city policy makers can use incentives to affect these decisions and improve energy productivity. Electricity prices are low in many Chinese cities, and increasing them would incentivize greater efficiency in end use.[51] By utilizing smart metering, the political difficulty of raising prices can be modified somewhat by introducing flexible pricing schemes—e.g., with unit prices rising with volume—to protect low-income consumers. Smart metering would also be an effective way to charge in real time, differentiating pricing according to electricity sources and therefore spurring investment in smart grids and cleaner energy sources. Even without the widespread installation of smart meters, a phased and targeted approach to tariff increases could significantly reduce end-use demand for electricity.

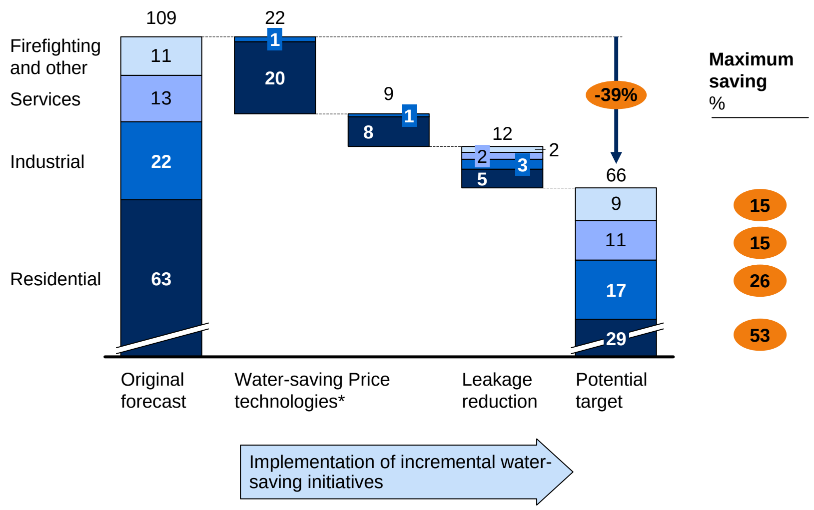
Major scope exists to boost water efficiency

China has significant potential to use its water resources more efficiently and create savings in all urbanization scenarios. Our research indicates that, even on moderate assumptions, China could abate overall urban demand by some 39 percent through targeted water-saving measures and action to plug leakages (Exhibit 6.7).

Exhibit 6.7

China could abate urban water demand by ~40 percent

Composition of urban water demand under different water-saving scenarios
Billion m^3, 2025



Note: Numbers may not sum due to rounding.
* For example, toilet retrofitting for residential facilities, increase of water-reuse ratio for industrial facilities.
Source: McKinsey Global Institute analysis

51 *Curbing global energy demand growth: The energy productivity opportunity*, McKinsey Global Institute, May 2007 (www.mckinsey.com/mgi).

The biggest savings are potentially available in the residential sector, where we estimate that China could more than halve demand through both using water-saving devices and plugging leakage. Although China's industrial water-use intensity has been improving between 2001 and 2005 at 15 percent a year, and service-sector intensity at 9 percent per annum, there is scope to do even better. Even were China to meet its goals of continuous 9 percent per annum improvement until 2025, its water-use intensity would still be three times that of the United States today. Greater industrial water reuse and efforts to plug leakage could reduce urban industrial demand by 26 percent under the trend (i.e., above and beyond meeting China's existing efficiency targets).

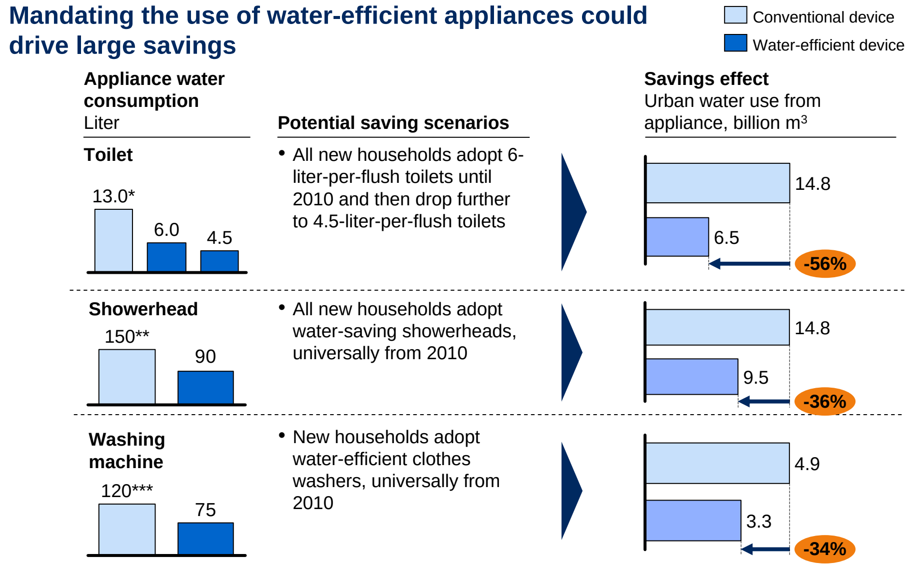
A range of policies would not only deliver large water savings but also open up new markets for businesses offering solutions:

- **Mandating the adoption of water-efficient appliances.** If households adopted low-water-use toilets alongside water-saving showerheads and water-efficient clothes washers (Exhibit 6.8), urban China would secure water savings of up to 32 percent of domestic use. China has already put regulations in place to switch to higher-efficiency toilets, but these are not universally enforced, and other categories of water-efficient devices are not economic investments for private consumers. A staggered increase in the price of water would incentivize the purchase of water-saving devices that would reduce the payback time on their investment. For some appliances (e.g., washing machines), the government may have to mandate manufacturers to introduce new technologies to ensure that scale effects reduce the price and make them economically viable—as for other energy-efficient appliances.

- **Boosting water reuse in industry.** Industrial water use is almost inelastic to changes in pricing, and therefore the most effective way to save industrial water use is to enhance the water-reuse ratio. The water recycling rate increased by 40 percent between 2000 and 2004 and could climb further for water-intensive industries. However, there is not much potential left given that China's reuse rate is already relatively high at 75 percent (Exhibit 6.9). If technical advances were to boost that ratio to 80 percent over the next 20 years, China could reduce consumption by high-usage industries by 18 percent and overall urban industrial water use by 7 percent.

Exhibit 6.8

Mandating the use of water-efficient appliances could drive large savings

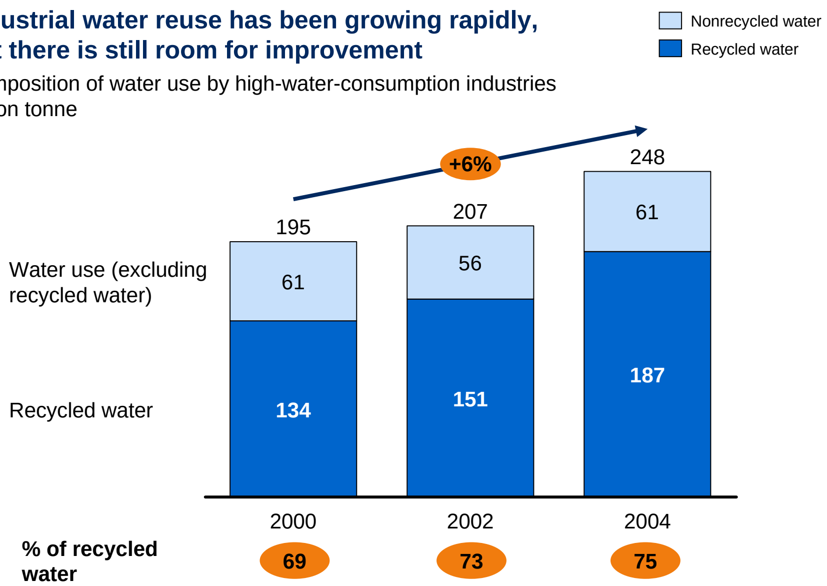


* Liter per flush.
** Liter per time, assume 15-minute shower.
*** Liter per cycle.
Source: Literature search; McKinsey Global Institute analysis

Exhibit 6.9

Industrial water reuse has been growing rapidly, but there is still room for improvement

Composition of water use by high-water-consumption industries
Billion tonne



Source: CEIC Data; McKinsey Global Institute analysis

- **Reducing leakage.** Unpublished estimates suggest that leakage from China's water-supply system could be as much as double the official estimate of 20 percent, compared with an international average of between 8 and 12 percent. If China were to revamp the water-supply system to cut leakage to 15 percent, the country could save substantially on this scarce resource. MGI research indicates that operational changes can be as effective as heavy investment in pipelines and infrastructure and be less costly as well. Changes to incentives and the organization of detection and repair teams can soon lead to rapid improvements in leakage rates.

- **Increasing total water reuse.** Particularly in more developed cities, water-cleaning technologies have advanced to the stage at which domestic water can be treated to leave it cleaner even than source water. Such technology could in effect make cities water-neutral (100 percent recycling). Such an approach has proved to be politically controversial, given emotional public perceptions, but there have been successful examples: Singapore introduced it as "new water," which could supply the country with 10 percent of its water needs.[52] China should explore this option, particularly in critically water-short regions.

- **Introducing staggered water-price tariffs.** Water in China is as much as three times cheaper as a percentage of income than it is in other countries, and because the amount households spend on water is insignificant as a share of income except at the bottom of the income distribution, demand is fairly inelastic to small changes in price. As Chinese incomes rise, water is set to become relatively even cheaper. Cities could introduce staggered water-price tariffs, with exemptions at certain value levels for low-income consumers, with aggressive increases that would cross the "price sensitivity" threshold in order to influence demand. Tianjin, for instance, has started moving in this direction. However, cities may also have to impose quotas on water consumption given international evidence that even aggressive price increases, on their own, reduce demand only in the short term.

Standards and technology won't work without economic incentives

Standards and technology will likely be ineffective—particularly in such a large and diverse country—without strong economic incentives and enforcement mechanisms. China has rolled out new, "clean" technologies to tackle pollution, including flue-gas desulfurization (FGD) to reduce SO_2 and electrostatic precipitators

52 "Singapore opens largest recycle water plant," *People's Daily* Online, March 15, 2007 (http://english.peopledaily.com.cn/200703/15/eng20070315_358011.html).

to control industrial gas. However, the utilization of such technologies remains low due to a lack of financial incentives and a poor supporting "ecosystem" (e.g., skilled professionals to install and maintain equipment).

China's control and monitoring methodology is limited, covering only six pollutants (compared with 189 in the United States). China's emission levy system is also limited to primary pollutants from medium and large emitters. Some 180 mid- to large-sized Chinese cities are now implementing air-quality monitoring, but there are doubts about the reliability of data. Going forward, China will need not only a serious effort to increase efficiency but also further action on tightening standards and requiring technology upgrades, emulating international best practice such as Japan's evolving regulations on river-water quality and widely applied cap-and-trade program and emissions fees and taxes in the United States. China has started to move in this direction through the recent creation of the Ministry of the Environment, enhancing the powers of the previous State Environmental Protection Agency.

National action will be necessary in some respects, but city governments can rapidly implement "smart-growth" pilots, as some cities are already doing. For instance, with the help from a government subsidy, Shenyang has catalyzed the replacement of conventional heating systems with heat pumps in the city center, achieving an annual cut in coal use of 120,000 tonnes and major cuts in local SO_2 emissions. By mandating the use of solar energy for heating and lighting and providing a subsidy for the adoption of solar technology, the city of Rizhao has secured annual savings of almost 10,000 renminbi per heater. Chengdu has aggressively rolled out a taxi and bus fleet that runs on CNG. Many of these "smart-growth" antipollution actions have been at a marginal cost and have not therefore compromised economic growth in these cities. Here are some key areas for action:

- **Boosting scrubber technology installation and usage.** MGI estimates that China could cut SO_2 emissions by 27 percent by ensuring that all new power plants not only install flue-gas desulphurization scrubber technology but continually utilize it. Power generation currently accounts for 69 percent of industrially generated SO_2 but "cleans" only 16 percent of its emissions. Moreover, current estimates suggest that only 60 percent of plants with FGD installed are actually using it, with the remainder often claiming subsidies as if they were using scrubbers. Local enforcement needs to improve to ensure that government pays subsidies only for the actual use of this technology. Some cities have already scored success. Dalian has achieved annual emissions reductions of 20,000 tonnes of SO_2 by helping to fund the installation of FGD technology, monitoring its usage, and increasing the efficiency of combustion through latest-technology boilers in local plants. The National Development and Reform Commission (NDRC) has indicated that it will start requiring the installation of real-time monitoring equipment on new power plants, a policy that should be implemented as soon as possible. Such steps could potentially also be reinforced by charging for environmental impact/damage through, for instance, the real-time monitoring and pricing of industrial waste gas or wastewater emissions.

- **Pushing local alternative fuel sources in cities.** Cities could explore incentivizing the use of alternative fuels and subsidizing the switch away from older, more polluting technologies. This is not virgin territory for China. Since the early 1990s, Dalian, for example, has been developing combined heat and power cogeneration and central heating programs to replace coal-fired low-capacity boilers for domestic heat. Cities could also explore local alternative energy sources, such as utilizing energy given off in other processes that today is lost (i.e., waste heat), or production of biofuels.[53] For example, Huainan has started capturing the methane given off by local coal mining and using it to heat local homes in a bid to address the city's severe pollution.

- **Implementing aggressive antipollution policies in transportation.** China could bring even supercities to a target Level III air quality standard (China's "safety level") through a combination of increased density, expanded public-transit provision, the conversion of public fleets to clean technology, the support for electric vehicles, congestion measures such as restricting vehicle ownership, and the implementation and enforcement of emissions standards. The latter will be the crucial measure in efforts to control transport-related pollutants. Our analysis of Shenzhen shows that tightened emission standards, smart spatial development, congestion-control measures, and fleet conversion could cut NO_x concentrations by 90 percent (Exhibit 6.10). The conversion of public fleets to alternative fuel technologies may not, in some cases, appear to be clearly economic; however, investments in such conversions may well become strong business propositions when energy savings combine with

53 China has launched a pilot ethanol program in five cities in central and northeastern regions. They are Zhengzhou, Luoyang, and Nanyang in Henan Province, and Harbin and Zhaodong in Heilongjiang Province. In 2004 this pilot program was extended to seven additional provinces. See Christoph Frei, Edgard Gnansounou, and Hans B. Püttgen, *Sustainable biofuels program*, White Paper, Energy Center, École Polytechnique Fédérale de Lausanne, College du Management De La Technologie, November 7, 2006 (http://cgse.epfl.ch/webdav/site/cgse/shared/Biofuels/White%20Paper_ForWebsite.pdf).

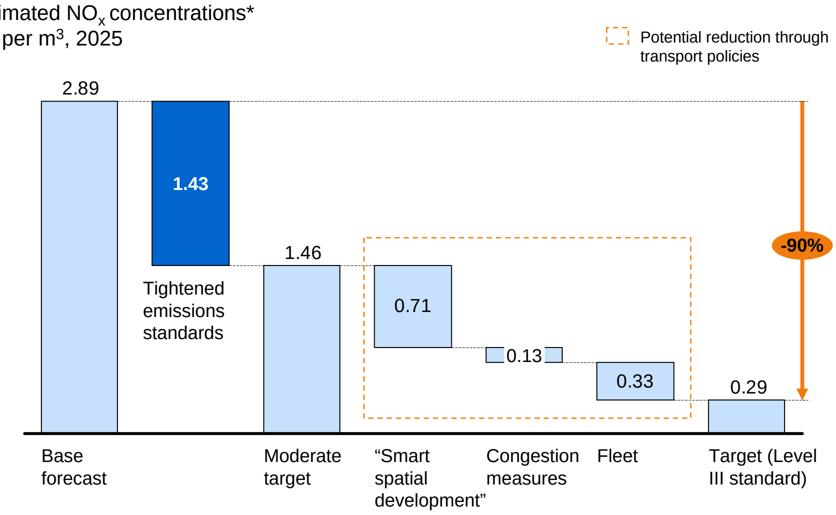
their impact on pollution. Because of severe NO_x problems in a supercities scenario, fuel-cell buses could become relevant despite the fact that the energy savings that these would secure would miss the bar to justify the investments on a purely economic basis under all energy-price scenarios.

Exhibit 6.10

Aggressive transport policies and emission standards could mitigate supercities' air-quality issues

SHENZHEN EXAMPLE

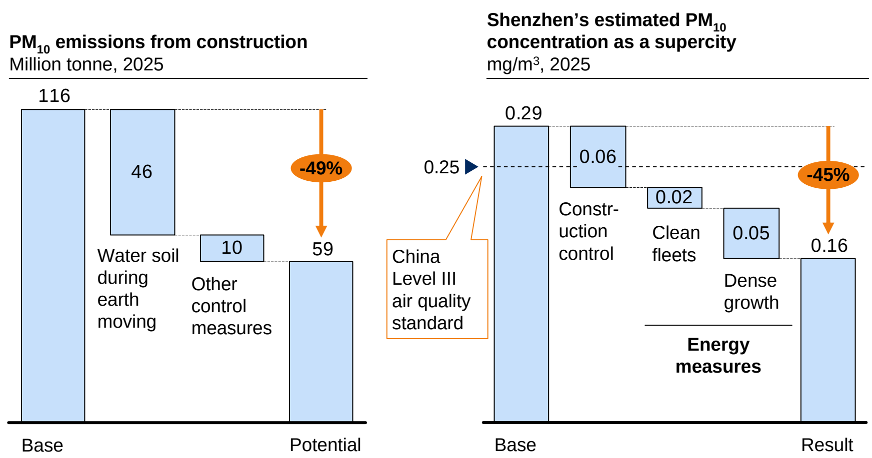
Estimated NO_x concentrations*
mg per m^3, 2025



* Assuming a constant concentration factor; includes only transportation-related measures; further potential may exist in, e.g., NO_x scrubbers on power plants in addition to SO_2 scrubbers.
Source: Literature search; McKinsey Global Institute analysis

Exhibit 6.11

Measures in construction can cut PM10 significantly and help bring megacity pollution under control



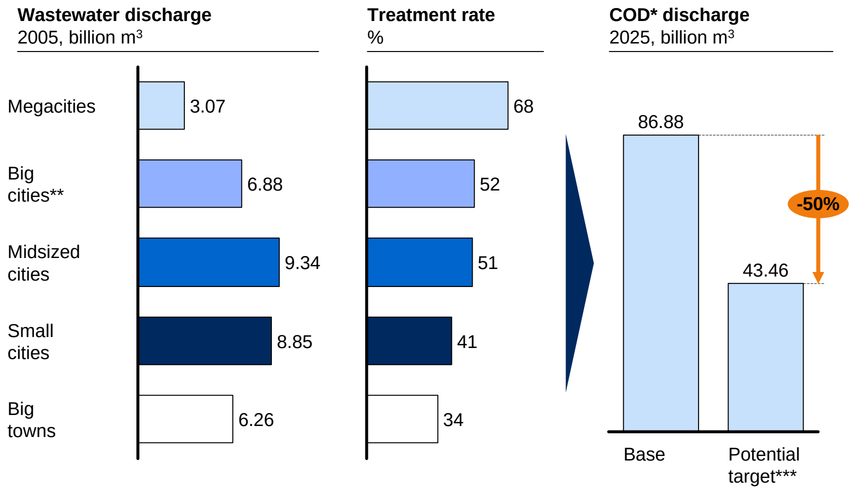
Note: Numbers may not sum due to rounding.
Source: Midwest Research Institute; McKinsey Global Institute analysis

- **Implementing advance control measures in construction.** China can reduce PM_{10} emissions from the construction industry by nearly 50 percent through advanced control methods including watering soil during earth moving (Exhibit 6.11). Requiring minimum soil moisture of 12 percent for earth moving alone would cut emissions of this pollutant by 40 percent; watering soil after a demolition is completed and prohibiting demolition when wind speeds exceed 25 miles per hour would cut emissions by 7 percent; and applying dust suppressants such as polymer emulsion would cut emissions by another 5 percent. Together with other policy actions including the conversion to clean fleets and dense spatial development, MGI analysis finds that the city of Shenzhen, for instance, could cut PM_{10} emissions by 45 percent. However, regulation and education may not be enough to prompt widespread adoption of such measures without some form of economic incentives. Cities could, for example, charge a standard fee for all construction sites, waived if advanced measures can be proved to have taken place.

- **Driving toward a higher wastewater-treatment target.** Wastewater-treatment rates are as low as 41 percent in China's small cities, and there is potential to reduce water pollutants by 22 percent in smaller cities and towns simply by upgrading—or putting in place—wastewater-treatment infrastructure (Exhibit 6.12). An estimated 240 big towns and small cities have no wastewater-treatment facility at all. Water pollution could become very serious, particularly in townization, if this situation were to continue. However, by targeting a 75 percent wastewater-treatment rate, China's cities could achieve a 50 percent reduction in the discharge of water pollutants. To achieve this target, urban China would need to increase discharge fees, possibly by four times, and put in place incentives, in the form of both subsidies and fines, to increase the utilization of treatment facilities. Changes in enforcement mechanisms and the governance of institutions including China's state environment agency will also likely be necessary.

Exhibit 6.12

Deployment of wastewater-treatment infrastructure and enforcement could net dramatic discharge cuts



* Chemical Oxygen Demand.
** Excluding Dongguan, as extreme outlier (9 percent reported treatment rate).
*** With flat treatment rate of 75 percent.
Source: Interview; China wastewater-treatment plants compilation; McKinsey Global Institute analysis

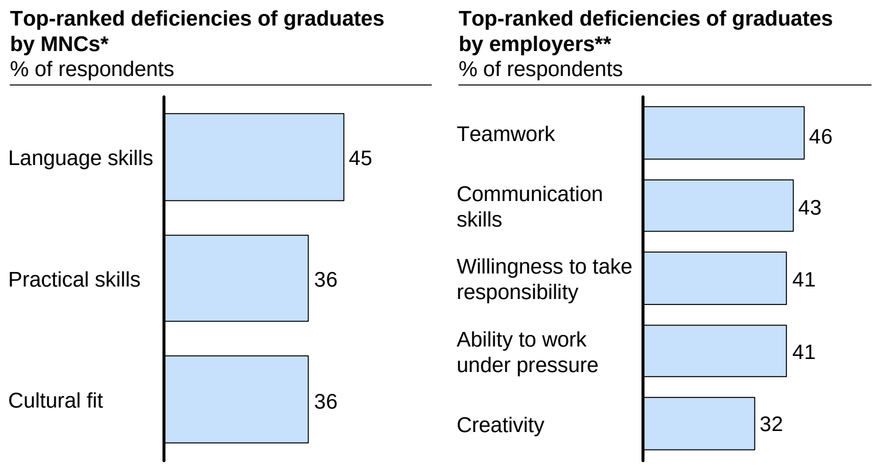
3. INVEST IN LABOR AND SKILLS DEVELOPMENT

In addition to guaranteeing a sufficient supply of labor overall, all cities need to increase the quality of labor in order to maximize their economic output through a gradual shift toward value-added economic activities. Attracting and retaining talent after graduation is a major challenge, particularly for smaller urban centers. China is in the throes of debating long-term reform to its national-level educational system. However, there is substantial scope for local-level initiatives to raise the quality of graduates. It will be important to shift from the current system of measuring performance that emphasizes quantity of inputs (e.g., enrollment numbers) to one that measures attainment (e.g., the employment rate of graduates in those professions that a city may need the most) and therefore encourages improvements in overall quality. Even more broadly, cities should complement such a shift with systems to measure and improve the labor productivity of their workers. Some key policy initiatives might include:

- **Encouraging local collaboration.** Current trends suggest that in 2025 the big-city talent market will be a recipe for inequality, with a large number of underemployed graduates and a small number of high-skilled graduates commanding very high salaries. Long-term decisions about the educational system are probably necessary. However, in the short term, there are several no-regrets moves that China's cities can make to tackle the quality issues repeatedly pointed out by local and foreign employers alike (Exhibit 6.13). These include forging partnerships between local colleges and companies to boost practical experience, providing internships, and encouraging more teamwork in classes. For example, city governments could collaborate with local companies to set up joint vocational training centers, where tertiary education and company training happen side-by-side (this is already happening in Nanjing, for example). This would not only give graduates a skill set better tuned to local needs, but it would also allow them to interact continuously with real-world practitioners of their discipline.

Exhibit 6.13

There are several commonly recognized deficiencies in China's graduate pool



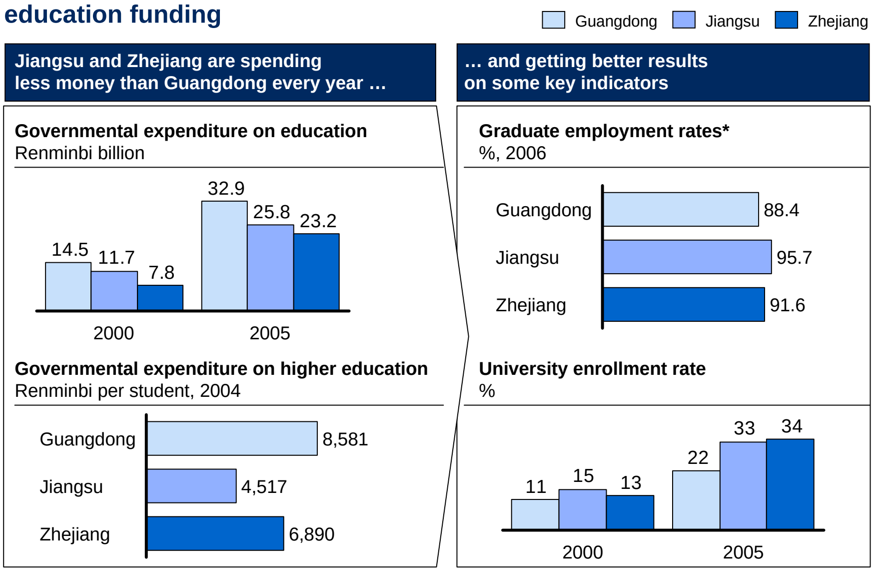
* Based on a survey conducted by McKinsey among German HR managers in multinational corporations (MNCs)
** Based on a survey conducted by Beihang University among 250 interviewees from employers in 2005.
Source: Diana Farrell and Andrew J. Grant, "China's looming talent shortage," *The McKinsey Quarterly*, 2005, No. 4, pp. 70–79

- **Investing more resources in educational "software."** At the start of 2007, central government announced a 2.5 billion renminbi special allocation to improve graduate quality from 2006 to 2010. The focus of this program appears largely to be on educational "hardware" such as textbooks and institutions. An alternative would be to invest in educational "software" in a large-scale project to investigate and disseminate best-practice teaching methods. Individual cities could further push local institutions to compete for funds and thereby innovate substantially.

- **Emulating best practice in increasing education funding efficiency.** The broad range of Chinese cities, in conjunction with the private sector, has an opportunity to replicate successful initiatives that are already appearing in some cities and provinces (Exhibit 6.14). Jiangsu Province has launched an education modernization program, including both hardware and software approaches, and has conducted regular performance reviews; productivity has increased as a result. Zhejiang has encouraged private capital to invest in education with the result that funding has been more efficient, strains have eased, and there has been an "intensive" improvement in quality. Graduate employment rates are higher in Zhejiang than Guangdong, despite the latter having a higher per capita GDP. In short, both Jiangsu and Zhejiang are spending less money with better results in terms of graduate employment rates. Encouraging the active engagement of the private sector will be a key effort in Chinese cities more broadly. In conjunction with provincial and city governments, a number of Chinese and multinational companies have instituted internship and training programs at the city level, aimed at raising graduate quality.

Exhibit 6.14

Some provinces have begun to improve the efficiency of education funding



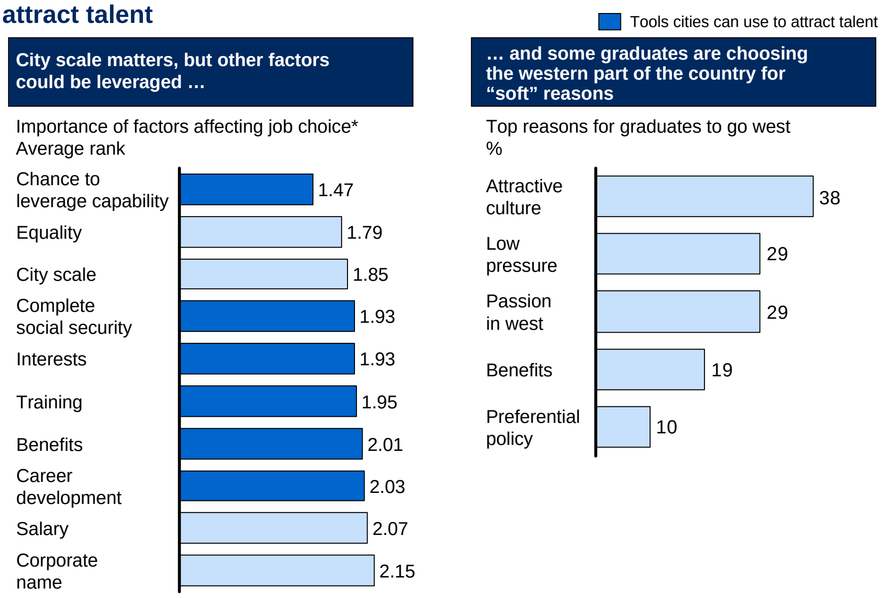
* Only for undergraduates.

Source: Interviews; literature search; local statistical yearbooks; local bureaus of education; McKinsey Global Institute analysis

- **Leveraging tailored packages to attract talent to less developed areas.** MGI's analysis finds that "pulling" in necessary talent is less risky than "pushing" talent from oversupplied to undersupplied areas through mandatory instruments such as postgraduation allocation and using the *Hukou* system. Many midsized and small cities—notably in the west of China—have been effective in attracting skilled workers through lifestyle and benefit packages that offer graduates greater flexibility by, for example, allowing them to settle in the city before finding a job (Exhibit 6.15). Jinan, for instance, has a liberal policy of granting college graduates *Hukou* status. In addition, central government has begun to offer postgraduate stipends and help with paying off student loans to graduates prepared to work in the western part of the country for a short period.

Exhibit 6.15

Less developed areas can leverage “alternative” packages to attract talent



* Based on a 2005 survey conducted by Shanghai Jiaotong University among 3,948 graduates.
Source: Shanghai Jiaotong University; literature search; McKinsey Global Institute analysis

4. ENHANCE PUBLIC-SECTOR PRODUCTIVITY

Enhancing the productivity of China’s public-service provision and general administration is a vital and measurable opportunity that could generate savings worth up to 1.6 percent of GDP by 2025, which China could use elsewhere. For example, boosting public-sector productivity could close the deficits of smaller cities “left behind” in concentrated urbanization scenarios. Wuhan is one Chinese city that is piloting a progressive and transparent performance-management system designed to promote public-sector productivity. The city has implemented a broader set of performance measures for government entities that reward the reduction of energy consumption or the design of more environmentally friendly economic-development policies. Each unit within the municipal government is assigned targets across a range of measures (from economic growth to administrative efficiency). These measures are then suitably weighted against each other, and an independent agency audits the results;

units are differentiated across five performance ranks. Since implementing such policies, Wuhan has reduced its energy consumption per unit of GDP by 4.5 percent compared with the nationwide average of around 3 percent, cut administrative red tape in half, and boosted GDP growth to 15.5 percent from the average 13 percent growth of previous years. Other Chinese cities need to emulate such efforts, and key policy areas for action might include:

- **Boosting the productivity of health care provision.** An effort in this area will be crucial given that health provision could account for 20 percent of overall public-funding growth to 2025. There is a case for fundamental national health care reform, but cities can take short-term measures to boost productivity that could yield savings of some 9 percent of health care spending. There is potential for cities to raise the utilization of primary care (today such facilities operate at only 50 percent of their capacity compared with close to 100 percent for some clinics in Europe) simultaneously taking the pressure off specialized and general hospitals (with utilization of up to 95 percent) through differentiated co-payment on the basis of patient incomes, for instance. Cities could redesign the incentive system in hospitals by reducing length of stay by up to 20 percent to match international benchmarks. Cities could also secure major savings through prevention—reducing the cost of obesity alone would drop annual health care costs by up to 3 billion renminbi. Some cities are already taking positive steps in key areas:

  — **Encouraging primary care.** Jiangsu has established more than 1,800 primary care clinics covering almost 100 percent of residents in the southern province and 60 percent in the remainder. In Shanghai, nearly 200 centers and more than 422 stations provide primary care for common diseases and 80 percent of chronic diseases.

  — **Improving basic productivity.** Beijing has introduced convenience clinics to reduce outpatient waiting times. Shanghai gives 10 percent of disease-prevention subsidies to doctors and institutions to incentivize distribution.

  — **Extending social coverage.** Chongqing's pioneering rural cooperative medical scheme instituted in 2003 now covers 77 percent of farmers. he participation rate in basic medical insurance in the Qingpu district of Shanghai has reached almost 100 percent.

  — **Boosting health care prevention.** Urban areas of Shaoxing in Zhejiang Province offer five free annual health care checks to women.

- **Increasing public-sector efficiency.** General administration is by far the largest component of urban public spending at 46 percent of Government spending in 2005. The salary bill accounts for 80 percent of costs. On the basis of McKinsey's international experience, which demonstrates that lean techniques can improve the productivity of administrative personnel in the public sector by 30 percent and lead times by a factor of seven, MGI estimates that there is an opportunity to reduce government administration costs by 21 percent while maintaining the same or higher levels of delivery. One way that cities can help to achieve such a reduction is by restructuring work flows to eliminate duplication and automating repetitive tasks.[54] While applying this recipe in developed economies often results in painful layoffs in the government agencies, in China such action would allow the possibility of absorbing new urban residents without commensurate proportional increments in government staff—and guarantee improved provision of social services.

- **Shifting the infrastructure financing mix.** China could cut its cost of capital by changing the mix of its financing of infrastructure construction. Today equity accounts for two-thirds of the total and loans for the other one-third. If cities were to move to a more even split among equity, loans, and bonds, they could cut their cost of capital by between 1 and 2 percent. At the same time, smaller cities could take a number of steps to overcome today's barriers to capital inflows. For instance, they could invite participation from experienced Chinese and foreign infrastructure investors and operators and "buy in" planning and development skills. To attract such outside expertise and capital, cities would have to be more transparent and grant greater protection and flexibility to investors—for example, in determining ticket fares on mass-transit systems.

Over the long term, both local and central governments will need to tackle some significant structural challenges. Foremost among these will be the social security system and, in particular, pensions. Today the system is highly decentralized—a feature almost unique to China—with each city controlling and managing funds. Restrictive rules have kept returns on these funds very low—below inflation for many years. Moreover, the collection and disbursement rules on these funds make them fiscally unsustainable in the long term, risking city governments having to step into replenish funds if necessary and central government providing funds as a last resort.[55] If China were to embrace reform in this area in order to close these deficits, there would be a reduction of benefits at current returns. However,

54 Nina Bhatia and John Drew, "Applying lean production to the public sector," *The McKinsey Quarterly*, June 2006 (www.mckinseyquarterly.com).

55 Yvonne Sin, *China: Pension liabilities and reform options for old age insurance*, World Bank, May 2005.

if reform increased returns by, say, centralizing these funds and gaining benefits from scale effects, China could sustainably maintain benefits at current levels.

An even larger issue that will likely become subject to serious debate in China is the overall structure of the tax and transfer system, with questions raised about the fiscal flexibility of local government and the division in revenues between central and local authority. Although, as we have shown, the financial pressures of urbanization can, and should, be addressed through concentrated urbanization and a local urban productivity agenda, over the very long term the right changes to these structures could to a large degree address these pressures at their roots.

Last, but not least in level of importance, as local governments travel the urbanization journey toward enhancing productivity gains, city leaders need to implement tools to make "internal change" happen unambiguously. To guarantee effective implementation, a structured turnaround process should be put in place at the local level to incentivize key productivity initiatives and monitor their execution. China already has a few best-practice examples of such implementation (e.g., Wuhan, Shanghai). Both cities underwent diagnostic phases that identified issues in public-sector performance and then implemented performance-management systems that prioritized key initiatives to be undertaken, as well as spelling out a clear set of key performance indicators to measure whether or not targets were being met.

* * * * *

Through policy direction and incentives, China's central government can do much to influence how urbanization plays out in China. But while Beijing plays an important role in guiding the overall direction of urbanization at the national level, it is city leaders who make many of the key decisions that shape the path and pace of urbanization. Those cities that are already successfully executing an urban productivity agenda can be at the forefront of China's growth. For the long-term sustainability of China's new urban economy, it is vital that the broad swath of China's cities, rather than a farsighted few, adopt an urban productivity agenda that maximizes the efficiency of China's urbanization and minimizes the strains that it imposes.

If China's cities succeed in this, the People's Republic can ensure its stature as a rapidly growing and developing economic power that is following a sustainable path toward long-term prosperity. The change of emphasis from "growth at all costs" to growth with high productivity is crucial and urgent.

Glossary of terms

Census regional area

This definition includes all counties within the jurisdiction of a city. It tends to overestimate urbanization because vast stretches of countryside lying officially within a city's jurisdiction count as urban.

Census total area

This definition measures the population in the urban center coupled with people living in those areas—metropolitan or suburban—immediately surrounding the prefecture or provincial city. It covers the residential committees and village committees in city districts and county cities.

Census urban area

This definition captures the urban population at the city center, specifically the city districts of the prefecture or provincial city and the urbanized area in county cities. MGI believes that this measure alone would tend to underestimate urbanization somewhat. The same would hold true if New York counted only the population of Manhattan as urban, as opposed to including those living in the metropolitan area surrounding New York City with obvious economic connections to the urban center.

Distributed urbanization scenario

This urbanization shape is somewhat similar to a continuation of today's urban growth pattern but with a heightened emphasis on midsized cities and currently underdeveloped regions. This scenario could see a large number of cities with populations of 1.5 million to 5 million spread throughout China. Today's large and megacities would continue to develop but at a much cooler pace.

Energy productivity

Energy productivity is the level of economic output we achieve from the energy we consume. Like labor or capital productivity, energy productivity measures the output and quality of goods and services generated with a given set of inputs. MGI measures energy productivity as the ratio of value added to energy inputs, which is $79 billion of GDP per quadrillion British thermal units (QBTUs) of energy inputs globally. Energy productivity is the inverse of the energy intensity of GDP, measured as a ratio of energy inputs to GDP. This currently stands at 12,600 BTUs of energy consumed per dollar of output globally. Energy productivity provides an overarching framework for understanding the evolving relationships between energy demand and economic growth. Higher energy productivity can be achieved either by raising energy efficiency that reduces the energy consumed to produce the same level of energy services (e.g., a more efficient bulb produces the same light output for less energy input), or by increasing the quantity or quality of economic output produced by the same level of energy services (e.g., providing higher-value-added services in the same office building).

Five-Year Plan

Five-Year Plans are a crucial part of China's national economic development planning. These plans include major economic initiatives (e.g., major national projects, the design of the national economic structure) and decide the long-term goals and direction of economic development.

Floor-area ratio

The floor-area ratio (FAR) is the ratio of the total floor area of buildings in a certain location to the size of the land of that location, or the limit imposed on such a ratio. FARs can be used in zoning to limit the amount of construction in a certain area. For example, if the relevant zoning ordinance permits construction on a parcel, and if construction must adhere to a 0.10 floor-area ratio, then the total area of all floors in all buildings constructed on the parcel must be no more than one-tenth the area of the parcel itself.

Gini coefficient

The Gini coefficient is an internationally recognized measure of statistical dispersion most prominently used as a measure of inequality of income distribution or inequality of wealth distribution. We are aware that its use is sometimes controversial but have used it in this report as an indicator of trends in urban inequality.

Great Western Development Strategy

While coastal areas of eastern China made huge economic strides during the 1980s, western regions lagged behind. For this reason, then leader Zhu Rongji launched the Great Western Development Strategy in 2000 to help the west catch up. The emphasis was on developing infrastructure, including transportation links, telecommunications, and energy; attracting foreign direct investment; promoting education; and taking action to retain talent that was flowing to richer provinces.

Hub-and-spoke cluster

A hub-and-spoke cluster is a demographic and economic concentrated region consisting of a group of cities with different characteristics and scales but with geographic proximity and close economic linkages. It relies on one or several hub cities as the economic center(s); a number of spoke cities are located around the hubs.

Hub-and-spoke scenario

This model comprises city clusters with one or two cities playing the central "hub" role and with several neighboring city "spokes" closely linked to the hub(s) through well-developed transportation connections and, more important, very deep economic ties. South Korea, for instance, has a well-established cluster system around Seoul. In the United States, Arizona is at the heart of a high-tech and biotech cluster, and Orlando, Florida, is the focal point of an entertainment-based cluster. Many cities in the Benelux form a cluster around Antwerp, with its world-scale port as the focal hub.

China already has some major hub-and-spoke systems—the Yangtze River Delta centered on Shanghai, and the Pearl River Delta centered on Shenzhen, Hong Kong, and Guangzhou. Hub and spoke is a plausible intermediate urbanization shape representing a conceptual midpoint between dispersal across the country into midsized cities and concentration in a small number of supercities. Our simulation of a hub-and-spoke model would see a strong development of 11 urban "networks" of cities, linked by strong economic ties, with an average population of 27 million today and up to 60 million by 2025. These 11 clusters would together account for almost three-quarters of the urban population. Three of the clusters in this scenario would have populations of almost 100 million people in 2025, ranking them among the world's top 15 "countries" in terms of population. As of today, all 11 clusters have already conceptualized plans to operate in a coordinated manner, in some cases cutting across provincial lines, but most of them are still far from the level of integration of the Yangtze River Delta and Pearl River Delta clusters.

Hukou

This is China's household registration system, embodied in the Household Registration Regulation of the People's Republic, which identifies a person as a resident of a particular area. China issues "internal passports" to families, a *Hukou* booklet that records information about its members. Until 1980, when the system was relaxed to an extent, people were required to stay in the neighborhood in which they were born and, while they could travel, the system did not permit them to move to seek employment, educational opportunities, or better public services. Nor could they qualify for coupons (*Liangpiao*) for food or receive treatment in a hospital or clinic other than in their designated *Hukou*.

Land area

For our purposes, a city's land area corresponds to MGI's urban population measure. Land areas change due to annexations of surrounding countryside to accommodate urban expansion.

Level III air quality standard

China has three levels of ambient air quality standards for areas with different functions. The Level III standard is used for special industrial zones and is based on the density of SO_2, TSP, PM_{10}, NO_x, NO_2, CO, O_3, Pb, B(a)P, and F. For example, the Level III air quality standard requires daily levels of NO_x to be no greater than 0.15 mg/m^3.

Megacity

A megacity is a city with a population of 10 million or more.

MGI's urban population definition

This comprises the population located in a census total area, plus the urbanized area in counties screened by MGI using the NBS urban area definition.

Midsized city

A midsized city is an urban center with a population of between 1.5 million and 5 million people.

Municipality

A municipality is an administrative entity composed of a clearly defined territory and its population and commonly denotes a city, town, or village, or a small grouping of them. A city or municipal council typically governs a municipality. The notion of municipality includes townships but is not restricted to them. A municipality is a general-purpose district, as opposed to a special-purpose district.

National Bureau of Statistics (NBS) urban area

The NBS definition includes the urbanized area in city districts of prefectural and provincial cities, the urbanized area in county cities, the urbanized area in counties, and residential committees in city districts and counties.

Net migration ratio

This is the ratio of the net migration population to the total city urban population.

New city

These are counties that satisfy NBS city criteria (population, industry mix, economic development, and infrastructure) but that the NBS did not define officially as cities after 2000. The number of new cities is growing as China urbanizes. MGI discovered 9 such counties that qualified as new cities between 2000 and 2005 and estimates that a further 81 new cities will emerge between 2006 and 2025.

Official city

There are 663 official cities in China, including 271 prefectural cities and 392 county cities, defined by NBS according to national classification standards of administrative areas in 2000.

Peak pollution

This refers to the extreme concentration of pollutants (air or water) that can be measured during peak times in particular locations—for example, air pollutants emitted at busy crossroads during rush hour in big cities.

Population dependency ratio

This is the ratio of dependents to the total population from ages 15 to 64. The number of dependents is those people ages 0 to 14 and those ages 65 and above. The total dependency ratio is calculated as follows: the number of dependents/population ages 15 to 64 × 100 percent.

Prefecture-level city

A prefecture-level city is an administrative division of the People's Republic of China, ranking below a province and above a county in China's administrative structure. Prefecture-level cities form the second level of the administrative structure (alongside prefectures, leagues, and autonomous prefectures). Since the 1980s, prefecture-level cities have mostly replaced the prefecture administrative unit.

Province

A province is an administrative division in China. Together with municipalities, autonomous regions, and special administrative regions, provinces make up the first level (known as the provincial level) of administrative division in China.

QBTUs

QBTUs are quadrillion British thermal units used in the power, steam generation, heating, and air-conditioning industries. 1 QBTU = 1 x 1,015 BTU. A BTU is defined as the amount of heat required to raise the temperature of one pound of liquid water by one degree from 60° to 61° Fahrenheit at a constant pressure of one atmosphere. As is the case with the calorie, several different definitions of the BTU exist, which are based on different water temperatures and therefore vary by up to 0.5 percent.

Shanghai Pudong New Zone (the Zone)

Shanghai Pudong New Zone is a district of Shanghai, China, which enjoys subprovincial administrative status. It is named Pudong because of its location on the east side of the Huangpu River, on the opposite of Puxi, the west side. Since the beginning of its development in 1990 when plans were first announced, Pudong has become a new open economic development zone and has emerged as China's financial and commercial hub. Pudong is home to the Lujiazui Finance and Trade Zone, the Shanghai Stock Exchange, and a skyline that includes the symbolic Oriental Pearl Tower, the Jin Mao Building, and the Shanghai World Financial Centre, reflective of Shanghai and China's rapid economic development.

Size of entry-level workforce

The ratio of population from ages 15 to 24 to the total population at working age from 15 to 64.

Smart growth

Smart growth is an urban planning and transportation theory that suggests concentrating growth in the center of a city to avoid urban sprawl and advocates compact, transit-oriented, walkable, and bicycle-friendly land use, including neighborhood schools, mixed-use development, and a range of housing choices. Smart growth values long-range considerations of sustainability over a short-term focus. Its goals are to achieve a unique sense of community and place; expand the range of transportation, employment, and housing choices; equitably distribute the costs and benefits of development; preserve and enhance natural and cultural resources; and promote public health.

South-North Water Transfer (SNWT) Project

The South-North Water Transfer is a multidecade project being implemented by the People's Republic of China to better utilize water resources available to China. This is to be achieved through a South-North Water Diversion Project. While the main thrust was to divert water from the Yangtze River to the Yellow River and Hai River, other spinoff plans are also loosely included. This is because the heavily industrialized northern China has a much lower rainfall and its rivers are running dry. In recent decades, the Yellow River has often gone dry in its lower reaches, and some of the Hai River tributaries have almost dried out throughout the year. Supply and demand conditions have often changed more rapidly than the project plan's ability to accommodate these developments, resulting in much higher costs and reduced benefits. On the other hand, positive results have been seen in Beijing, host city of the 2008 Olympics.

Special economic zone (SEZ)

Special economic zones in China are cities or even entire provinces that the national government designates for special financial, investment, and trade policy. From the 1980s onward, under China's economic opening and reform policy, Beijing set up the first SEZs in coastal areas of southeast China including Shenzhen, Zhuhai, Shantou in Guangdong Province, Xiamen in eastern China's Fujian Province, and southern China's Hainan Province. In 1984 China opened 14 other coastal cities to overseas investment and from 1985 onward expanded the coastal areas to include, for instance, Hebei Province, which surrounds Beijing and Tianjin; the Shandong peninsula; the Yangtze River Delta; the Xiamen-Zhangzhou-Quanzhou Triangle in southern Fujian Province; the Pearl River Delta; and Guangxi. In 1990 the Chinese government decided to open the Pudong New Zone in Shanghai, as well as more cities in the Yangtze River valley, to overseas investment.

State-owned enterprises (SOEs)

Some 150 corporations in China are unambiguously government-owned and report directly to the central government. However, thousands more companies fall into a gray area, including the subsidiaries of these 150 corporations, companies owned by provincial and municipal governments, and companies that have been partially privatized yet retain the state as a majority or influential shareholder. Since the 1980s, the Chinese government and the ruling party have followed a policy of *zhengqi fenkai*, which formally separates government functions from business operations. The policy has been applied gradually, first to the consumer goods industry, then to high tech and heavy manufacturing, and, more recently, to banking, as officials have attempted to strengthen domestic businesses and the economy to prepare them for unfettered global competition. As a result, government favoritism toward state-owned companies is fading.

Supercities scenario

One of the four urbanization scenarios explored in this report, this pattern of urban expansion is highly concentrated with a small number of truly world-scale megacities with populations of 20 million or more. International examples of supercities include Tokyo, New York, and Mexico City. In this urbanization model, the expansion of midsized cities would decelerate, while smaller cities would halt their development almost entirely. China today has no supercities, although based on current trends, Shanghai and Beijing are well on the way to becoming large enough to be counted as such by 2012.

Supercity

MGI defines a supercity as an urban center with a population of 20 million or more.

Three industries

The "three-industries" industrial structure in China refers to a historical sequence of development. Primary industry refers to extraction of natural resources. Secondary industry involves processing of primary products. Tertiary industry provides services of various kinds for production and consumption. This classification is used worldwide but varies to an extent from country to country.

Townization scenario

In this urbanization shape, MGI assumes a deliberate boost to urban expansion at the grass roots of China with the parallel growth of many small cities with populations of between 500,000 and 1.5 million. Migration is on a reduced scale with many rural counties being "converted" into cities and their economies deliberately developed at a rapid pace. In this scenario, the overall urbanization level would not change from trend, but the number of cities would increase significantly to almost 1,000 (and likely higher after counting new county seats as cities).

Township and village enterprise (TVE) system

TVEs were originally developed as an industrial complement to agricultural production. This scheme provided employment for farmers so that they would not need to migrate to distant cities. TVEs comprised companies that were in partnerships with local governments, collectives, and private entrepreneurs. TVEs first appeared in 1978 and accounted for significant production. At the end of 2004, the TVE sector employed 138.7 million people. However, many TVEs failed to withstand the retrenchment of China's economy in the mid-1990s, and some estimates suggest that some 30 percent of these enterprises went bankrupt.

Unofficial city

These are counties that satisfy the NBS city criteria for population, industry mix, economic development, and infrastructure given as of 1996 (detailed criteria can be sourced on the NBS Web site), but which the NBS does not define as cities. According to the NBS, China had 663 cities in 2005, a large number of which came into being between 1991 and 1996. After 1996, however, there appears to be no increase in the number of Chinese cities in statistical records. We discovered that this halt in the creation of cities was artificial. In 1994 China's central government issued notices to all layers of government indicating that it would henceforth cease to promote counties to cities, a process that it had carried out previously according to a fairly exhaustive list of criteria. By 1997 the State Council had officially mandated this decision and China named no more new cities thereafter. As of 2000, MGI identified 186 counties as unofficial cities, using the same criteria that the Chinese government had used to determine cityhood. We then extended this analysis to 2005 and found that another 9 new cities would have formed. We have therefore boosted the tally of cities considered in this report from the 663 in official records to a total of 858.

Urban productivity

Urban productivity is an innovative approach to growth that shifts the focus of policy makers and businesses from the outputs to the inputs of urbanization. It allows cities to achieve better results with the same or fewer resources, implying better returns out of the urban investments.

Urbanization scenarios (concentrated vs. dispersed)

At the national level, broadly speaking there are four approaches to urbanization that China might choose to pursue. Concentrated urbanization pictures a situation where new urban residents in the next 20 years will tend to flow to cities, which are already very large as of today, and includes two potential patterns: "supercities" and "hub and spoke." Under a supercities scenario, a small number of very large cities—with populations of 20 million or more—could emerge. Under a "hub-and-spoke" scenario, clusters of medium-sized and small cities could develop around larger ones. Dispersed urbanization covers another two quite different approaches: "distributed growth" and "townization." In these scenarios, new urban residents will mainly flow to cities that today are classified as midsized, or even smaller. Under a distributed growth scenario, we could see a large number of cities with populations of 1.5 million to 5 million spread throughout China. Under a townization scenario, many smaller cities—with populations of 500,000 to 1.5 million—could be the model.

Our trendline analysis shows a behavior closely tracking a dispersed pattern of urbanization. Following current trends, China's urbanization will in fact show a pronounced expansion in the number of midsized cities across the country. Although China today has two megacities—Shanghai with a current population of close to 18 million and Beijing with 14.5 million—and a number of prominent hub-and-spoke systems, notably those in the Yangtze River Delta and Pearl River Delta, many midsized cities are growing in parallel and will become more and more relevant in the national landscape. Currently numbering 69, midsized cities, which account for 28 percent of GDP, will grow in number to 115 by 2025, accounting for 34 percent of GDP. The closest international comparisons to the current dispersed urbanization that is taking shape in China are arguably the United States and Germany, both of which have a decentralized, federal power structure.

Urban productivity

Urban productivity is an innovative approach to growth that shifts the focus of policy makers and businesses from the outputs to the inputs of urbanization. It allows cities to achieve better results with the same or fewer resources, implying better returns out of the urban investments.

Volume II

1. City profiles: 14 city case studies

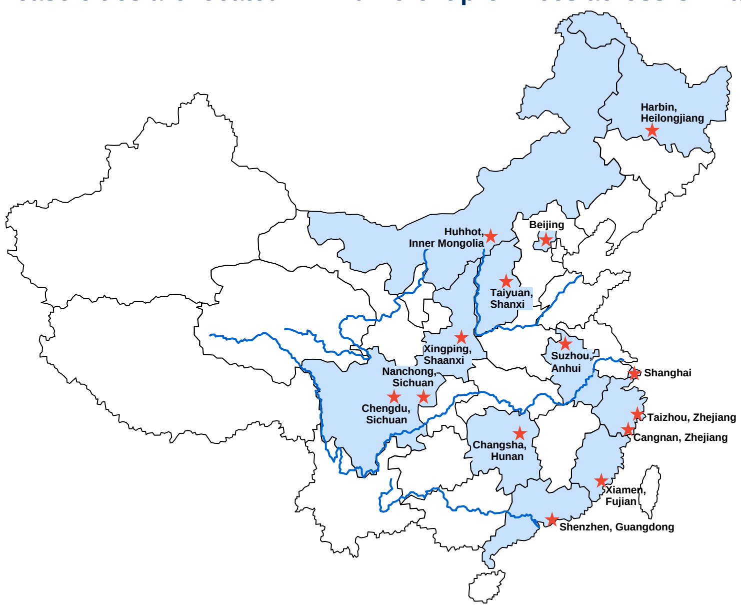
This section of the report provides an individual look at each of our 14 city case studies. Collectively our examinations of how these urban centers are developing on the ground provide the fact base from which we developed the three-horizon framework of urbanization that we described in chapter 3. Each of these 14 cities has its own urbanization story, and it is valuable to understand in some detail how each is handling the process and the particular way in which each is applying a range of policy levers.

We chose these 14 urban centers to represent a broad range of Chinese cities in terms of geographic location, size, and speed of growth. The cities are located in 12 different provinces (Exhibit 1). They have populations ranging from 400,000 to 17 million people (Exhibit 2). The 14 urban centers have a range of per capita GDP from 4,000 renminbi to 51,000 renminbi (Exhibit 3). And finally, these cities have GDP growth rates between 2000 and 2005 ranging from 5 to 30 percent (Exhibit 4).

For each of these cities, we carried out extensive desktop research including an investigation of its recent history; a study of key economic variables including population, GDP, income, trade, investment, the breakdown of local GDP by sector, and employment; and an analysis of data relating to the key benefits and costs of urbanization such as pollution levels, education spending and attainment, health care, density, and water consumption. Having undertaken this exercise, we then sent a small team of professionals to visit each city and conduct a series of interviews with key personnel including city officials, urban planners, academics, local business leaders, and everyday citizens and migrant workers.

Exhibit 1

The 14 case cities are located in 12 different provinces across China

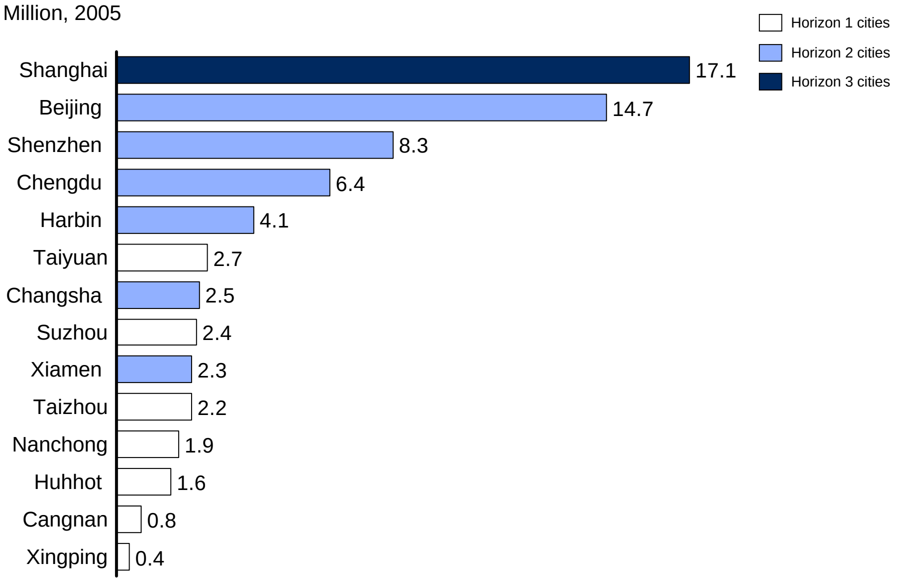


Source: McKinsey Global Institute analysis

Exhibit 2

Populations of the 14 cities range from 400,000 to 17 million

Million, 2005

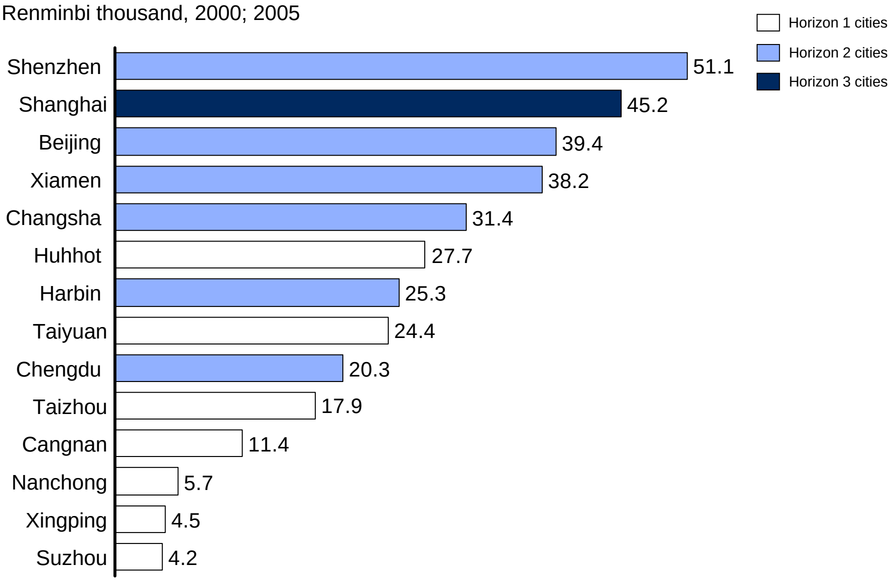


Source: National Bureau of Statistics; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Exhibit 3

Cities' per capita GDP ranges from 4,000 to 51,000 renminbi per year

Renminbi thousand, 2000; 2005

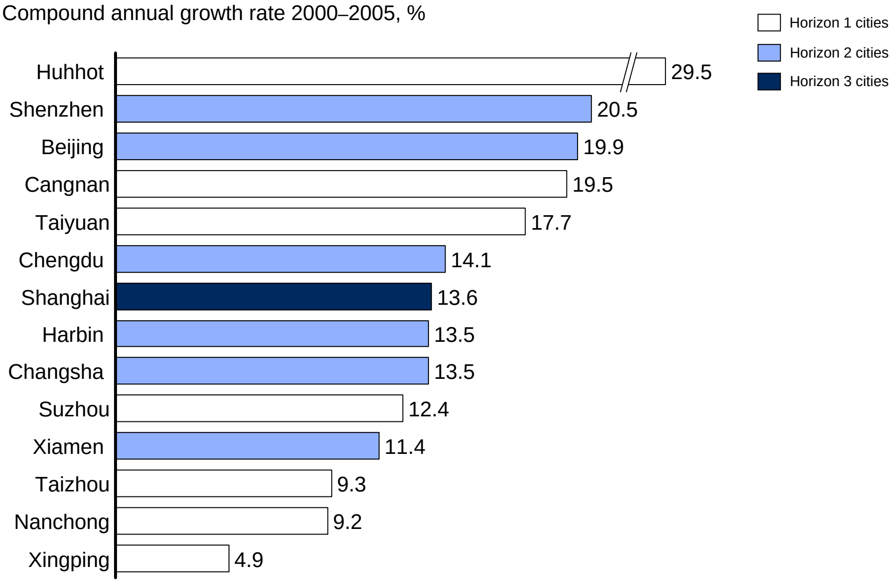


Source: National Bureau of Statistics; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Exhibit 4

The GDP growth rate of the 14 cities ranges from 5 to 30 percent

Compound annual growth rate 2000–2005, %



Source: National Bureau of Statistics; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

This quantitative and qualitative analysis gave us a detailed perspective on how each city is approaching urbanization in a broad sense and how policy choices relate to the seven key levers of urbanization on which we have chosen to focus. We have classified each city on each of these levers—e.g., Beijing is Horizon 2 on land use—and at an aggregate level. To place each city in one of our three horizons, we look at its behavior across the seven levers and use a simple average. However, there is some room for adjustment. For instance, a city cannot be Horizon 3 if it doesn't achieve a certain level of quality of life—the lever that to an extent gives us an overview of the state of a city and reflects the other six levers.

Seven of the cities—Huhhot, Taiyuan, Taizhou, Xingping, Suzhou (Anhui Province), Nanchong, and Cangnan county—fall into Horizon 1; six—Harbin, Changsha, Chengdu, Beijing, Xiamen, and Shenzhen—are Horizon 2. Shanghai is the only city that we classify as Horizon 3.

1. Beijing: Symbol of Chinese urbanization

Beijing has been China's capital since the emergence of the Ming dynasty 800 years ago and was already an established urban center at the time of the Cultural Revolution in the 1950s. In some respects, the city's geography is not ideal—Beijing lies on the North China Plain, which is short of water and plagued by seasonal dust storms, and swings uncomfortably between hot, humid summers and cold, windy winters. But the city makes up for these shortcomings with its beauty and spectacular attractions such as the Great Wall of China, which skirts its northern edge, and the Forbidden City, home for centuries of China's emperors.

Beijing today in many ways epitomizes urban China. Its huge population, urban sprawl, rapid growth, and rising pollution and congestion are the qualities exhibited by many Chinese cities writ large. Although China's capital city displays many characteristics of a truly modern Horizon 3 city, the key pressure points of urbanization including pollution and congestion currently prevent the city from moving beyond Horizon 2.

THE CAPITAL SYMBOLIZES THE BENEFITS AND CHALLENGES OF CHINESE URBANIZATION

As a result of its role as the nation's capital, the government of the People's Republic of China put its premier city at the top of its priority list, allocating significant public resources to building up the city's infrastructure. The government also located many large state-owned enterprises (SOEs) in the city during the post-1949 planned economy, leading to significant job creation and the emergence of a substantial industrial base. Between 1950 and 1980, it was those Chinese cities where large SOEs were located that generally urbanized most quickly, and Beijing was no exception. China's networks of railways and roads splayed out across the country from Beijing at their center. In addition, the government channeled water supplies to the capital from surrounding provinces. By 1980, the city already had a population of five million.

As China opened up to international trade and economic reform, the city's role as the country's capital ensured that it shared fully in the growth that ensued. At that time, Beijing attracted all the industry it could, focused on providing the necessary resources to enable growth, and desired nothing more for its people than to provide jobs to alleviate poverty.

Over the years, however, Beijing conceded the lead role as the nation's economic heart to Shanghai, and we now know the city better as a political, cultural, and educational center. When the central government designated China's original four special economic zones (SEZ) and 14 coastal cities in the southeastern part of the country, the focus of foreign investment and economic growth shifted away from Beijing to those regions.

Nevertheless, Beijing has urbanized quite rapidly over the past 25 years and today is still among the most developed cities in China. Beijing's urban population expanded at a compound annual growth rate (CAGR) of 4 percent over the past 15 years, slower than the average of Chinese cities of 6 percent.[1] But between 2000 and 2005, the city saw annual growth of 14 percent in its per capita GDP, by far surpassing the national average. Even so, Beijing's real per capita GDP of about 39,400 renminbi in 2005 still ranked only 33rd out of China's 663 officially recognized cities and its 186 unofficial cities.

In 2006 Beijing's population stood at an estimated 15.3 million. By 2025, we project that Beijing's population will have reached 27 million people—vaulting it into the supercity category that we characterize as having populations of 20 million or more. At this point, we expect the city's per capita GDP to have risen to about 133,000 renminbi, 15th among all China's cities. Of the 14 representative cities that we have profiled, Beijing was already in the late stages of being a Horizon 2 city in 2005 and remains so today. The question is whether the city will adopt urbanization policies in such a way that it attains Horizon 3 status at the same time as becoming a supercity.

1 All percentages to which we refer from this point and in all the city cases that follow in this section are compound annual growth rates (CAGR). When we discuss urban or metropolitan areas, we use the census total definition in all city cases.

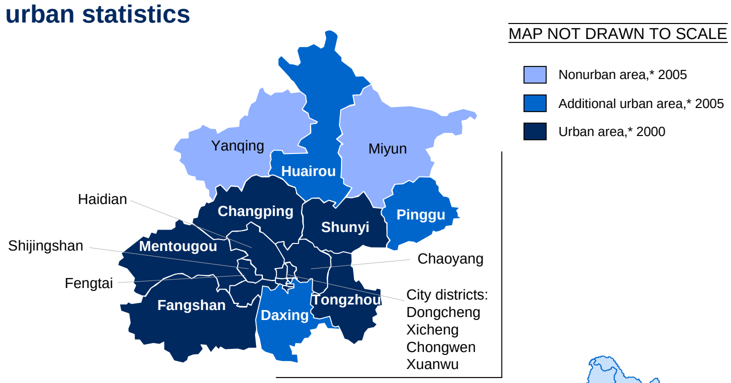
BEIJING WOULD BE A HORIZON 3 CITY BUT FOR QUALITY OF LIFE

Beijing is a fairly advanced Horizon 2 city if we analyze its urbanization using the seven governmental levers that we described in chapter 3 of volume I. Particularly in terms of its industrial policy, its regional and international networks, and its plentiful supply of labor, it behaves as a Horizon 3 city. However, shortcomings in its quality of life prevent the capital from attaining that urbanization milestone.

Land. Beijing's use of land acquisition has certainly shifted from Horizon 1 to Horizon 2 behavior since 1990. In the early part of the past decade, Beijing had aggressively acquired land. Its suburbs radiated out from the center, leading to a near tripling of the metropolitan urban area from 4,568 square kilometers to 12,574 square kilometers (Exhibit 1.1.1). The need to provide more space for new businesses setting up in the city and for migrants to live in initially motivated this expansion. More recently, however, there is not much available land left to develop in the city "proper" or urban area. As a result, real-estate prices have increased dramatically, and today the city is able to sell the land it acquires on the commercial market, netting significant revenues. The actual amount is unpublished, but our research indicates that the proceeds of land sales in our Horizon 2 case cities on average account for 30 percent of local government revenues. On this basis the amount for Beijing could be quite substantial. Similarly, the need to offer businesses incentives has diminished as the city has industrialized and now boasts a desirable combination of an advanced infrastructure and a strategic location (see "Interview with CEO of an international nutrition company"). The fact that the city currently offers relatively modest land discounts of 25 percent to incoming businesses—and even then to a few chosen industries—is evidence that it does not have to compete very hard for companies to locate in the city. This in turn leaves the city free to use its land increasingly as a source of revenues to fund urbanization. However, if the city is to modernize fully and reach Horizon 3 status on this dimension, Beijing would need to use its land more strategically. This would imply optimizing land to promote the city's overall economic development—in other words, increasing green space or entertainment zones to encourage consumption rather than focusing on the short-term advantage of boosting government revenues.

Exhibit 1.1.1

Beijing's vital urban statistics



Vital statistics

	1990	1995	2000	2005	2025
Urban area* km²	4,568	4,568	6,496	12,574	12,574
Urban population Thousand	7,362	8,164	11,510	14,661	26,812
Real GDP/capita Renminbi thousand	11.74	16.38	20.26	39.44	133.10

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; in the case of Beijing, its urban area was updated by the National Bureau of Statistics in 2001.
Source: National Bureau of Statistics; McKinsey Global institute analysis

Interview with CEO of an international nutrition company

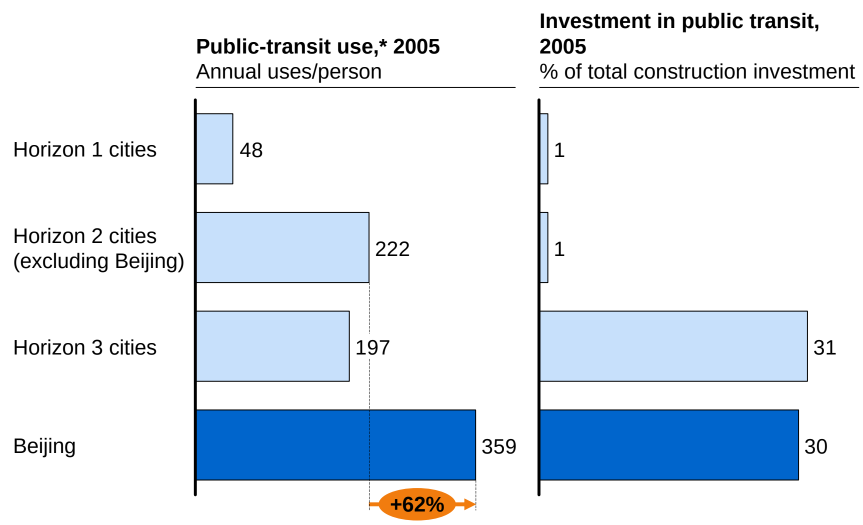
This company first entered the Chinese market in 2005 and chose Beijing as its base. That decision was not without controversy, however—some executives felt that locating in southern China would be preferable because the business environment would be less restricted farther away from the seat of central government. However, the international connectivity of Beijing, its developed infrastructure, and the size of its consumer market helped drive the decision to choose Beijing.

In the short term, the company intends to stay in Beijing, which has the advantage of keeping the company close to central government and therefore abreast of changing policies. In addition, the CEO said that consumers both domestically and abroad generally have more confidence in companies that are located in major cities. However, in the longer term, the company is keeping a close watch on rising labor and land costs; if they continue to rise, the company will consider moving out of Beijing.

Infrastructure. With one of the two most developed subway systems in China and the highest use of public transit of any Chinese city, Beijing has a modern infrastructure by Chinese standards and attains Horizon 3 status on this lever. The city has been spending some 10 percent of its GDP on building the city's infrastructure. Since 2000, the city government has continued to promote basic infrastructure through private-sector investment and development in large projects. The biggest single project is upgrading of the city's subway system, which the city plans to extend to double its length to 600 kilometers by 2020. If we compare Beijing to other international cities, we see that the Chinese capital's land area is 16 times that of New York, but New York's subway is 3.6 times that of Beijing in terms of kilometers as of 2005. In 2005 Beijing dedicated 30 percent of its public-construction budget to the public-transit system including the subway, which is one of the most widely used systems in China (Exhibit 1.1.2). Nevertheless, there is definitely still room for Beijing to develop further in this respect. Although the city's public-transit system is strong by Chinese standards, citizens of Beijing do not use public transportation as much as do their counterparts in other international cities such as Tokyo and Seoul, and this may be contributing to congestion. Continuing to develop its subway system and implementing demand-side restrictions on private-car ownership, for instance, would help further Beijing's infrastructure development.

Exhibit 1.1.2

Beijing's investment in public transport has led to the system being one of the most widely used in China



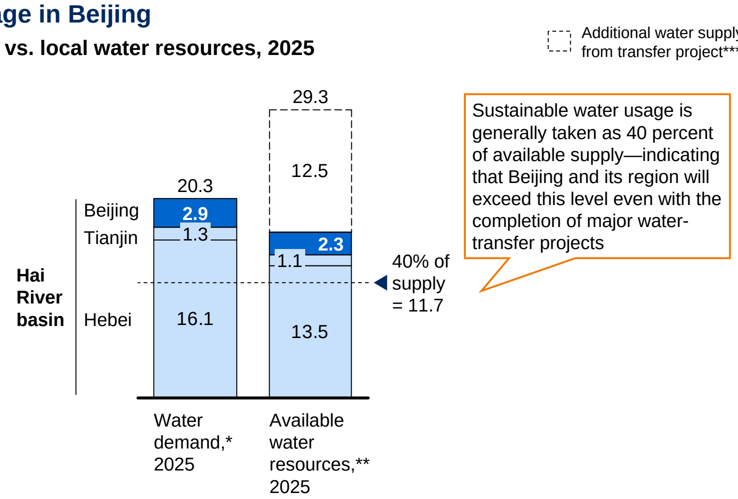
* Public-transit uses include bus and subway.
Source: Field interviews; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; McKinsey Global Institute analysis

The city has experienced the energy resource constraints typical of most Chinese cities in Horizon 2. In terms of water, usage in Beijing, Tianjin, and Hebei—sharing the same river basin—is running close to 100 percent, way above the 40 percent level that the World Bank argues is sustainable. Courtesy of a major project transferring water to the city from sources in the south, Beijing will be able to bring its usage rate below the 100 percent level; without this transfer, the capital would have reached a "supercritical" water shortage. However, even by 2025, when we expect the transfer project to be complete, the three cities' water usage will remain above the 40 percent threshold (Exhibit 1.1.3).

Exhibit 1.1.3

The south-to-north water-transfer project should help ease severe water shortage in Beijing

Water demand vs. local water resources, 2025
Billion m^3



Note: Numbers may not sum due to rounding.
* Estimated water demand is the sum of agricultural and urban water use.
** Local water resources are based on 2005 data.
*** We assume that the south-to-north water-transfer project will be completed by 2025.
Source: China Water Resources Bulletin; McKinsey Global Institute analysis

Urban planning. Beijing is a classic Horizon 2 city in terms of urban planning. In the early stages of its industrialization, the city layout had overlapping residential and industrial zones near the city center. However, as pollution and congestion rose over the past decade, the city went back to the drawing board and initiated "blank-sheet" planning. This involved relocating all heavy industry from the city center to new industrial zones in suburban Beijing—for example, in the Yizhuang economic development zone. Complemented with industrial parks to encourage technology development, the new economic zones are enabling firms to move up the value chain while commercial and residential use now dominates the city center. Thus far, however, the city has skewed development to the northern areas of the city while southern areas remain underdeveloped. Every district is still thinking in terms of maximizing its own advantage rather than thinking about what would benefit the city as a whole. In order to shift its urban planning to Horizon 3, Beijing would have to use concepts of sustainable development, such as increasing green space, implementing building height restrictions in certain areas of town, or encouraging multifunctional, self-sufficient zones in which housing, services jobs, and entertainment are colocated.

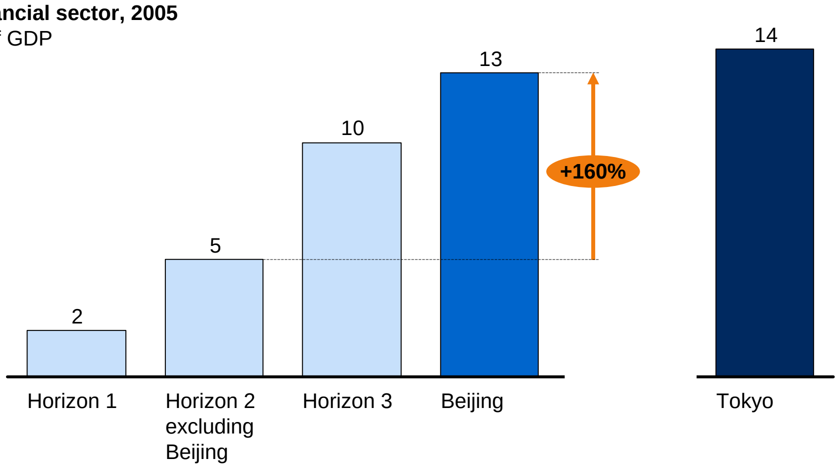
Industrial strategy. With its burgeoning services sector and, by Chinese standards, developed financial sector, Beijing is at Horizon 3 level on this lever (Exhibit 1.1.4). Over the past few years, the city's government has been proactive in encouraging services and modern, high-value-added manufacturing to locate in the city through preferential taxation and land policies (e.g., 25 percent discounts for the purchase of land outright and tax breaks for technological breakthroughs in research and development). To target financial services to locate there, the government has offered special tax breaks for managers of financial institutions, subsidies for newly established or incoming financial firms, discounts on office leases, and *Hukou* quota priority to employees of financial institutions. All these policies have clearly borne fruit. Beijing's services share of GDP jumped from 42 to 70 percent in just 15 years, and the financial sector now accounts for 13 percent of the city's GDP. The financial sector and services more broadly have among the highest shares of GDP of any Chinese city—although these shares are still relatively low in comparison with some international cities such as New York where services account for 90 percent of city GDP. A greater focus on the domestic market in terms of both consumers and businesses—through measures that Shanghai has adopted, for instance—might allow Beijing to foster continued growth in its services sectors.

Exhibit 1.1.4

Beijing's financial sector is the largest as a share of GDP among our case cities

Financial sector, 2005

% of GDP



Source: Field interviews; Economist Intelligence Unit; China City Statistical Yearbook 2006; China Statistical Yearbook 2006; Bureau of General Affairs, Tokyo metropolitan government; McKinsey Global Institute analysis

Networks. Beijing has just recently begun to exhibit Horizon 3 behavior in terms of its domestic and international linkages. Domestically the city started paying attention to the potential benefits of optimizing resources from strategic cooperation with surrounding cities or provinces. Beijing has formed a three-legged economic-development zone with Tianjin and Hebei Province, improving transportation links and integrating port facilities in the area. Beijing already boasts the second-highest freight and airport traffic in China. Hebei Province and the capital are cooperating on industrial planning, the idea being to shift manufacturing from Beijing to Hebei. Internationally Beijing is second only to Shanghai in terms of international flights with 598 and 768 weekly flights, respectively. Beijing's foreign-direct investment (FDI) accounts for a respectable 4 percent of its GDP compared with 6 percent of GDP for Shanghai. Beijing has also been active in building a stronger international brand through organizing and hosting global activities, most notably through its hosting of the 2008 Summer Olympic Games.

Labor and skills. Unlike many other Chinese cities where skills shortages are hobbling their development, Beijing has a huge oversupply of labor and skills. A member of a team from a leading independent urban-development institute in Beijing that has set up a system to evaluate the city's competitiveness told us, "One of the biggest advantages that Beijing enjoys is its huge talent pool, even compared with Shanghai. Every year, hundreds and thousands of students come from all around China to Beijing to study; every year, 117,000 students graduate from college in the city—and most of them aspire to stay in Beijing to work." Not only does the city have the nation's most advanced higher-education system but it also attracts substantial migrants from surrounding cities and provinces. Indeed, the city operates very strict *Hukou* requirements, evidence that it doesn't need migrant labor to feed economic growth. Interviews with local businesses revealed an abundance of labor to fill the most basic jobs. Restaurant owner Mr. Zhang, whose establishment serving Shanghai cuisine opened five years ago, said that all his waiters and waitresses were migrants and that he never has any difficulty in finding workers from the city's abundant pool of migrants. "Local people wouldn't like to do these low-level services jobs," he said. "They would rather stay at home, unemployed." Beijing is a clear Horizon 3 in terms of its ability to pick whichever workers the city desires.

Quality of life. While Beijing has the highest per capita spending on education in China and ranks well on "livability" aspects, the overall quality of life actually is perceived by many—including leading academics who we interviewed—to be a major constraint in Beijing and the main factor that prohibits it from matching

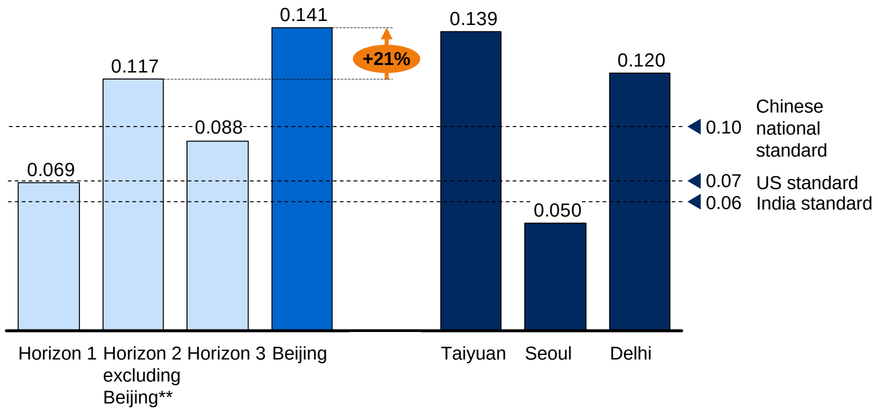
Shanghai in terms of its urbanization. In fact, limitations on the quality of life are perhaps one of the strongest reasons that we categorize Beijing as a late Horizon 2 city rather than Horizon 3. First, congestion is arguably a more severe problem in Beijing than in any other Chinese city. The average speed of vehicles in the city center has dropped from 45 kilometers per hour to only 10 kilometers per hour over the past ten years. A leading academic told us that, in spite of investments in the subway system, the government's relatively *laissez faire* attitude toward urban sprawl and private-car ownership has allowed the number of cars to soar. Per capita road space has decreased to 188 square meters per car (15 percent less than Shanghai). Second, pollution is also a serious problem. Beijing is among the world's ten most polluted cities according to the World Health Organization and, alongside Taiyuan, is the most polluted among our case cities (Exhibit 1.1.5). According to a professor at Peking University, there are now 7,000 garbage "mountains" around the city because the authorities haven't put a proper solid-waste-collection system in place.

Exhibit 1.1.5

Beijing's pollution is the highest among the case cities

PM_{10}* level

mg/m^3



* PM_{10} comprises tiny particles of solid or liquid suspended in a gas with a particulate content of 10 percent. PM_{10} currently accounts for about 10 percent of the total amount of aerosols in the atmosphere. Increased levels of fine particles in the air are linked to health hazards.

** Horizon 2 average excludes Changsha and Shenzhen because of incomplete data.

Source: China Zoning Economy Statistical Yearbook 2006; Ministry of Environment, Republic of Korea; Central Pollution Control Board of India; McKinsey Global Institute analysis

The reason Beijing doesn't fall down to Horizon 1 on this dimension is that the local government has taken steps to mitigate these problems. For example, the city has attempted to set up satellite cities to alleviate pressure on the city center. In addition, the capital invests 2.6 percent of GDP in pollution treatment and prevention, which is well above average for a Horizon 2 city.

Nevertheless, these measures seem thus far to have done little to improve congestion and pollution. To progress into Horizon 3, Beijing would have to find ways to improve the quality of life for its citizens. Placing greater limitations on private-car ownership, reorganizing the inner-city road system, and spending more on pollution treatment are among the activities the city might undertake.

* * * * *

Beijing today is a late Horizon 2 city that is veering toward Horizon 3. In China, only Shanghai surpasses the capital city in terms of infrastructure. Beijing generates 70 percent of its GDP from service industries, and the city has a developed financial sector; the city has strong linkages both within China and internationally; and its skills and basic labor pool are both in abundance and arguably the strongest in the whole country. However, to move into Horizon 3, the city will need to leverage its land more strategically, apply concepts of sustainable development to its urban planning, and significantly improve its quality of life, most notably in limiting pollution and congestion. Should it be able to do all of these things, Beijing has the potential to grow into a modern supercity with a projected 27 million people by 2025.

2. Cangnan: An unofficial city

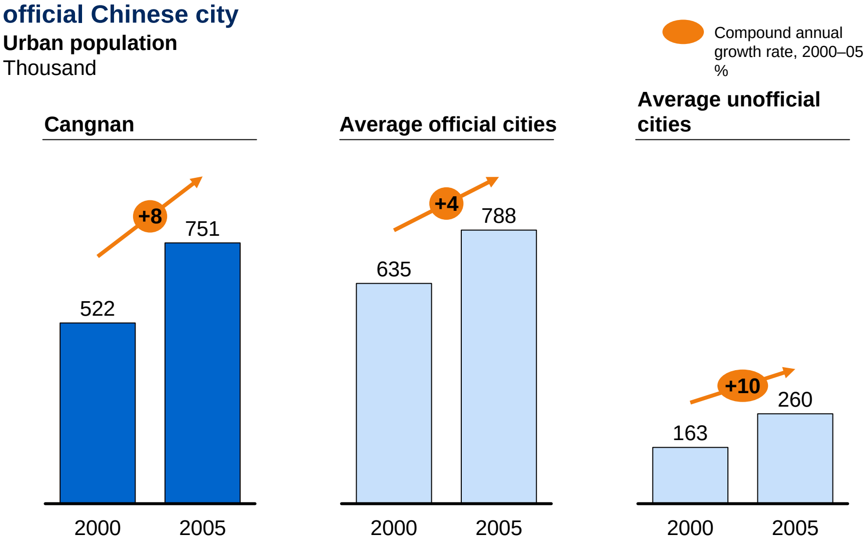
Since 1981 China has officially classified Cangnan as a county under the jurisdiction of the prefecture-level city of Wenzhou in Zhejiang Province on China's eastern seaboard. But according to our analysis, Cangnan has urbanized rapidly enough in recent years for us to classify this urban area as a city in its own right. Albeit at an early stage of urbanization, Cangnan's density of 590 people per square kilometer is more than double that of the average official Chinese city and its population virtually the same (Exhibit 1.2.1).[2] In terms of its land area, Cangnan's urban area is twice that of the Republic of Singapore. As such, Cangnan is one of the 186 unofficial cities in China that we identified during our research.

Exhibit 1.2.1

Cangnan has virtually the same population as the average official Chinese city

Urban population

Thousand



Source: China City Statistical Yearbook; Census 2000; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

2 In classifying Cangnan as a city, we applied the criteria used until 1996 by the central government for city qualification. These criteria include population, industry mix, GDP, and infrastructure. In 2005, Cangnan qualified under all criteria. For this case study, we drew on field interviews, our model output, and the Wenzhou Statistical Yearbook 2006.

Known as the "southern gate of Zhejiang Province" and surrounded by mountains and sea, Cangnan adjoins Fuding City in Fujian Province and is one of the top 100 counties in China in terms of population. Cangnan's economy, which had traditionally relied largely on agriculture, has grown rapidly in recent years largely on the back of robust growth in Wenzhou, which has profited from the central government's drive to develop coastal cities, and on huge investments in road and rail paid for by the central and provincial governments that have connected Cangnan more closely to its larger urban neighbor.

Definitely deserving of city status, we nevertheless categorize Cangnan as a very early Horizon 1 city on all seven levers of urbanization.

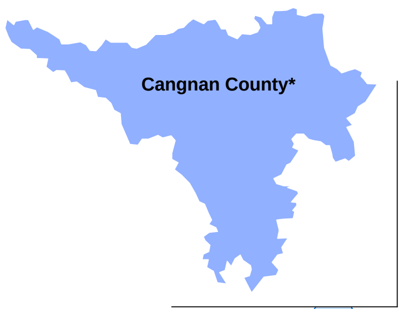
A SMALL CITY EMERGES FROM THE COUNTRYSIDE

Before 1981, most of Cangnan's few hundred thousand residents made their livings from agriculture. By 2005, however, the city had expanded to a population of more than 750,000 urban residents (Exhibit 1.2.2). The city's GDP has increased more rapidly than the average official Chinese city over the past five years, tripling between 1981 and 1990. This growth spurt was due primarily to the activities of private industry, whose development the county leadership encouraged. Many farmers began to shift from agriculture into working for private businesses, although at this stage the scale of such enterprises was still very small and run by families. Even now there are many family-run small businesses in Cangnan.

Exhibit 1.2.2

Cangnan's vital urban statistics

MAP NOT DRAWN TO SCALE



Vital statistics

	1990**	1995**	2000	2005	2025
Urban area* km²	n/a	n/a	569	569	569
Urban population Thousand	n/a	n/a	522	751	1,396
Real GDP/capita Renminbi	n/a	n/a	6,719	11,378	53,774

* Given Cangnan's status as a county rather than a prefecture or county city, no official data is available on where urban areas are located within the county. Its urban land area is estimated using the China All City model.
** No data is available until 2000, as Cangnan is an unofficial city.
Source: National Bureau of Statistics; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

During the 1990s, increasing numbers of local people traveled to other cities, mainly in the Yangtze River Delta region, to sell their products. They saw firsthand the extraordinarily fast pace of wealth creation that the shift to free-market economics was creating, and this gave them the impetus to set up their own businesses back in Cangnan, which was seeing increasing demand from within the region. As its industrial sector developed, Cangnan began to see an influx of migrants from the countryside looking for work. During that ten-year period, Cangnan's industrial GDP grew at a rate of more than 20 percent a year.

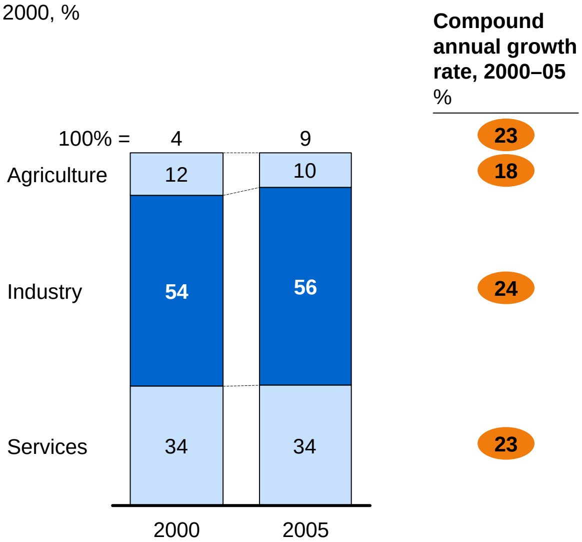
Between 2000 and 2005, Cangnan's real GDP continued its quick ascent, rising at almost 20 percent per annum from 3.5 billion renminbi to 8.5 billion renminbi. While this was a more rapid growth rate than official Chinese cities, it was lower than the average for the 186 unofficial cities that we have identified. Services and industry have grown at roughly the same pace, although industry still makes up the lion's share of the economy (Exhibit 1.2.3). During this period, leading incumbents in the local market were able to hold on to market share, and it was hard for newcomers to made headway. Indeed, the government encouraged this balance of power by favoring large-scale enterprises, which, in turn, worked hard to improve their selling networks. Over the past six years, the city's trading and logistics businesses have seen their turnover soar. Up to 2006 Cangnan had 70 players in the trading market with a total volume of 6.9 billion renminbi—but four companies predominated with trading volumes of more than 1 billion renminbi each.

Exhibit 1.2.3

Industry is the largest sector in Cangnan's economy

Real urban GDP

Renminbi billion, 2000, %

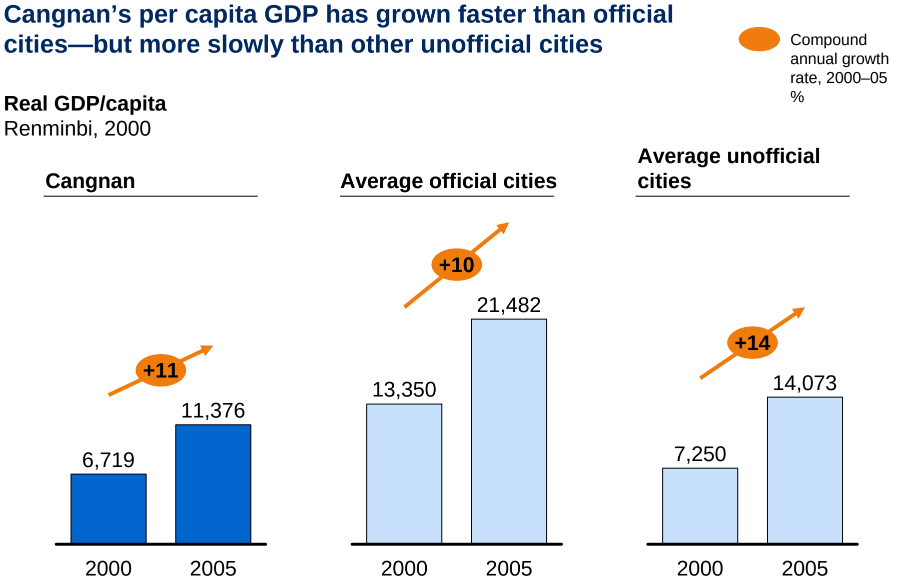


Source: China City Statistical Yearbook 2006; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

The city's focus has remained exclusively on attaining the highest possible rate of GDP growth—typical of a Horizon 1 city. However, despite the strides made in recent years, per capita GDP in the city had reached only some 11,400 renminbi in 2005 compared with the official-city average of about 21,500 renminbi and the unofficial-city average of slightly over 14,000 renminbi (Exhibit 1.2.4). Cangnan today still has a huge gap between some very prosperous business owners and workers who earn no more than basic wages. There are multiple other pressures that the city needs to tackle if it is to continue to post sustained and balanced growth including increasing pollution and a lack of educational facilities to produce the skilled labor that the city will need to feed incoming businesses.

Exhibit 1.2.4

Cangnan's per capita GDP has grown faster than official cities—but more slowly than other unofficial cities



Source: China City Statistical Yearbook 2006; Census 2000; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Cangnan also faces the possibility—aired in interviews that we conducted during our visit—that, as central government emphasizes its Great Western Development Strategy, smaller developing cities on China's east coast may not have access to the preferential policies that would fuel their economies. This means that the city may have to place even more of a priority on attracting private enterprise to continue injecting dynamism into the local economy.

CANGNAN FACES THE PRESSURE POINTS OF EARLY URBANIZATION

Our visit to Cangnan revealed that the county has both many of the characteristics of China's 663 official cities and many of the same emerging pressure points. Cangnan's urbanization remains at a lower level than that of its larger neighbor Wenzhou, and the city faces challenges on all seven levers of urbanization. We classify Cangnan as early Horizon 1.

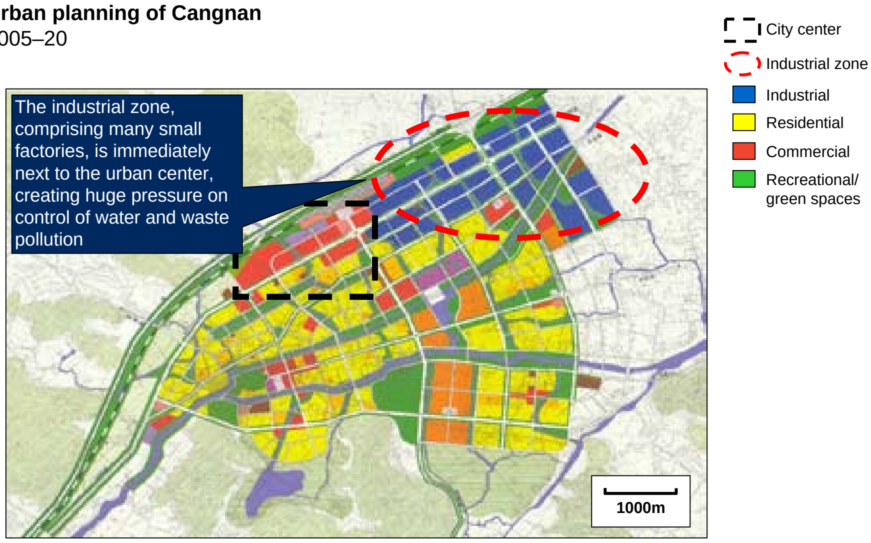
Land. Theoretically Cangnan should be able to benefit from being in close proximity to China's dynamic Yangtze Delta economic cluster, as well as the fact that the city has more available land for development around the urban center than many other cities in Zhejiang Province. In the early 1990s, Cangnan was free to acquire land and then sell it to incoming business investors either for free or at heavy discounts, and the local government was receiving significant revenues from such activity. However, since 2004 when the central government instituted regulations limiting its acquisition, land has become scarcer and prices have shot up. The new rules prohibit county governments from making their own decisions on land prices, and all land sales now have to go through a bidding process. So it is now more difficult for Cangnan to discount land as a way of attracting business. Indeed, Cangnan is investing 1 billion renminbi to 2008 on a 250,000 square meter sea-reclamation project simply to provide enough land for future residential and industrial needs.

Infrastructure. The city's basic infrastructure has expanded dramatically over the past five years. Because Cangnan has relatively low government revenues (1.2 billion renminbi in 2005), the central and provincial layers of government have largely provided the financing for this construction. The city's focus has mainly been on building roads, railways, and bridges that connect Cangnan to other cities nearby. A highway now connects Cangnan to Taizhou, Ningbo, and Wenzhou, which will likely strengthen the business and economic connections among these cities. The local city government has also been devoting funds to building roads that connect the urban center to the surrounding countryside in order to help farmers to travel out of their villages to their jobs in the urban areas. Cangnan does not yet suffer from traffic congestion, which means that investment on inner-city roads and on public transport is not yet a priority. The other major thrust of the city's infrastructure investment has been the building of power capacity. As recently as 2005, Cangnan's factories had to shut down periodically because of a lack of power, prompting the city to begin upgrading its power grid. However, it is likely that the private sector, rather than the city government, will be the major source of funding for this effort, providing an estimated 80 percent of the necessary investment. For instance, one Hong Kong–based company is investing 14 billion renminbi on building a power plant in Cangnan in a build-operate-transfer (BOT) deal. Horizon 1 and Horizon 2 cities are increasingly using such vehicles to attract investment for urbanization given increasing strains on sources of funding. In these deals, private enterprise pays for the construction of infrastructure, earning returns from the industrial user and then returning ownership to the government at an agreed point. Capital spending and real-estate investment now account for 60 percent of fixed investment in the city.

Urban planning. Cangnan has virtually no urban planning in place. Many small factories are located within two kilometers of the city center and along the river into which they are pouring pollution; many more industrial plants are only three kilometers from the city center (Exhibit 1.2.5). As the city center expands, this means that industrial, residential, and agricultural areas will exist alongside each other, most likely building up to a pressure point for the city in the near future. While there is a dedicated "industrial zone," this is an area with a concentrated number of factories located right next to the city center.

Exhibit 1.2.5

Cangnan's industrial zone is very near the city center
Urban planning of Cangnan
2005–20



Source: *Investment Invitation*, Cangnan People's Government Investment Invitation Office; field interviews; McKinsey Global Institute analysis

Industrial strategy. Over the past 15 years, Cangnan has welcomed any type of business prepared to locate in the city. The city now has relatively large printing, plastics, small-gift, and food-processing sectors. Indeed, the development of industry in the city has been somewhat more rapid than urbanization itself because of the relatively major role of the private sector in driving the local economy. Up until now, Cangnan has showed a preference for large, high-tech factories, but the city has not attempted to encourage specialization by offering preferential policies that go beyond those offered at the national level. In light of this, some of the large companies located in the city have been looking for alternative opportunities in other cities in central and western China. Nevertheless, there are now some early signs that a more discriminating view of which type of investment is likely to suit the city in the longer term is beginning to emerge. Fearing it may lose some of its businesses, the city is hoping to become more competitive by focusing on a few industries. Rising concerns about pollution—and the pressure to meet central government environmental regulations—may also be one trigger for this new attitude. Some CEOs of large local factories have become actively involved in Cangnan's people's political consultative committee and are advising local officials on how best to industrialize. For instance, the CEO of a local printing company is the vice president of the committee.

Networks. Despite the fact that Cangnan officially remains a county under the jurisdiction of Wenzhou, the local government is doing little actively to promote economic links either with its larger neighbor or with regional urban centers such as Taizhou and Ningbo. Nevertheless, the new highway linking Cangnan to these cities is likely to help forge closer links. Cangnan currently has no airport, with all visitors traveling through Wenzhou.

Labor and skills. Cangnan has abundant basic labor, including migrants, but faces a serious shortage of educated and skilled workers to offer to businesses that invest in the city. The city has no colleges, and those citizens who have the financial capacity send their children away to study. Few of these young people return to their hometown to find work because there is such limited employment opportunities that pay well. A member of a consultative committee whose son studied at Zhejiang University told us, "I would prefer it if my son didn't come back at all until he can find something to do in Cangnan, and most of the people I know in government departments and in business feel the same way as me." An increasingly prevalent view among Cangnan business and government leaders is that, over time, the city needs to offer sweeteners such as higher wages and housing to administrators and managers to persuade them to come to the city to work. On a positive note, some leading local factories are already providing training for employees, as well as medical and social insurance and dormitory housing. It remains the case, however, that such benefits are not affordable for many small factories and enterprises.

Quality of life. Cangnan's *Hukou* population has incomes that are comparable with a Horizon 2 city, but most residents are much poorer than this, and the city's quality of life has all the hallmarks of a Horizon 1 city. Pollution is a major problem, and the city faces having to make an investment of 140 million renminbi solely to enable it to pipe water into the urban area from upstream of its own stretch of waterway. In addition, over the past two years the city government has tried to shut down some small-scale polluting factories. For larger-scale enterprises, the solution lies in creating dedicated industrial zones and the building of water-treatment plants, but the latter are only in the planning stages.

* * * * *

We believe Cangnan warrants its classification as a city. However, it is too early in its urbanization for Cangnan to have taken on the true hallmarks of the vast majority of China's official cities that display a relatively more aggressive stance in the management of urbanization as well as the fostering of a positive image as a tool to attract business investment and accelerate the process of urbanization.

3. Changsha: An unusual services-led city

Changsha is the capital city of Hunan Province in the center of Southern China. Records show that it has been a city for 2,400 years and, like many of today's Chinese cities, it has a rich history. Legends abound, including the story of the illustrious poet Qu Yuan committing suicide by drowning himself in Miluo River. But the province's most famous son in relatively modern times is Mao Zedong, who led China from 1949 to his death in 1976.

Changsha's development has been quite different from that of other Chinese cities since 1949 by virtue of some unique elements of its history. The fact that Mao Zedong grew up in the province has meant that the provincial capital has had special status in terms of its higher-educational system—the city's 45 universities and colleges produce more than 70,000 college graduates a year, a rich resource. In addition, Changsha's important Buddhist temples have meant that the city has been a favored destination for pilgrims.

Although inland, Changsha's location is advantageous—the city neighbors Guangdong Province, the first and most successful benefactor of China's program of economic opening and reform. Changsha is one hour's flight from the city of Guangzhou and less than two hours' flight from Shanghai and most of China's other coastal cities. We see Changsha as an early Horizon 2 city because, apart from in land policy where the city is more typical of Horizon 1, Changsha behaves as a Horizon 2 city on the urbanization levers we examine.

CHANGSHA'S STRENGTH IN SERVICES MAKES IT UNIQUE

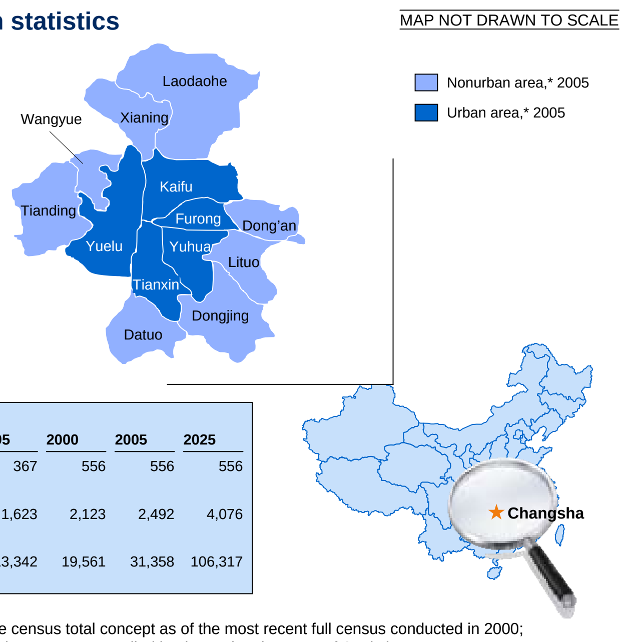
For a long time Changsha suffered economically from the fact that it is not on the coast, the early focus of China's 1980s economic reforms. Ten years of rapid coastal development meant that huge gaps opened between China's seaboard and inland areas in terms of GDP and per capita disposable income. So, despite its army of graduates, Changsha lacks the industrial base and sophistication to provide the same top-notch management and technical positions as well-developed coastal regions have to offer.

However, Changsha began to develop some momentum in the late 1990s as central government started to shift its development focus to inland regions and Changsha began receiving favorable policy support as a result. At the same time multinational corporations started looking inland as land and labor costs rocketed in coastal cities and as they searched for new markets. Fixed-asset investment in Changsha grew by 30 percent a year from 2000 to 2005, driving the expansion of GDP, which increased at a rate of 13 percent over the same period. As a share of GDP, fixed-asset investment reached 49 percent, dramatically higher than the 5.6 percent share in 1995 and 13.4 percent in 2000.

Changsha is now a vibrant city that is growing and developing rapidly. Between 2000 and 2005, the urban population grew by 3 percent and its per capita GDP by 10 percent (Exhibit 1.3.1). The city has made great strides in attracting FDI over the past six years. Its utilized FDI grew at 37 percent between 2000 and 2006, reaching $1.2 billion. The top three sectors for FDI are electronic appliances, food and beverages, and automotive.

Exhibit 1.3.1

Changsha's vital urban statistics



Vital statistics	1990	1995	2000	2005	2025
Urban area* km²	367	367	556	556	556
Urban population Thousand	1,329	1,623	2,123	2,492	4,076
Real GDP/capita Renminbi	7,639	13,342	19,561	31,358	106,317

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; as of 2005, no change in the urban area was applied by the National Bureau of Statistics.
Source: National Bureau of Statistics; McKinsey Global institute analysis

However, despite this relatively recent influx of FDI, Changsha differs from many other predominantly industrial cities in China in the fact that services have been the largest contributor to the city's GDP for ten years, accounting for 53 percent of total urban GDP in 1995. Services expanded by 16 percent from 1995 to 2005, reaching 66 percent of total urban GDP in 2005. This eclipsed the 14 percent growth of overall urban GDP over the same period.

This economic structure is quite unusual for a developing city such as Changsha. The reason is twofold. First, Changsha has a weak record in industrial development; despite a long urban history of more than two millennia, the city's industrialization didn't start until 1949, and even then the city's industrial base remained much smaller than that in its peer coastal cities. Second, Changsha's service industries have long been dynamic, benefiting from a combination of the city's well-developed higher-education system, its pilgrim tourism, and, over the past decade, its growing role in television entertainment—Hunan TV began running China's equivalent of talent show *American Idol* in 2004, which became one of the most successful television productions in China's history (see "Interview with Sunchime Digital Cartoon Group"). Changsha's leaders have actively promoted these characteristics of the city not only within China but abroad.

Interview with Sunchime Digital Cartoon Group

We interviewed executives at Sunchime Digital Cartoon Group, the largest producer of television cartoon programs in China. The company began in 1996 as a movie library for children in elementary and middle schools and then expanded into the online movie and music sales and rental business in 1998. In 1999, Sunchime invested in a digital cartoon production facility in Changsha, focusing on producing knowledge-based cartoon shows for children. Today, the group's Blue Cat science cartoon is famous throughout China and, with more than 8,000 episodes under its belt, it has the record as the longest-running cartoon series, according to Guinness in Shanghai. Sunchime Digital Group derives 30 percent of its total revenue from broadcasting of its cartoon productions by television stations in China and abroad and 70 percent from licensing its Blue Cat brand.

While Sunchime's digital cartoon research and development and production are located in Changsha, the company bases its sales and marketing group in Shanghai and its brand licensing department in Beijing. This three-site structure reflects the respective strengths of each—Changsha has an ample supply of skills in design and computing, while Shanghai is China's business center, and Beijing is the country's legal and regulatory capital.

CHANGSHA IS NOW FOCUSED ON MOVING SERVICES HIGHER UP THE VALUE CHAIN

Our trendline projection is that Changsha's population will expand to 4.1 million people by 2025 and that the city's real urban GDP will grow at 8.9 percent from 2005 to 2025. To move to the next level of urbanization, the city is working to attract more FDI to help build on its services base and move toward higher-value-added businesses. The local government is increasing spending on marketing-awareness campaigns as well as heavily investing in a light-rail system and transportation ties to the coast to reduce costs. Changsha is squarely a Horizon 2 city on six out of the seven levers we have analyzed; only on land does Changsha still merit a Horizon 1 status.

Land. Changsha differs from many other Horizon 2 cities in that the city still offers large land discounts. Discounts of some 50 percent on land in industrial zones are on offer to companies in high-tech and other high-value-added industries. However, given Changsha's strategic focus on building its relatively underdeveloped industrial base, business incentives such as discounts are to be expected. Land sales, too, remain important, with one official saying that sales are "a major source for funding urban development."

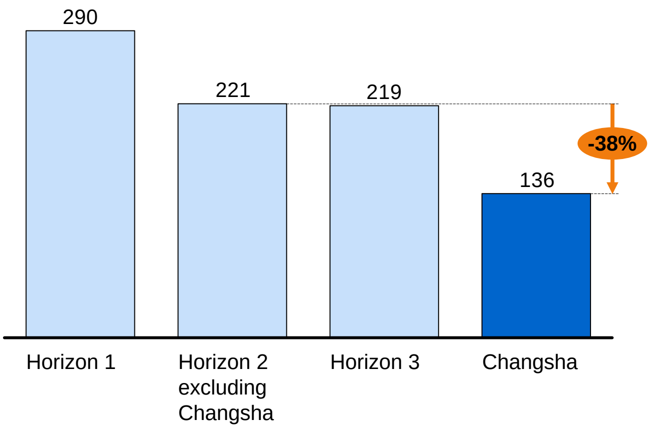
Infrastructure. Changsha has grown organically over many years with little formal planning, and this has left the city struggling to accommodate the needs of a modern city with a rapidly increasing urban population. Underground tunnels and pipes are showing signs of strain, and the city's roads are under increasing and constant pressure as the number of vehicles on the road soars at a current rate of 4,000 new cars a month. Changsha's road space per car is the lowest of all 14 case cities—even lower than in heavily congested Chengdu and Beijing (Exhibit 1.3.2). The city has responded vigorously to such pressures, spending 88 percent of its infrastructure budget on revamping old inner-city roads—more than any other case city (Exhibit 1.3.3). Although the city already has higher-than-average public-transit use, Changsha still invested 1.5 billion renminbi in 2005 on public transit. In the period from 2000 to 2005, the city expanded its public bus system by 40 percent and now has a total of 99 operational bus lines. More important, the city is also planning to invest some 75 billion renminbi from 2008 to 2014 on a 180 kilometer light-rail system, the biggest infrastructure project in the history of the city and equivalent to 4 percent of its projected GDP over that period. In addition, Changsha is investing 6 billion renminbi on upgrading the city's power grid between 2006 and 2010 in order to ensure adequate power supply.

Exhibit 1.3.2

Changsha's road space has become quite limited with rising car ownership

Road space per car, 2005

m^2 per car



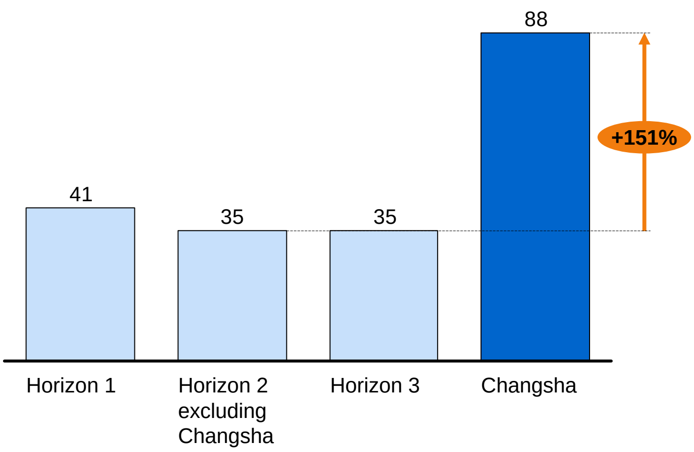
Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Exhibit 1.3.3

Changsha spends nearly 90 percent of its construction budget on improving and expanding inner-city roads

Investment on roads and bridges, 2005

%, total local government infrastructure investment



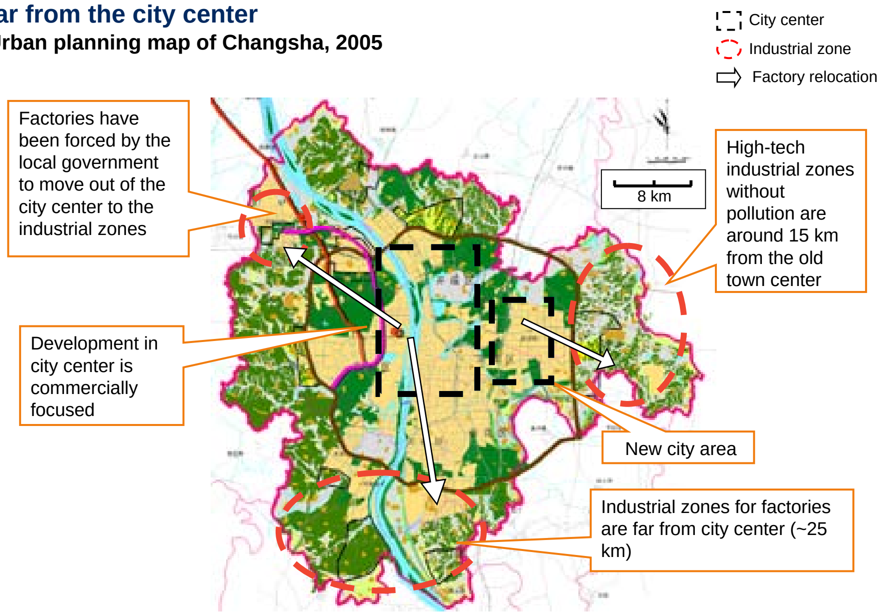
Source: Field interviews; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; McKinsey Global Institute analysis

Urban planning. Changsha has begun to turn a new page in urban planning after years of disorganized, organic development. As the city grew, factories were historically dispersed through countless industrial zones and adjacent to residential locations and the city center. However, over the past five years, the city has forced factories out of the city center and relocated them into two special high-tech zones and six industrial zones some 25 kilometers away (Exhibit 1.3.4). These actions have helped reduce pollution and congestion in the city center and fostered a better atmosphere for commercial development.

Exhibit 1.3.4

Changsha is reorganizing its layout by moving factories far from the city center

Urban planning map of Changsha, 2005



Source: Field interviews; Changsha Planning and Information Service Center; McKinsey Global Institute analysis

Industrial strategy. The city currently derives some 66 percent of its GDP from services, but it is working to attract high-tech and high-value-added industry in its designated development areas. The city offers a 15 percent rebate on income tax exclusively to high-tech foreign investors. The local government feels that FDI is the key to Changsha's being able to attract high-value-added industry, and officials hope that such policies will increase the level of FDI beyond its current 6 percent share of GDP. However, in spite of its current aggressive focus on industrial development, Changsha's leadership is clear that it wants the city to retain its special character. While city officials want to learn from the industrialization of Shenzhen and Shanghai, they insist that Changsha will not emulate the development trajectory of either city. Instead, they see Changsha retaining its booming service sectors, environmental greenness, and a flavor of small-city livability. One option they have considered is teaming up with neighboring cities that have industrial strength to match Changsha's forte in services.

Networks. Changsha has a relatively significant level of rail and highway freight traffic that is between the averages of Horizon 1 and 2 cities. In addition, the city has Xianing (off the Xiang River), one of China's main inland ports with very strong business links to Shanghai, and an international airport with almost 20 weekly international flights to destinations within Asia. To bolster its regional standing, Changsha has been working ever more closely with smaller neighboring cities to deepen economic ties. The idea of uniting Changsha with Zhuzhou and Xiangtang some 40 kilometers away into one larger city or single economic zone has been in discussion for 25 years. Both neighboring cities have strong industrial bases, which could complement Changsha's strength in services. The momentum for such a scheme has been building since the Hunanese provincial government formed the Office for Three Cities' Unified Economic Development in 1998. The province needs the blessing of central government to go ahead with unification, and there have been indications that this approval might be forthcoming within the next five years.

Labor and skills. Despite Changsha's uniquely rich educational provision—with 45 universities and colleges, 76 private educational institutions, and 70,000 new graduates every year—the city still faces strong competition from China's coastal cities for top talent in management and technology. Most people with the requisite skills are still attracted to the coast where high-paying jobs abound and living standards are high (see "Xiangying—a migrant girl").

Quality of life. Changsha is clearly committed to increasing the quality of life for its citizens and has scored some successes. For instance, at 25 square meters per capita, the city has the second-highest amount of green space out of the 14 cities that we analyzed (Exhibit 1.3.5). One local government official said that the city is "focused on fighting all types of pollution—water, air, and solid waste." Yet in spite of these claims Changsha invests an amount equivalent to only 1.3 percent of GDP on pollution treatment—nearly one-quarter less than the average for a Horizon 2 city. Unsurprisingly, its untreated wastewater per capita is third highest among the 14 case cities at 56 cubic meters.

* * * * *

There is a great deal of optimism about the city's prospects among government officials, academics, and private citizens whom we interviewed. They take a collective pride in Changsha's culture of emphasizing education, valuing risk taking and optimism, and displaying hospitality. This is a city that sees its moment coming and is positioning itself to take advantage of economic development opportunities. A commitment to balanced development, coupled with vigor in tackling environmental pressure points, is already evident.

Xiangying—a migrant girl

Xiangying is 17 and studying at a technical school for English in Changsha. Initially, her parents were supporting her studies from their small rural hometown in the province, but this proved too difficult. The fees for one year of schooling in Changsha cost them some 10,000 renminbi, twice the fees that they would have paid in their hometown. The entire family therefore moved to the city two months ago in search of better-paying work and in order to be closer to their daughter. They had little to lose from the move. The family had lost its farming land due to agricultural consolidations and claimed not to have received proper compensation; they sold their house to pay for their move to the city.

The family now works at a restaurant in Changsha and lives in a house provided by the restaurant owner behind his premises, rent-free as part of their compensation package. Xiangying helps out during the summer school break. She hopes that, after graduation, she will be able to use her English skills to find work for a foreign company in a city on the coast where she will make more money to help recompense her family for the money they spent on her education.

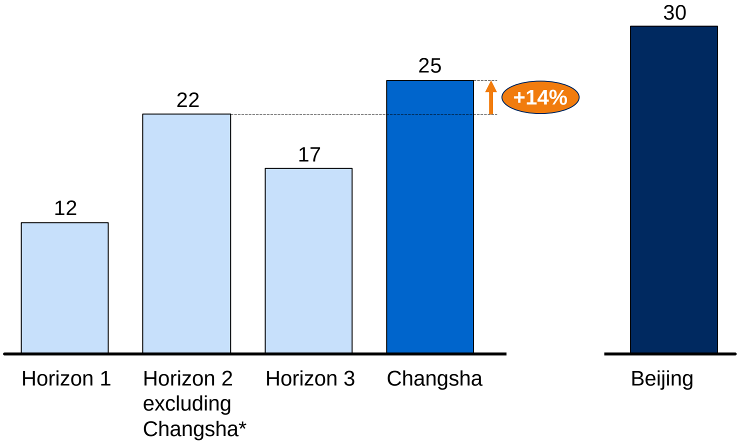
Many companies find that, despite Changsha's large output of graduates, they have to recruit from outside the city.

Exhibit 1.3.5

Changsha's green space per capita is the second highest—after Beijing—of our 14 case cities

Green coverage per capita, 2005

m^2



* Also excludes Shenzhen because of incomplete data.

Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

4. Chengdu: At the heart of China's interior

Chengdu is a large inland city that for centuries has been the political, cultural, and economic center of southwestern China. It has been the capital city of Sichuan, China's most populous province since 1952, and is today well known for its leisurely lifestyle, spicy cuisine, and tourist attractions—including the world's only giant panda breeding and research center.

In 2008, the city tragically came to international prominence as one of the main urban centers hit by the Sichuan earthquake early in the year. However, we do not expect the rate of Chengdu's urbanization to slow down as a result. If anything, McKinsey's interactions with the Chengdu government in the aftermath of the earthquake confirms that the business and economics opportunities presented in Chengdu and how the city is pro-actively taking charge of urban renewal will leave the city fast tracking toward becoming an even more vibrant urban enclave.

The city's urban population has been growing at about 5 percent a year over the past 15 years, doubling from nearly 3 million in 1990 to more than 6 million in 2005. The urban area of Chengdu comprises 2,176 square kilometers and in 2005 was home to 6.4 million people, of which 4.8 million were permanent residents with *Hukou* status (Exhibit 1.4.1). Urbanization has been very rapid, driven largely by migrants coming to the city. Over the past 15 years, the number of people in the city of non-*Hukou* status has grown at an annual rate of 17 percent compared with a growth rate of 4 percent for the *Hukou* urban population.

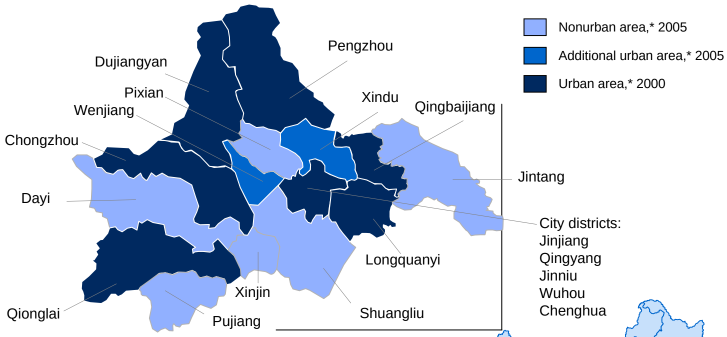
In recent years Chengdu's per capita GDP, disposable income, and consumption levels have also expanded rapidly. The city has caught the eye of many multinational companies that see the attractions of Chengdu's location in the middle of a populous inland consumer market, as well as the city's excellent educational provision that produces more than 40,000 graduates a year.

Chengdu displays all the behavioral characteristics of a late Horizon 2 city from its land use to urban planning and its regional network—although we will have to wait to see the extent of the possible impact of the recent earthquake on the city's development over the next few years.

Exhibit 1.4.1

Chengdu's vital urban statistics

MAP NOT DRAWN TO SCALE



Vital statistics

	1990	1995	2000	2005	2025
Urban area km^2	1,418	1,418	1,418	2,176	2,176
Urban population Thousand	2,955	3,572	4,334	6,381	10,321
Real GDP/capita Renminbi thousand	6,618	10,700	15,457	20,324	75,228

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; in the case of Chengdu, its urban area was updated by the National Bureau of Statistics in 2002.
Source: National Bureau of Statistics; McKinsey Global institute analysis

CHENGDU IS SPEARHEADING THE DEVELOPMENT OF WESTERN CHINA

Chengdu's history as a population center goes back two millennia. At the foundation of the People's Republic of China in 1949, the city already had an urban population of more than 600,000, and the government categorized it as a pivotal city for development during China's first Five-Year Plan period from 1954 to 1960. The city duly saw substantial investment in its industrial base, and its urban population increased by 190,000 between 1960 and 1969.[3] However, the city's extremely rapid development did not prove to be sustainable, and its infrastructure fell behind the needs of the growing urban population. By 1962, the city's per capita living area had fallen to 3.3 square meters, well below the 4.1 square meters that had prevailed in 1952.

3 For this case study, we used the Chengdu Statistical Yearbook 2006 and information from the Chengdu Municipal Development and Reform Commission.

In the 1960s and early 1970s, the city experienced a 15-year downturn, and the process of urbanization stopped as the Cultural Revolution swept through China and set back economic development throughout the country. However, once China embarked on the path of renewed opening and economic reform in 1978, the city underwent a renaissance and urbanization resumed. In the 1980s, the government established Chengdu as a "city with special designation in the state plan," which gave the city a considerable degree of freedom in determining its own economic development. Because light industry and national research and development facilities predominated in Chengdu under the planned economy before the 1980s, the city had less industrial "baggage" from the past than other Chinese urban centers, and this facilitated development planning.

Today, Chengdu is a large city that has attracted a good deal of foreign investment due to its abundant natural resources, well-educated people, low labor costs, and robust economic hinterland. By 2006, the city boasted 4,015 foreign investment enterprises with a total value of $45.4 billion. In 2003, for instance, Intel announced a $375 million investment in a factory in Chengdu and, evidence of its satisfaction with that move, invested another $75 million in 2005 (see "Interview with Intel Products Chengdu Ltd.").

Chengdu is also home to western China's only state-level industry park for investors from Taiwan and has attracted 684 Taiwanese enterprises with a total invested value in Chengdu of $1.58 billion. The city has also set up new high-tech industrial zones specializing in high-end manufacturing and information technology and is a national center for software. In June 2007, China designated Chengdu, along with Chongqing, as a new twin-city SEZ designed to spearhead development of China's western regions as part of China's Great Western Development Strategy.

The city's real urban GDP has grown at an annual rate of 13.4 percent since 1990, very close to China's overall urban growth rate over this period of 14.5 percent. By 2005, Chengdu's real urban GDP totaled 130 billion renminbi. The services sector has been the fastest-growing component of real GDP, increasing its share from 50 percent in 1990 to 55 percent in 2005. In per capita terms, real GDP stood at about 20,300 renminbi in 2005, slightly lower than the national urban average of 20,900 renminbi.

Interview with Intel Products Chengdu Ltd.

Intel, the world's largest manufacturer of computer chips, needed to shorten its supply chain to China—the world's second-largest customer for computer chips after the United States. After an in-depth survey of a number of Chinese cities including Shanghai, Suzhou, and Xi'an, Intel chose Chengdu as the site of two assembly and test plants and has thus far invested a total of $450 million in its facilities in the city. The first assembly line began operations in 2005, and the second facility started production in 2007.

Intel is Chengdu's largest foreign investor today and also the city's biggest exporter. The company has ambitious plans for the future. Craig Barrett, Intel's CEO, praised Chengdu's "unique strategic position, outstanding educational system and large numbers of well-trained workers" and said that the city is a central part of the company's future plans for China. He said that the company intends to recruit more high-skilled workers to its Chengdu plants and, more broadly, to promote the development of high-tech industries in the city and in Sichuan Province.

CHENGDU FACES ISSUES OF SKILLS, INFRASTRUCTURE, AND RURAL DISLOCATION

Chengdu's urbanization appears to have settled into a steady growth phase since 1990, but there are areas that the city needs to keep under scrutiny to ensure that it continues to provide an effective platform for growing prosperity. For all its advantages, the city also faces a number of challenges including fierce competition from China's burgeoning coastal cities for skilled labor, an imbalance between the development of its rural and urban areas, and the potential for the cost advantage the city currently enjoys in its general service industries to dissipate over time. Chengdu is on track to be a megacity by 2025, when its population is expected to reach ten million people. To make sure that it can absorb such growth and retain its prosperity and dynamism, the city has opportunities to improve on a number of dimensions.

Land. Typical for its phase of urbanization, Chengdu has relied heavily on land sales to bolster government revenues, particularly ever since it aggressively acquired land to increase its urban area by 50 percent in 2001. In 2005 land sales accounted for a hefty 39 percent of government revenues and, up to that point, had been a major source of funds to finance urban development. However, Chengdu will need to find new sources in the future as land is becoming scarcer and the central government is imposing increased restrictions on acquisition, even in China's western regions. In addition, the city has used land as a tool of planning, providing discounted prices to encourage factories to relocate to the east of the city and into industrial parks. Over the past six years, 66 factories have moved out of the city center.

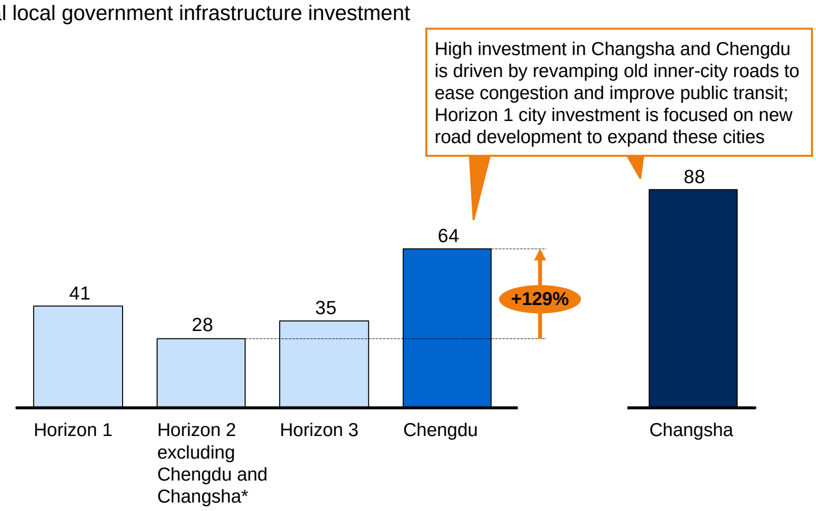
Infrastructure. Chengdu's traffic problem is particularly troublesome. The city has the most private cars in any city in China apart from Beijing and Guangzhou, and there is some research suggesting that Chengdu is the most inefficient city in China measured by the time it takes for people to travel to work. The city has already worked hard to improve its public-transit system over the past decade, increasing the number of public buses from 700 in 1995 to 2,800 in 2002 and planning to hit 8,000 buses by 2010. Currently, 64 percent of the government's infrastructure investment budget goes toward building inner-city roads to ease congestion—second highest among the 14 case cities after Changsha (Exhibit 1.4.2). Chengdu plans to build seven subway lines, each with an average completion time of five years. The first line is currently under construction and is due to be up and running by 2009. In addition, the city has been discussing ways of limiting private-car ownership through the use of quotas or levying a fee on each license plate granted.

Exhibit 1.4.2

Chengdu's investment on inner-city roads is the second highest of all case cities

Investment on roads and bridges, 2005

%, total local government infrastructure investment



* Chengdu's and Changsha's inner-city road development would likely obscure the true Horizon 2 average.
Source: Field interviews; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; McKinsey Global Institute analysis

In addition to this considerable spending on the city's transportation system, from 2006 to 2010 Chengdu plans to invest 5 billion renminbi on power plants, 11 billion renminbi on its power grid and power transformer, and 6 billion renminbi on its natural gas delivery system and storage—a total of 1.5 percent of the city's real GDP. The city believes that these investments should be adequate to deal with the fast pace of increasing energy demand.

Urban planning. Like the rest of China, Chengdu has seen a growing divide between the incomes of citizens in its rural and urban areas as well as large-scale dislocation of workers from rural areas, the corollary of urbanization in most parts of the country. Chengdu's city government has been creative in its attempt to solve the imbalance between urban and rural development; its "three concentration policy," inaugurated in 2004, embraces social security, employment, health care, and *Hukou* in both rural and urban areas. The three "concentrations" are a concentrated industrial base, large-scale farms, and the townization nearby of dislocated farmers. Over the past three years, the city has made considerable progress. By creating new, larger industrial zones in the eastern and western outskirts of the city and shutting down factories close to the city center, the city has decreased the number of industrial zones from 166 to 20. Additionally, there has been significant consolidation of arable land, and productivity has increased as a small number of major operators now farm larger areas of land. Last, new local resources have encouraged villagers to develop businesses with local characteristics such as tourism and shoe manufacturing. This three-pronged policy appears to be an effective course for the city's future development.

Industrial strategy. Chengdu's inland location isn't ideal for heavy manufacturing because of its high transportation costs but is well suited to high-tech and R&D facilities because of its highly skilled but relatively low-cost labor force. The city has already achieved much in driving toward specialization in such economic activities by, for instance, investing more than 20 million renminbi over the past few years on a national software-base technology platform. This platform provides facilities and services to all the investors in the city's new high-tech industrial zone for free in the hope that it will encourage further investment. The city already has a growing financial sector that accounted for 5 percent of Chengdu's real GDP in 2005. Already 15 foreign financial institutions have positioned their branches or offices in the city. The city government has also fine-tuned its industrial strategy in the aftermath of the recent earthquake. For example, it is considering to enhance its CBD so as to improve its competitive status for domestic and foreign investors. Chengdu is also reinvigorating its real estate and tourism markets which were negatively impacted by the earthquake.

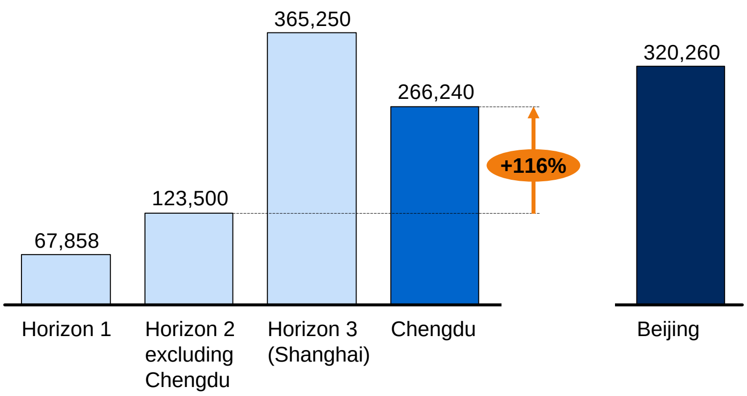
Networks. Chengdu has one of the five major airports in China with more than 1,500 domestic and 30 international flights per week, and it is the central meeting point of four major railway lines. The third-highest freight volume of any of the 14 case cities passes through Chengdu (Exhibit 1.4.3). The city is also well served with ten expressways, and companies from smaller cities in the region such as Nanchong have established "sales offices" in Chengdu that further enhance economic linkages. There are plans to extend by 2010 direct rail linkages with other relevant destinations in Sichuan, such as Emeishan, Leshan, and Jinyang. FDI was 4 percent of real GDP in 2005, indicating a strengthening of economic ties with the rest of the world. Last, while it is not quite yet a large international tourist destination, Chengdu is famous in China for its ancient ruins as well as its outdoor pursuits and cultural activities. Its tourist industry ranks in the top ten domestically. The 2008 earthquake is likely to impact the city's economy mainly in the form of a short-term reduction of FDI inflows and a loss in accommodation and catering activities of up to 30 percent of their expected value.

Exhibit 1.4.3

Chengdu is third in terms of freight volume after Shanghai and Beijing

Railway and highway freight, 2005

Thousand ton



Source: Field interviews; China City Statistical Yearbook 2006; literature search; McKinsey Global Institute analysis

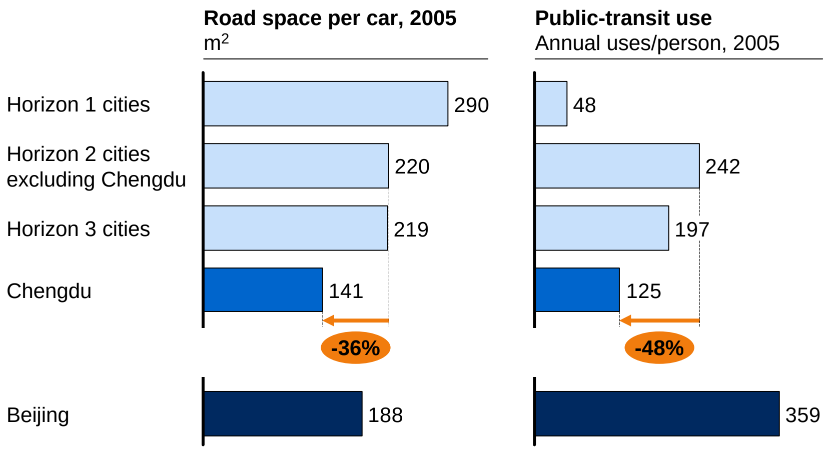
Labor and skills. Although Chengdu has the advantage of 40,000 well-educated graduates per year who command salaries that are up to 50 percent lower than those paid in China's large coastal cities, the city still faces retention issues. Most of these graduates currently regard Beijing, Shanghai, and Guangzhou as the cities where they would most like to pursue their careers. The city is therefore pursuing policies to persuade these graduates to stay in Chengdu, including improving the social benefits that the city offers. The city is also trying to change the mix of industries in the services sector to attract high-paying jobs for these graduates. Traditional service industries such as food and retail have made an important contribution to Chengdu's GDP for many years, but the city's authorities are increasingly looking to stimulate high-GDP-generating and high-paying modern services, too. It is notable that Chengdu is currently putting a great deal of effort into enhancing the city's position as the center of finance, commerce, and trade for southwestern China. City leaders are supporting private-sector firms in these industries in offering packages to attract skilled labor; packages include higher payment and better social benefits. In addition to addressing retention issues in these ways, Chengdu is also trying to expand the city's "output" of graduates in order to meet growing demand from those companies that Chengdu hopes to attract in coming years.

Quality of life. City officials have proved to be farsighted enough to have recognized that they need to ensure that the environment is as attractive as possible if Chengdu is to retain businesses' investments and jobs in the long term, particularly as the city's current labor cost advantage of some 25 percent relative to China's coastal cities will gradually erode as Chengdu expands. In this context, the authorities are engaged in a drive to raise social benefits throughout the city. Chengdu has increased the number of hospitals by 50 percent over the past decade and currently spends a relatively generous 900 renminbi per capita on education and health care. The city is also encouraging new leisure activities to enhance the city's attractiveness for all citizens but particularly graduates in the hope that they might opt to stay and work in Chengdu, as well as highly motivated and skilled migrants who will ensure that the city has a competitive edge in future years (see "Interview with Mr. Li—driver").

The most severe pressure point the city currently faces is congestion. In spite of doubling per capita road space since 2000, Chengdu's private-car ownership is so high that its road space per car pales in comparison to most of China's large cities (Exhibit 1.4.4). Additionally, its public-transit system remains largely dependent on buses, and the city can only hope to run more smoothly when its subway system opens in 2009.

Exhibit 1.4.4

Chengdu has low road space per car and low public-transit use



Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Interview with Mr. Li—driver

Driver Jiaming Li was born in 1979 in Mianyang, a prefecture city in Sichuan Province close to Chengdu. He first came to the city six years ago, working for the first three years in an illegal “gray market” timber business with his father that netted them an average monthly profit of some 80,000 renminbi. However, when the city authorities tightened up regulations and enforcement, he and his father gave up the business; since then Mr. Li has worked as a full-time driver with a car company. He earns just over 3,000 renminbi per month, made up of a base salary of around 1,000 renminbi and usually around 2,000 renminbi of commissions based on the number of passengers carried.

He sends about 2,000 renminbi a month home to his wife and three-year-old child who live back in Mianyang. He doesn’t see them much and misses them badly. He has only two days off per month, and it costs him 250 renminbi to make the round trip home. But this separation won’t be forever. Although he has learned a lot from the work experience he has gained in the city and is positive about the time he has spent in Chengdu, he intends to return to his hometown next year. His aim is to set up his own business—perhaps in leasing, car service, or countryside tourism.

* * * * *

Chengdu's authorities have already displayed impressive vision about how to maximize the city's existing advantages, including its already established record of attracting high-tech businesses. The city has cleverly calibrated the policies it believes are necessary to achieve megacity status over the next 20 years without undue economic or social disruption. The success of these polices now depends on their effective implementation.

5. Harbin: Moving on from central planning

Harbin, a railway town with a long, war-torn history, is located in China's northeastern corner about 400 kilometers from the Russian border. The city's growth first took off at the very beginning of the 20th century when the Chinese Eastern Railway, an offshoot of the Trans-Siberian Railroad that ran through the city from inner Manchuria to the Russian port of Vladivostok, opened for business.

Today, although the city is inhospitably cold with an average annual temperature of 10 degrees Celsius, Harbin has a special role as portal to the north, and the city has a strong transport infrastructure that has enabled it to establish an equally strong industrial base. Harbin was one of the first cities to adopt the Communist planned-economy system and one of the last to embrace China's more recent economic modernization. The local economy therefore remains dominated by SOEs, a feature that some observers believe has prevented the city from fulfilling its true potential.

We classify Harbin as an early Horizon 2 city. Although in some respects the city shows several characteristics of a Horizon 1 city, its relatively effective urban planning and high quality of life (despite the cold) relative to Horizon 1 cities give Harbin the hallmarks of an urban center that is transforming itself through rapid development.

HARBIN WAS LARGELY FORGOTTEN AS CENTRAL GOVERNMENT LOOKED TO THE COAST AND THE WEST

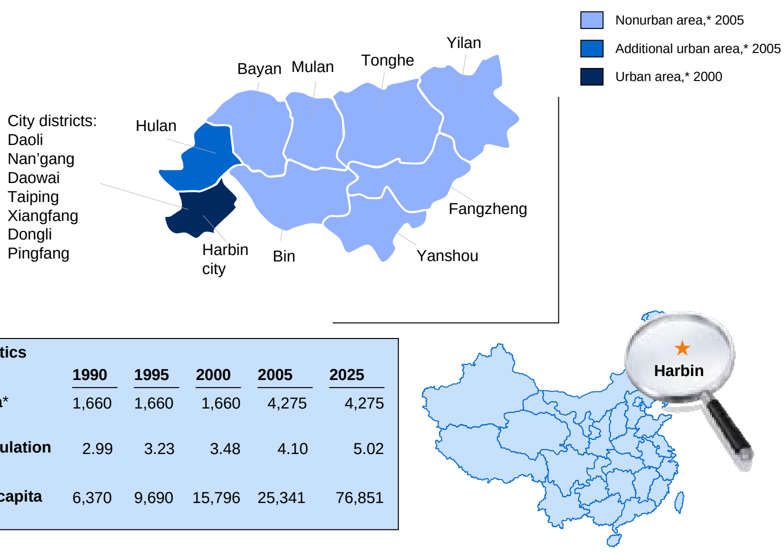
Due to the creation of the ancient Chinese Eastern Railway through the city, Harbin already boasted a population by 1905 of a quarter of a million, many of them refugees from Russia after the fall of the czar. After a few decades of rapid expansion, Harbin's history would then follow a turbulent path. Japan occupied the city in 1932, followed by Russia in 1945. It was only in 1946 that China finally took back control of the city. At this point, Harbin's population had dwindled to 700,000—smaller than it had been in the 1920s and 1930s—as many foreigners fled during the Second World War.

With the Communist Party's arrival into the city in 1946 and the subsequent establishment of the Republic in 1949, the central government directed Harbin largely toward heavy industry. Many SOEs were located in Harbin, and the city thus built up a strong industrial base. But when China adopted economic reform and opening in 1978 and Beijing concentrated on setting up SEZs, Harbin dropped off the central government's radar screen. By the 1990s, Harbin's population had reached about three million, but its economic growth was rather volatile. In interviews local companies expressed their nervousness about the city's economic ups and downs during the 1990s—in the early 1990s, the city's growth actually slowed—and even in the early 2000s. They questioned whether the city could secure a more sustainable growth trajectory. When the central government shifted its attention from coastal cities to the western interior, it sidelined Harbin and much of northern China again. As a result, Harbin's industry began to decline, and agriculture played a larger role in GDP—increasing from 3 percent to 7 percent of GDP from 1990 to 2005—as people moved back to the region to try to earn their livings. The city's population grew only slowly at a rate of 2 percent a year between 1990 and 2005 (Exhibit 1.5.1).

Exhibit 1.5.1

Harbin's vital urban statistics

MAP NOT DRAWN TO SCALE



Vital statistics

	1990	1995	2000	2005	2025
Urban area* km^2	1,660	1,660	1,660	4,275	4,275
Urban population Million	2.99	3.23	3.48	4.10	5.02
Real GDP/capita Renminbi	6,370	9,690	15,796	25,341	76,851

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; in the case of Harbin, its urban area was updated by the National Bureau of Statistics in 2004.
Source: National Bureau of Statistics; McKinsey Global Institute analysis

However, starting in 1999, the central government not only initiated its Great Western Development Strategy but also turned its attention to revitalizing northeastern China. This new push focused not only on attracting foreign direct investment (FDI) but also on building infrastructure, restructuring the industrial base in the region, and putting in place environmental protection in selected areas. From 2003 onward, with central government help on reconstructing SOEs, tax relief, and investment subsidies, Harbin has finally begun to regain momentum. The city leadership put in place its own strategic plan following the guidelines of the 11th Five-Year Plan. The city's emphasis has recently been on heavy industry, agriculture, pharmaceuticals, and some high-tech industries. In the winter, Harbin is a draw for tourists because of its festival of ice sculpture, hockey, and skiing. The city has also begun to succeed in attracting foreign investment. In 2005, foreign companies committed $533 million of direct investment in 124 enterprises, some $311 million of which has come to fruition.[4]

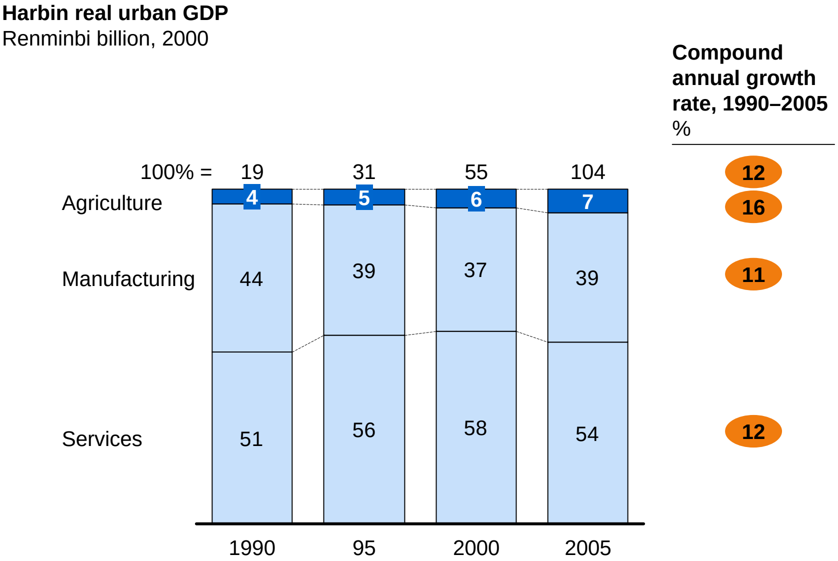
Fortunately, extremely fertile land surrounds the city. Harbin is well known throughout China for its high-yield grain production, and this has helped the city to attract some major food companies (see "McCain Foods, Limited"). Unlike many other urbanizing Chinese cities, Harbin does not have a shortage of arable land, and it also has relatively plentiful natural resources such as water. Although demand for water is slowly catching up with supply, it is projected that demand will not surpass supply over the next 20 years. Agriculture has posted a compound annual growth rate of 16 percent since 1990, higher than either services or industry (Exhibit 1.5.2). People are returning to the fields due to a scarcity of jobs in urban Harbin, and the city has also acted to boost agricultural output by mechanizing production and plans to continue to make agriculture an economic priority.

Having grown only slowly in terms of population to 2003, in 2004 Harbin acquired enough surrounding territory to more than double its land area. The additional land also added roughly half a million people, and the city's overall population reached 4.1 million in 2005. This large land acquisition has had a negative effect on the city's GDP performance in the short term as the acquisition included large numbers of residents with relatively low incomes. Between 1990 and 2005, the city's real GDP grew by 12.0 percent, somewhat slower than China's overall urban rate of 14.5 percent. In 2005 itself, Harbin's per capita GDP stood at about 25,300 renminbi—well above the average GDP of midsized Chinese cities

4 We have drawn on the Harbin Statistical Yearbook 2006 and the 2005 Harbin Government Working Report 2005 in this city case study.

Exhibit 1.5.2

Agriculture has been the fastest-growing sector over the past 15 years



Note: Numbers may not sum due to rounding.
Source: Harbin Statistical Yearbook 2006; China City Statistical Yearbook 2006; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

McCain Foods, Limited

Canadian company McCain Foods, Ltd., one of the world's largest producers of frozen French fries and supplier to giants of the industry such as McDonald's and KFC as well as supermarkets under its own label, was looking to open up production in East Asia. After a prolonged search, the company had two candidates—Inner Mongolia and Harbin—and chose Harbin because of the fertile arable land—at the right latitude for growing potatoes—surrounding the city. Moreover, Harbin had a well-established industrial base and a developed transport system. This meant that McCain could focus all of its processing in one area and therefore save costs. The plant has flourished and has become the headquarters of the company's production in northern Asia.

Harbin now faces the challenge of revitalizing an industrial sector that is still reliant on old SOEs that account for 50 percent of GDP in Harbin and employ 58 percent of the city's workers. The city has much work to do if it is to sustain GDP growth and attract talent to its companies. If it succeeds in these respects, Harbin has every potential to become the pivotal city of northeastern China.

HARBIN NEEDS TO OVERCOME ITS STATE-DOMINATED PAST WITH A CLEAR STRATEGIC PLAN

Harbin's tumultuous history has not given the city the best launch pad for development, but it does have some advantages—notably its natural resources—on which to build. Harbin's GDP is projected to grow at a rate of 6.8 percent from 2005 to 2025, but achieving this growth rate will require some careful planning and proactive policy making in the following areas. An early Horizon 2 city, Harbin has much to transform before looking toward becoming a modern city.

Land. From 2000 to 2004, when central government still sanctioned the sale of discounted land, Harbin offered relatively large markdowns of between 30 and 50 percent but limited these to high-tech, high-value-added, and/or environmentally friendly investment and to reward companies that undertook mergers or purchased loss-making SOEs. On the commercial market, the average square meter fetched about 2,140 renminbi—slightly above the national urban average of about 1,870 renminbi.[5]

Infrastructure. Between 2003 and 2006, Harbin invested 5.3 billion renminbi on 34 city bridges, on the expansion of its road system, and on 54 new bus lines, which doubled its bus coverage compared with its level in 2002. The results have paid off somewhat meagerly as public-transit usage has increased only to 184 annual trips per capita in 2005 from 178 trips in 2000, close to the Horizon 2 city average of 222. Now the city has entered a second phase of infrastructure building focused on ensuring adequate provision of resources. Harbin is spending 46 percent of its infrastructure investment on increasing the city's water and gas supply and in 2006 spent 6.2 billion renminbi on its power grid and on power transformers.

Urban planning. Since 2004 Harbin has been moving inner-city factories to outside counties or dedicated industrial zones some 20 kilometers away and redrawing the inner-city areas as residential and commercial zones. Nevertheless, the city still appears to lack consensus on how it should develop the city's economy. Some interviewees favored the city taking advantage of the manufacturing infrastructure already in place and building on it. Others preferred the idea of putting more effort into high-value-added agriculture. A third group argued for a shift toward a service-led model. All three of these options have

5 This statistic comes from China's dynamic land-price monitoring system.

arguments in their favor, but clearly Harbin cannot pursue all three at once. It remains to be seen whether the city clarifies its urbanization strategy to put in place a strong base from which to launch further development.

Industrial strategy. Harbin's local economy remains dominated by SOEs that generate 50 percent of the city's GDP and account for 58 percent of total employment. Around one-quarter of Harbin's SOEs are educational facilities, of which half are elementary schools and another one-fifth is public and social organizations. There are more than 500 SOEs in the manufacturing, wholesale and retail, scientific research, and health and sanitation categories. This preponderance of SOEs poses a significant challenge, not least because these publicly owned companies do not have as positive a performance record as companies in the private sector. Public-sector companies also follow a different set of regulations from those in the private sector, which affects the rest of the local economy. Broadly speaking, the dominance of SOEs means that Harbin's economy may have crowded out the private sector, and there is a question mark over the sustainability of this structure in future years. The city's growth remains dependent on decisions at state level—will central government invest more or less? And it is arguable that the existence of so many SOEs is crowding out private-sector investment. At the same time, those private-sector firms that have come to Harbin have posed tough competition for the city's SOEs. Looking to the future, Harbin is seeking to leverage its location so close to the Russian border and its history of openness to foreigners to attract more FDI, which in 2005 stood at just 2.1 percent of GDP (Exhibit 1.5.3). Tourism is an area that the city could develop further, as is financial services—currently Harbin has only a limited financial sector accounting for less than 1 percent of GDP (Exhibit 1.5.4).

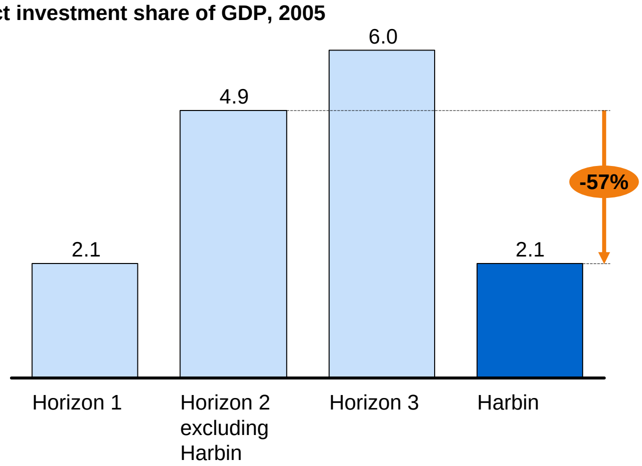
Networks. Harbin has an international airport that runs flights to all the major Chinese cities and 24 weekly international flights to eight different countries. In addition, the city has a port that connects it to Russia, Japan, and Southeast Asia. The city receives 14 million tourists each year driven mainly by its winter-sports offerings. The city's level of rail and highway freight lies between the Horizon 1 and 2 averages.

Exhibit 1.5.3

Harbin's foreign direct investment is the lowest of our Horizon 2 case cities

Foreign direct investment share of GDP, 2005

%



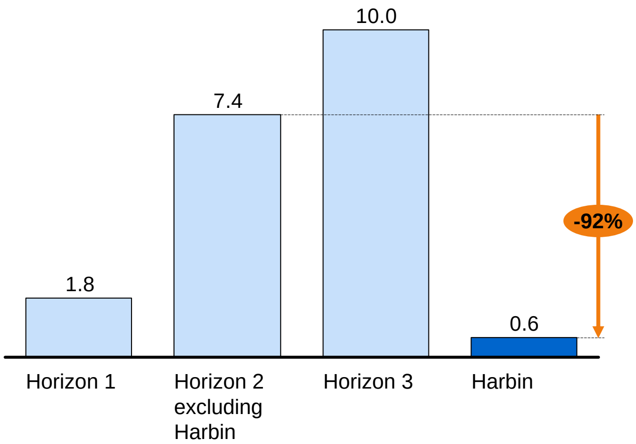
Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Exhibit 1.5.4

Harbin's financial sector is underdeveloped compared with other Horizon 2 cities

Finance sector share of GDP, 2005

%



Source: Field interviews; Economist Intelligence Unit; China City Statistical Yearbook 2006; China Statistical Yearbook 2006; McKinsey Global Institute analysis

Labor and skills. Harbin lacks people with sufficient skills to sustain economic growth but has already worked hard to tackle this problem. The city government is investing in local universities in an effort to boost the number of graduates, and the enrollment of students has increased rapidly from 12,640 in 2004 to 16,651 in 2005. Unlike other cities that see a huge hemorrhaging of graduates to China's largest cities, according to the city's Human Resources Bureau, Harbin managed to retain some 50 percent of local graduates who have chosen to work in their home city. However, in spite of these efforts, when comparing the number of graduates to Shanghai's annual 100,000 strong or Changsha's 78,000, it is clear that Harbin—with its 4 million people—needs to attract skilled workers even more rapidly. Thus, the other part of the city's strategy to fill the skills gap is to provide more benefits to migrants—both skilled and unskilled (see "A migrant fruit seller"). Harbin is one of the few cities in China that offers rights to medical care to all migrants. For skilled migrants the city also offers other benefits including education for their children and even *Hukou* status in some cases. Last, Harbin has instituted a range of policies, including increasing its green spaces, an effort designed to make the city a pleasant place to live in the hope of attracting the right kinds of skilled people that Harbin will need to grow.

Quality of life. While Harbin's air quality meets China's national standard of 0.10 micrograms of particulate matter per cubic meter, its untreated water per capita is 62 cubic meters per capita, second highest among the 14 case cities. The city's reputation and pollution levels were not helped by a 2005 chemical-plant explosion in neighboring Jilin Province that caused a benzene and nitrobenzene slick down the Songhua River toward the city. At the time, city officials ended up having to shut off all water for Harbin for several days while they tried to deal with the slick. Since then, Harbin has dug several wells to supplement its river water, and most locals agree that, because of this accident, the city has had unfair press on the pollution issue. Harbin recognizes that if the city is to attract skilled workers and companies, the local government will have to continue to address this misperception. The city already spends a relatively high 2.6 percent of GDP on preventing pollution compared with the Horizon 2 average of 1.7 percent.

Beyond pollution, Harbin's green space coverage is 18 square meters per capita, ahead of the Horizon 1 city average of 12 square meters but the least among its Horizon 2 peers we have investigated. With fewer cars than many other Horizon 2 cities, congestion is less of an issue than in many other fast-growing urban centers in China.

A migrant fruit seller

This 32-year-old migrant (with a full secondary education) comes from a rural area of Yushu County in neighboring Jilin Province and largely makes a living by selling fruit on the street from May to August. His family mechanized the family's 30-acre farm (where he still helps out at harvest time) and therefore needs only one laborer. This has freed him to come to the city to make extra cash. He makes a reasonable profit selling fruit on Harbin's well-known Guo Geli Street, making up to 80 renminbi a day or 2,000 renminbi a month. He gets up at about 4:00 a.m. every day to get the fruit from his wholesaler and works the street all day. At night, he goes back to his rented room and sometimes even surfs the Internet. His living costs amount to between 300 renminbi and 400 renminbi a month, of which about half goes toward housing expenses and the other half toward other basic necessities.

He has been coming to Harbin to sell fruit for eight years and plans to continue doing so. As a migrant, he doesn't receive any social benefits, except medical care, but this isn't a great concern. The lack of educational provision for migrants doesn't apply to him because his son still lives at home. Overall, he enjoys the city and believes that it has seen great improvements including more green space and cleaner roads. He has high hopes that it will get even better.

* * * * *

Harbin faces many challenges as it attempts to overcome its government-dominated economic history and takes full part in China's economic modernization. By transforming its industrial makeup, drawing in more skilled workers, and continuing to reduce water pollution and improve its image, the city aspires to fulfill its potential in the next 20 years.

6. Huhhot: Back from the wilderness

Huhhot (formal name Huhehaote), which means Blue City in Mongolian, lies on the Tumerchuan Plain of Inner Mongolia and enjoys a temperate climate. China chose the city to be the capital of its Inner Mongolia Autonomous Region in 1947, and it remains the cultural and political center of Inner Mongolia today. Dating back to the Ming dynasty, Huhhot is studded with fine Buddhist temples and ancient pagodas and is a major tourist attraction in the summer.

For many decades, the city had suffered from constant warfare, social instability, and a poor transportation system—unable to capitalize on its historical position as a trading hub on China's northern border, close not only to Beijing but also to Tianjin's port. Despite rich resources of coal, iron ore, nonmetallic minerals, electrical power, natural gas, and agriculture, Huhhot remained something of an economic backwater until 1999 when the central government launched its Great Western Development Strategy.

That shift was the breakthrough Huhhot needed to revive its role as a trading hub. Today the city not only has rapidly improving connections within China but also has a railway line that runs all the way to Europe. After a slow start, the city has been expanding strongly. Between 1990 and 2005, real per capita GDP grew at a rate of 12 percent to reach a level of about 27,700 renminbi at the end of this period. We categorize Huhhot overall as a late Horizon 1 city (Exhibit 1.6.1). The city's land use, urban planning, and industrial strategy are much more representative of Horizon 1, but its labor resources and infrastructure would qualify as Horizon 2.

THE BLUE CITY GAINS MOMENTUM AFTER A SLOW START

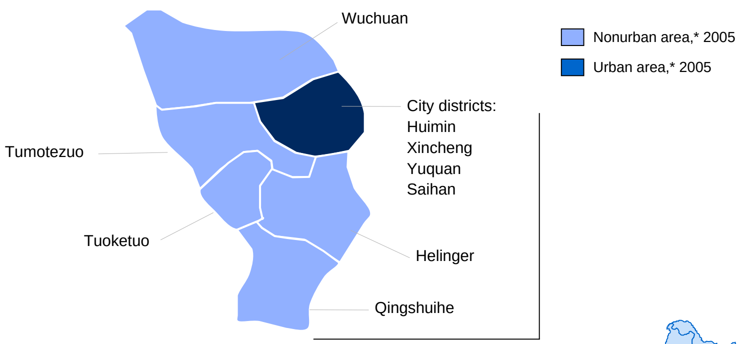
Huhhot wrote the first chapters of its urbanization story shortly after 1949 at the foundation of the People's Republic of China. At that point, the central government implemented a strategy to develop China's "minority" regions in order to stabilize them politically. As a result of being the capital of the Inner

Mongolia Autonomous Region, Huhhot received central government funding and a few key government projects in the 1950s and 1960s that boosted skills and technological support. By the 1970s, fixed-asset investment received a boost as more factories located in the city from Tianjin, Shanghai, and Yantai and a relatively well-established industrial base began forming in Huhhot with textiles, electronics, and food processing leading the way. Huhhot's trade and services industries also benefited from its proximity to Baotou, a major base of steel production for northern China. As a typical Horizon 1 city would do, Huhhot was broadly open to any business that was prepared to locate in the city and wasn't proactive in seeking industrial specialization.

Exhibit 1.6.1

Huhhot's vital urban statistics

MAP NOT DRAWN TO SCALE



Vital statistics

	1990	1995	2000	2005	2025
Urban area* km^2	2,054	2,054	2,054	2,054	2,054
Urban population Thousand	938	1,137	1,407	1,637	2,650
Real GDP/capita Renminbi thousand	5,025	6,661	8,849	27,710	81,774

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; as of 2005, no change in the urban area was applied by the National Bureau of Statistics.
Source: National Bureau of Statistics; McKinsey Global institute analysis

During the 1980s when China embarked on national economic reform, Huhhot's economy stalled as the central government's preferential policies shifted to its developmental priorities on the eastern seaboard. The city's industrial base had not sufficiently developed to motor ahead under its own steam. The city's state-owned textile companies and machinery manufacturing plants faced fierce competition and declining profits, and a number closed down; people moved out of the city in droves in search of work on the coast. From 1990 to 2000, Huhhot's population expanded from 0.94 million to 1.4 million, a growth rate of a mere 4 percent, while the rest of the urban Chinese population grew at 6 percent during the same period.

A visit to the city in 1999 by President Jiang Zemin—the same year that the central government announced its Great Western Development Strategy—marked the turning point in Huhhot's fortunes. China's president urged the city's leadership to "stay united, be proactive and innovative, and build Huhhot into a modern capital city." Having lagged behind the rest of China for much of the 1980s and 1990s, Huhhot's industrialization and urbanization took off. Indeed, Huhhot has enjoyed the most rapid economic growth of all China's provincial capital cities for six consecutive years. The city has embarked on a major city renovation and rejuvenation since 2001 in which the city has torn down most of the old commercial structures and replaced them with new commercial buildings, served by new roads. The built-up area of the city—land that has not just been designated as urban but also developed—doubled from 83 square kilometers to 143 square kilometers.

Between 2000 and 2006, Huhhot's real GDP grew from 12.4 billion to 53.7 billion renminbi, a compound annual growth rate of 28 percent. Services are the largest and fastest-growing sector of Huhhot's GDP. Huhhot's 2006 per capita GDP at about 32,200 renminbi was much higher than the all-China urban average of about 23,300 renminbi, and it has grown at a rate of 24 percent annually since 2000. Imports and exports have grown from just 46 billion renminbi in 1999 to 848 billion renminbi in 2005.

In future years, Huhhot's transition into being a full-fledged Horizon 2 city will depend on its ability to address key pressure points. These challenges include redrawing the zoning in its urban plan, providing greater social services and jobs for migrants, improving its industrial base, and attracting increasing FDI that is still relatively modest compared with coastal cities. If Huhhot effectively addresses these issues, it should be able to meet our trendline projections of an urban population of 2.7 million and per capita GDP of about 81,800 renminbi by 2025.

HUHHOT IS NOW SPRINTING TOWARD HORIZON 2

Huhhot's urbanization took on a qualitatively different character after the government launched its Great Western Development Strategy in 1999 and put in place the preferential policies that encouraged investment. At this point, the city government began developing more specialized industries, attracting new investment, and exploring linkages with neighboring cities. In short, after years of stagnation, Huhhot started to display some of the behavior more typical of a Horizon 2 city.

Land. Huhhot's ability to acquire and convert rural land has been limited somewhat in the past few years as central government restrictions have made the process increasingly difficult. In the recent past, however, the city provided preferential land policies in its industrial zone to attract businesses—offering discounts of 80 percent or more or some 400 renminbi per square meter (Exhibit 1.6.2). Some companies in particular industries can obtain free land if the investment they are making in the city is more than 50 million renminbi. Clearly, Huhhot is seeking to attract all forms of investment.

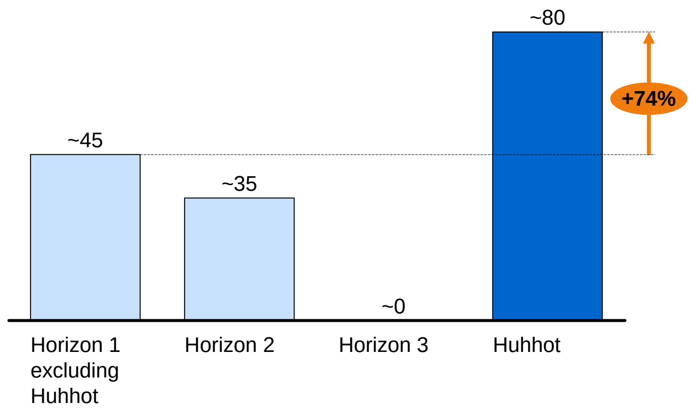
Exhibit 1.6.2

In 2000–04, Huhhot offered higher land discounts than other Horizon 1 cities

Estimated average land discount (vs. official minimum pricing) offered to businesses by local governments

%, 2000–04

QUALITATIVE ESTIMATE BASED ON INTERVIEWS



Source: Field interviews; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; McKinsey Global Institute analysis

Infrastructure. When President Jiang visited the city in 1999, its infrastructure lagged behind that of many other Chinese cities and planning was poor. Today the city's leadership puts a great deal of emphasis on urbanization and industrialization. In 2000, the city embarked on a major city-center building effort that has modernized its urban area. A member of Huhhot's construction committee told us, "We started rebuilding the 'city villages' in 2000, and the city has changed a lot since then." The city has placed a great deal of emphasis on improving the city's infrastructure, most notably by expanding its transportation system to create even closer network linkages with Beijing and Tianjin. It is opening a super railway to Beijing that will reduce travel time to three hours, and it is also increasing the number of trains on the Huhhot to Frankfurt line. Within the city, Huhhot has shifted its focus from expanding its basic infrastructure such as roads and bridges to increasing its resources and improving its public-transit system. Huhhot's shift of emphasis is already producing results. The city has increased its electricity supply by more than 70 percent over the past five years, and its per capita usage of public transit is three times that of the average Horizon 1 city.

Urban planning. The city plans to have ten industrial zones for businesses but still has *laissez faire* tendencies in terms of urban planning. One local government official told us, "Yes, we will have industrial zones, but we don't want to have complex urban planning to control where businesses locate. We want to let the city grow." As a result, the current city plan is one that seeks to place most of the city's industrial factories and plants between the second- and third-ring roads and locate Huhhot's main commercial and residential sector within the second-ring road. Even then, we were told during interviews that the reality is that development ends up being mixed in all areas of the city, which suggests that enforcement of zoning is only in its infancy. One expert we spoke with from the Huhhot Urban Planning Bureau said that the city government is not even sure that the model of zoning is a good one for some Chinese cities because strict zoning has its own problems. He mentioned traffic jams (as people travel from a residential zone to a commercial zone) and inequality (the commercial zone will likely be wealthier than the industrial zone). It remains to be seen in the future whether Huhhot will need to apply blank-sheet urban planning to relocate its industrial zones and factories.

Industrial strategy. Huhhot is in the relatively early stage of industrial specialization. The city is seeking to specialize in a few industries and attract investment through incentives. For example, the city first prioritized dairy as its pillar industry—China now knows Huhhot as China's "dairy capital." The city has also attracted new investment into the electronics sector by offering manufacturers preferential tax policies—including a five-year tax holiday for qualified high-tech companies—as well as through administrative support and provision of factory buildings. The city guarantees low-cost energy supply through its rich coal resources and wind power.

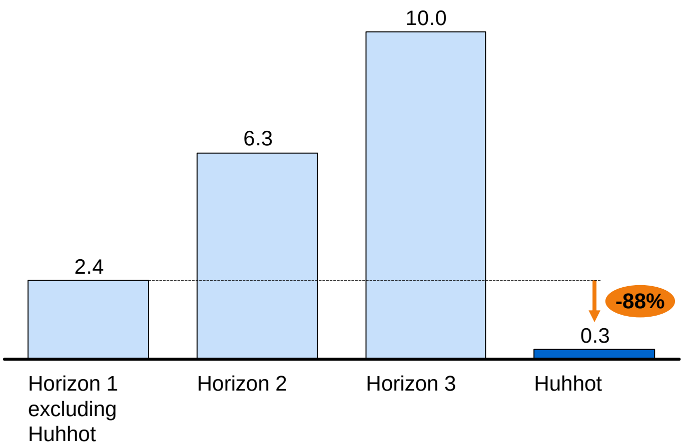
As a result, Huhhot's industrial base has shown progress. Huhhot's national-level economic development and technological zone, which includes the Ruyi and Jinchuan districts, has helped attract many high-quality firms especially in the manufacturing and technology sectors including China Mengniu Dairy Company Ltd., Inner Mongolia Yili Industrial Group Co., and TCL Electronic Appliance Co. FDI is also arriving—exemplified by the decision by Taiwan-based Hi-Pixel to set up its manufacturing base in Huhhot (see "Interview with Hi-Pixel"). The geographical location of the city makes it the perfect base for companies interested in trade with Russia and the rest of Europe; it can leverage a rail link with the neighboring countries that looks set to rapidly expand today's freight capacity of 50,000 tonnes a year.

Overall, Huhhot's six pillar industries—dairy, electronics manufacturing, power generation, biopharmaceutical industries, mineral chemicals, and machinery manufacturing—contributed 69 percent of the city's industrial value added in 2006. Today, Huhhot even ranks first in growth competitiveness among all the cities in China, according to the 2007 City Competitiveness Report. We should note that the "milk scandals" affecting China in the second half of 2008 may have heavy repercussions on Huhhot's economy in the near term.

However, the city's services and financial sectors remain underdeveloped (Exhibit 1.6.3). Many firms still lack accessible supply chains compared with those located in coastal cities, and, although transportation has improved, costs are still high.

Exhibit 1.6.3

Huhhot's financial sector remains underdeveloped
Finance sector share of GDP, 2005
%



Source: Field interviews; China City Statistical Yearbook 2006; China Statistical Yearbook 2006; McKinsey Global Institute analysis

Networks. Huhhot has long had some economic and cultural linkages both domestically and abroad, but the city is not quite yet a true national economic center. For example, Huhhot's foreign investment makes up 4 percent of GDP, in line with the Horizon 2 average. However, its rail and highway freight are on par with the Horizon 1 average of some 65 million tonnes per year (Exhibit 1.6.4). Additionally, the city has just a handful of international flights currently but the airport's new terminal will have the capacity to serve three million passengers a year by 2015 and will create a new freight air link with Russia and the rest of Europe. Last, the provincial government is investing in creating further transportation and economic ties among the Huhhot-Baotou-Erdos triangle. Combined with Huhhot's plans for enhancing its transportation links with Beijing and Tianjin, this deepening regional and national cooperation is likely to yield dividends and propel Huhhot forward.

Interview with Hi-Pixel

Hi-Pixel, a Taiwan-based LCD-TV manufacturing firm, set up its manufacturing facilities in Huhhot's Ruyi Economic Development District in October 2006 and is the "largest foreign enterprise supported by the Inner Mongolian government," according to an interview with the company's managing director. Hi-Pixel, which has a sales branch in Shenzhen and another in California, now has its main manufacturing facilities in Huhhot where its total investment is $10 million. Today the company has an annual capacity of two million LCD televisions, all of which it exports, with Wal-Mart a major customer.

There are several reasons why Hi-Pixel decided to locate in Huhhot after performing cost-benefit valuations among many different cities in China. The city government's support for high-tech firms—offering them an extended tax holiday of five years, cheap rents for those companies locating in Huhhot's economic zone, and help with customs relations—was pivotal. Second, Hi-Pixel was attracted by the city's strategic location close to both Beijing and Tianjin whose port is essential to the company's overseas shipping. The direct, once-a-week freight train to Frankfurt was another factor. Last, input costs are much lower in Huhhot; labor costs are just one-third of those in Beijing or Shanghai.

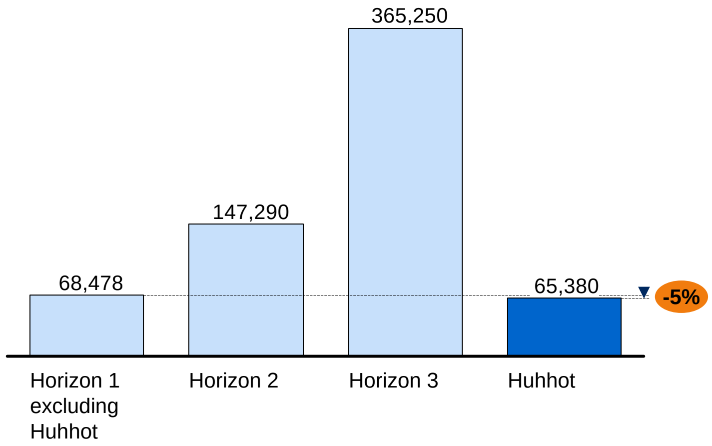
The managing director of Hi-Pixel's Huhhot factory was very positive about the company's experience in the city. He said that the quality of workers available is relatively good and that the company has already hired 130 line managers. The only problem is that most of the company's supply chain still comes from the southern coastal regions where the majority of Hi-Pixel's component manufacturing factories are still located. This bumps up costs. The managing director said that he hoped that Huhhot would continue to build the city's manufacturing base so that Hi-Pixel could one day make all the components in the city.

Exhibit 1.6.4

Huhhot's railway and highway freight tonnage is on a par with the Horizon 1 average

Railway and highway freight

Thousand tons, 2005



Source: Field interviews; China City Statistical Yearbook 2006; China Aviation Statistics Yearbook 2006; McKinsey Global Institute analysis

Labor and skills. Huhhot is well served with 19 institutions of higher learning; therefore, unlike in many other developing Chinese cities, talent shortage is not currently an urgent issue—and is not likely to be in the future. Additionally, the city has special benefit packages such as housing incentives to attract managerial talent to the city. However, as the city develops and contends with greater demand for labor, it may find that it will have to put in place a better social safety net for migrant workers. Several Huhhot experts we interviewed suggested this was a pressure point for Huhhot and that better health care and education benefits may prove to be the key to attracting additional basic labor. Nevertheless, Huhhot's basic labor and skills seem comfortably sufficient to allow the city to keep growing in the coming future.

Quality of life. Although the city's real per capita GDP is well above China's poverty line, Huhhot still has several challenges on this lever. The city invests only 0.2 percent of its GDP in pollution prevention, for instance, and its drinking water is largely from underground sources that risk running dry because of the city's rapid population growth. Income inequality is becoming an issue and has become more pronounced as the number of rural migrants coming to the city increases, creating, in the view of city leaders, intensifying pressure on the provision of social services and on Huhhot's infrastructure. One can travel to areas that are relatively close to the city center and find many people living in poverty. While we cannot describe such areas as slums, there is no doubt that many of the city's migrants live in difficult conditions and that public-service provision is patchy at best. Interviews with migrants reveal a real desire for increased support from the government for education and health care (see "An interview with a migrant noodle maker").

An interview with a migrant noodle maker

During a visit to Huhhot, we came across a decrepit compound only 2 kilometers outside the city where as many as six people from migrant families were living in concrete boxes. We spoke to a man making noodle sheets in a tiny room. Li Sung Loong is 39 years old and had moved to Huhhot three months before at the recommendation of his brother who also lived in this compound and who had been in Huhhot for some time. Sung Loong comes from a small rural community about 150 kilometers from Huhhot. The main impetus for his move was the promise of a higher salary that he had heard could run to 2,000 renminbi per month. This monthly wage is enough to send both his daughters to school back in his hometown, where his wife and parents are taking care of the family farm.

Although he is making more money in the city than he would at home, he is unhappy with life in the city—and particularly this compound. He said he receives no social benefits at all and has had his cell phone and money stolen. He would like to bring his daughters to Huhhot but worries about the fact that migrants have to pay much higher tuition fees than do residents. He is also highly dissatisfied with city officials who had done nothing to increase safety in his compound—or indeed organize rubbish collection. Despite earning more in the city, he would far rather live at home.

* * * * *

After two decades of rather inconsequential growth, Huhhot's urbanization trajectory has swung upward since 2000. With the help of the central government's Great Western Development Strategy, the city has pushed itself toward the latter part of the Horizon 1 spectrum and appears well positioned to continue to grow and develop into a Horizon 2 city. In terms of skills and basic labor as well as infrastructure, Huhhot should qualify as a Horizon 2 city. However, in the key areas of urban planning, land use, and quality of life Huhhot still acts as a Horizon 1 city and has much work to do to improve its own management of the challenges that it faces to clinch its position in Horizon 2. Nevertheless, Huhhot undoubtedly possesses a strong set of comparative advantages, notably those stemming from the Great Western Development Strategy's preferential policies.

7. Nanchong: A future run on gas?

Nanchong is a city in the northeastern area of the mountainous province of Sichuan along the middle stretch of the Jialing River. The city lies between Chengdu, the provincial capital, to the west and Chongqing, one of China's major industrial powerhouses. It is most renowned for its silk and fresh fruit.

The city falls under the umbrella of central government's Great Western Development Strategy and is working hard to leverage its existing major industries that include textiles, gas, and automobile parts. Arguably the most significant development for the city is the 2007 discovery of a large store of gas reserves (by far the largest gas field in China so far), a finding that could change the city's industrial development in future years, shifting it toward a "cleaner" industrial structure and giving the city potentially more appeal for investors and an opportunity to ease growing pollution issues in the area.

We classify Nanchong as a late Horizon 1 city. Although its land policies are more typical of Horizon 2, Nanchong's usage of the other six levers of urbanization is characteristic of Horizon 1 behavior.[6]

NANCHONG'S INDUSTRIAL DEVELOPMENT IS AT AN EARLY STAGE

Nanchong's economic development took off when it became an official city in 1993. Between 1993 and 2005, Nanchong's urban GDP posted a compound annual growth rate of 14 percent to hit 10.6 billion renminbi in 2005. Per capita disposable income and consumption, however, have expanded by only 6.3 percent and 5.3 percent a year to reach about 2,800 renminbi and 2,200 renminbi, respectively. This leaves the wealth of Nanchong's citizens significantly

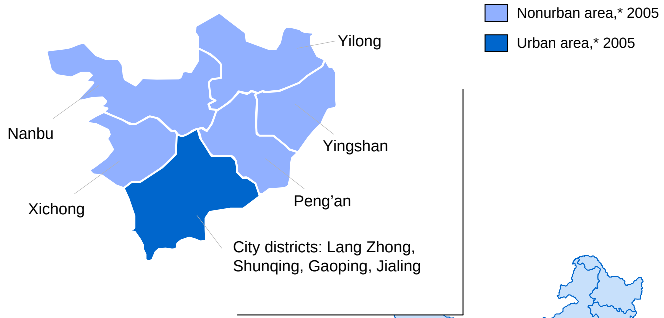
6 Nanchong was only indirectly affected by the Sichuan earthquake in 2008. Most of its utilities and gas facilities were largely unaffected, although some residential and commercial infrastructure were damaged. Like Chengdu we do not expect its pace of urbanization to significantly slow down as a result.

below that of many other cities in China, suggesting that the city still has huge potential to urbanize further. Per capita GDP has grown very slowly especially from 1995 to 2005 (at only 1.1 percent per year) compared with other Chinese cities to reach about 5,700 renminbi against the Chinese average of about 20,900 renminbi (Exhibit 1.7.1).

Exhibit 1.7.1

Nanchong's vital urban statistics

MAP NOT DRAWN TO SCALE



Vital statistics	1990	1995	2000	2005	2025
Urban area* km^2	2,527	2,527	2,527	2,527	2,527
Urban population Thousand	189	818	1,772	1,860	2,518
Real GDP/capita Renminbi	3,720	5,109	3,842	5,676	21,568

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; as of 2005, no change in the urban area was applied by the National Bureau of Statistics.
Source: National Bureau of Statistics; McKinsey Global institute analysis

Over the same period, fixed-asset investment increased at a compound annual growth rate of 23 percent largely due to substantial infrastructure investments, mainly in the city's transportation system, and real estate. The proportion of fixed-asset investment in the city's GDP has grown dramatically from 21 percent in 2000 to 40 percent in 2005.

On the back of all these developments, the city has urbanized at a rapid pace. Its population increased at a rate of 11 percent between 1993 and 2005, mainly driven by strong migration encouraged by rapid industrial development. Even now, however, more than 60 percent of the city's labor force is farmers. Yet the agricultural share of GDP has declined from 24 to 16 percent since 1995. Like much of urban China, Nanchong's industry remains rather limited and unstructured, and a relative lack of accessibility to the city is making it difficult to attract more business. Another pressure point is that the city has been acquiring large swaths of countryside, leading to rising unemployment among farmers. The restructuring of SOEs is also contributing to rising joblessness.

NANCHONG HAS A FULL AGENDA TO RAISE CITIZENS OUT OF POVERTY

Nanchong's urban real GDP is projected to grow at 8.5 percent per year over the next 20 years to reach 54 billion renminbi, in line with the average growth exhibited by Chinese cities. However, the city still faces some key pressure points that it will need to address to sustain this economic development. The city belongs to the early phase of Horizon 1, exhibiting typical behavior for this stage of urbanization across all levers with the exception of land. Its development in the future will largely rely on its continued industrialization through attracting business investment.

Land. Nanchong's city government has driven urbanization by buying and selling land at discounts of between 50 percent and 70 percent to potential industrial investors. Due to the large amounts of land the city government has been able to sell, funds from these sales have accounted for more than 50 percent of the local government's revenues in some years. The city has used this source of revenues to upgrade the inner-city infrastructure, build special economic zones, and build housing for farmers displaced by Nanchong's aggressive acquisition of land. However, this source of revenues is now under a tight squeeze due to increasing central government regulations, and the city government is looking for additional sources for funding. So it is fortunate that, since 2000, Nanchong has had central government support as part of the Great Western Development Strategy and has seen the location of several national projects in the city including the construction of new nuclear power plants. While the question remains open whether Nanchong will have sufficient revenues in future years to finance urbanization, the city does continue to plan to sell land as much as possible.

Infrastructure. One government official told us, "The basic construction of transport links like railways and highways has been the main driver of Nanchong's urbanization and growth since 1998." In the past Nanchong's industrialization has been limited partly because of the city's relative inaccessibility; for instance, it took two days to travel to the city of Chengdu across mountainous terrain, a factor that was a significant deterrent to potential business investors in Nanchong. That situation has changed dramatically with the construction of a rail link with Chengdu and Dazhou in 1998 and the more recent construction of a new highway to Chengdu in 2006 that has cut the travel time between the cities to less than three hours. Communication between Nanchong and neighboring cities has improved significantly, and now the city is becoming one of the key transport hubs of northeastern Sichuan. In coming years, Nanchong's government will focus on upgrading its power grid to make sure that the supply of power keeps pace with industrial development.

Urban planning. In the past Nanchong had very little organized urban planning. Developers tended to come to the city because of cheap land prices, but there was little attempt to plan construction in a sustainable way. According to the urban planning bureau, for instance, developers have tended to shy away from constructing tall buildings because these are more time-consuming and costly and investors were typically looking for short-term returns. Although the city has begun to rectify shortcomings in its urban planning with the building of three special economic zones outside the city limits, soaring real-estate activity and the rising price of land suggest that the city could soon hit bottlenecks. As the population grows, the city will need more land for housing but may well find that there is a shortage of available land to develop. Additionally, today many factories are still dispersed in the areas surrounding the city center, and the overlapping of industrial and residential zones may create the same congestion and pollution that have arisen in similarly laid-out, expanding Chinese cities.

Industrial strategy. Silk and textiles are the main industries today in Nanchong. The textile industry has a particularly long history in the city—indeed it was Nanchong's only main industry from the 1950s to the 1980s. Other industries are now emerging including the rapidly growing auto-parts sector—Dongfeng Nanchong Automobile Co. Ltd. is a famous brand throughout China—as well as petrochemical and agricultural product businesses. Nanchong is also a trade center for the northeast of Sichuan Province. The city's Guangcai trading market covers one million square meters and has received investment of one billion renminbi. However, in general Nanchong has pursued a policy of welcoming all comers to the city and has not to any great extent pursued industrial specialization, although this is beginning to change. The city's new economic zones aim to attract specific industry clusters based on the city's four existing main industrial sectors. Nanchong still has preferential tax and land price policies in place to attract business. The discovery of a very large gas field around Nanchong has the potential to change the city's industrial profile and growth prospects dramatically in future years.

Networks. New roads connecting Nanchong not only with Chengdu but also with Chongqing are helping to facilitate economic ties between these cities. Moreover, Nanchong has set up business consulting offices in both neighboring cities in an attempt to provide more information about Nanchong in the hope of attracting more business to the city. However, in terms of highway and rail freight, Nanchong's tonnage at 21 million is less than one-third of the Horizon 1 average. The city's small domestic airport has fewer than five flights a day.

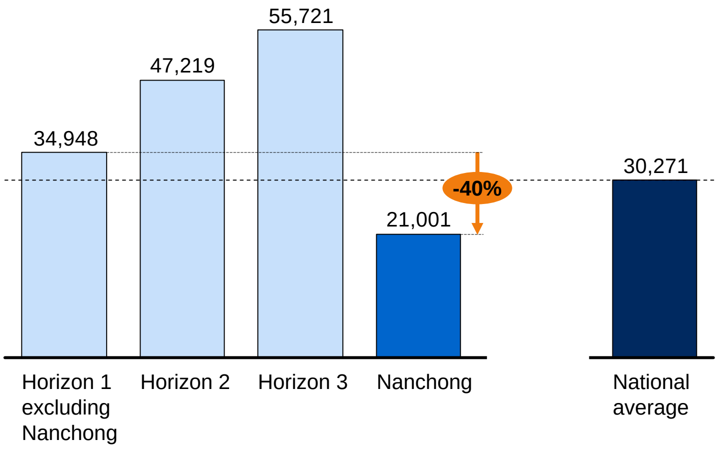
Labor and skills. Today local farmers make up 60 percent of the labor force in Nanchong. While there is no current labor shortage, Nanchong is already offering *Hukou* permits to migrants who come to work in the city to broaden the labor supply. While labor costs remain extremely low—less than 9,000 renminbi per year for an unskilled worker—there is still a large influx of displaced farmers who would benefit from the increased wage and potential for *Hukou* status. In terms of skilled labor, it is very difficult for Nanchong to both attract and retain workers as the average income level hovers around 21,000 renminbi, among the lowest of our case cities (Exhibit 1.7.2). Boosting retention rates from the city's five universities and colleges could help build the city's skilled-labor force (see "Interview with Mr. Wu—hotel key-account coordinator").

Exhibit 1.7.2

Nanchong's average skilled-labor wage is the lowest of the case cities

Skilled-labor average per annum wage*

Renminbi, 2005



* Skilled labor includes finance, IT, and science; unskilled labor includes mining, manufacturing, and construction.
Source: China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Quality of life. With one of the lowest per capita income levels of our 14 case cities at less than 2,800 renminbi, Nanchong's residents on average are still living rather close to the national poverty line at 1,700 renminbi (Exhibit 1.7.3). The city's residents suffered particularly when the textiles industry went through a bad patch in the mid-1990s and many thousands of workers lost their jobs. Today the restructuring of SOEs is leading to significant job losses as new managements attempt to cut costs and increase efficiency. Exacerbating high unemployment is the fact that aggressive land acquisition from around 1995 has led to more than 170,000 farmers becoming homeless, with little prospect of these people being able to buy a house because of soaring real-estate prices.

Many of these displaced agricultural workers have also joined the ranks of the unemployed as there are not enough job opportunities in Nanchong to absorb these relatively unskilled people.

All of these effects combine to place increasing pressure on the local government. In 2005 the government spent 0.38 billion renminbi or some 3 percent of GDP on providing basic housing for homeless farmers. In addition, the city is paying these displaced farmers monthly stipends to ensure that they have a minimum basic living standard. Nanchong is also trying to provide training to the unemployed. The city does have other growing pressure points such as pollution—Nanchong's worsening air and water quality are more or less on par with other Horizon 1 cities. However, the city's current focus is on dealing with poverty, displaced farmers, and the high level of unemployment rather than tackling pollution.

Interview with Mr. Wu—hotel key-account coordinator

Mr. Wu is 23 years old and came to Nanchong to attend university, majoring in administration management. He chose Nanchong because his aunt had studied at the same university and recommended the city's good education system.

He joined Wantai Hotel, one of the best in Nanchong, immediately after graduation as the key-account coordinator for VIP customers. He is fortunate to receive the health insurance and pension package that Wantai Hotel offers those in managerial positions. Others, such as waiters and receptionists, unfortunately do not receive the same benefits. Mr. Wu's basic salary is 800 renminbi per month with 400 renminbi to 500 renminbi extra depending on whether he receives a performance bonus. He actually earns more than most of the staff, but he still spends almost all the monthly salary on housing, food, phone, the Internet, and entertainment. He finds it very hard to save money with his current income and is worried he would be short if something unexpected happened. He likes his job and feels he is gaining valuable experience—although he concedes the pressures of a new job can be challenging.

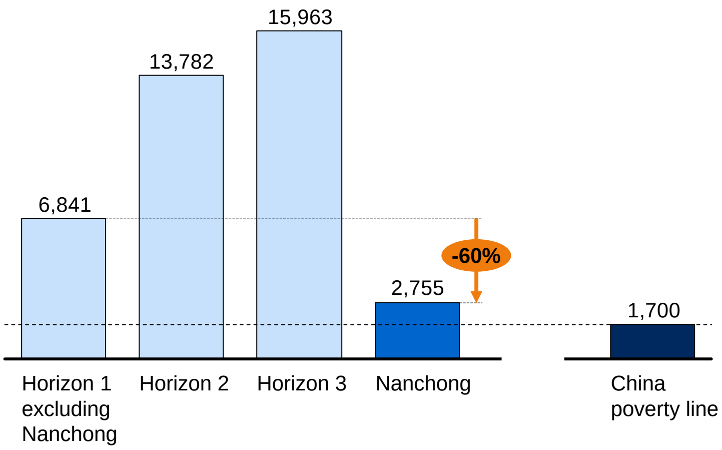
In the near future, he would like go to Chengdu to hunt for jobs together with his girlfriend when she graduates from university. Ultimately, while he likes Nanchong, he thinks that he could earn at least twice as much in Chengdu and learn more. However, he does not plan on returning to Luoyang, his hometown. Rather, he is trying to leverage his contacts in Sichuan Province to earn the greatest possible income to help support his parents.

Exhibit 1.7.3

Nanchong's citizens are living above the poverty line, but their standard of living is still far below average of Horizon 1 cities

Annual per capita disposable income

Renminbi, 2005



Source: China Population Information Network (POPIN); McKinsey Global Institute Indicator model; McKinsey Global Institute analysis

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As a poor city with difficult social issues, Nanchong's challenges are clear. However, the discovery of one of the largest natural gas fields in China means that the local government is highly confident about the city's future development. But until this gas find bears fruit in terms of new investment and industrial opportunities, the city faces the task of improving the city's quality of life on a limited budget.

8. Shanghai: A modernizing city on course to become a supercity

Shanghai was the financial and cultural center of the Far East for many decades and became the lodestone of economic liberalism for colonial powers such as France and England. By the early 20th century, the city had become the third-largest financial center in the world behind New York and London. The Cultural Revolution in the 1960s and 1970s brought an end to this golden era as heavy taxation and the closure of the city to international investment took a heavy toll. Now Shanghai has risen yet again, reinventing itself as the poster child for China's modern economy.

No other city in China so completely represents the success of the country's economic reforms. "Shanghai is China's modern portal of the 21st century where modern-day travelers come to catch glimpses of the new People's Republic," says the *Lonely Planet* city guide. Shanghai is China's capital of commerce, a teeming, flashy metropolis whose entrepreneurial verve, as much as its skyline, reminds one most of Tokyo.

Shanghai has capitalized on the natural advantages of its geography. It sits conveniently on China's eastern coast with easy access by sea to both other parts of the country and all over the world. Sitting at the heart of the trading and economic powerhouse of the Yangtze River Delta, Shanghai accounts for one-quarter of China's burgeoning trade. It is the only city among our case cities in China that we can describe as Horizon 3—a full-fledged modernizing city.

ECONOMIC LIBERALISM HAS FUELED SHANGHAI'S RENAISSANCE

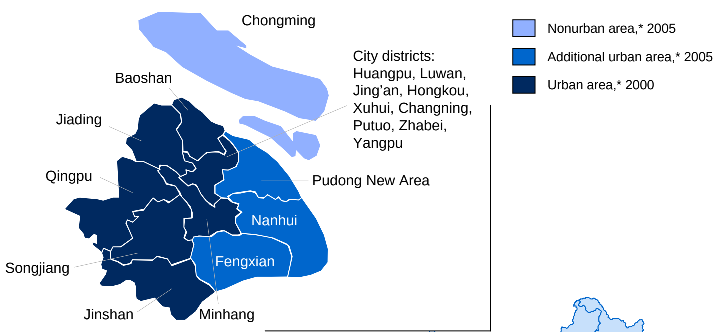
Shanghai was a successful, international city in 1949 when the People's Republic of China was born but was destined to go through a period of economic stagnation, isolation, and painful industrial restructuring during the Cultural Revolution in the 1960s and 1970s. It was only in 1984 that Shanghai became one of 14 Chinese coastal cities opened up to foreign investment and in 1990 that the government opened the Shanghai Pudong New Zone (the Zone). This zone conferred even more valuable freedoms than those enjoyed by special economic zones. In addition to the right to reduce or eliminate customs duties and income taxes, after 2001 the new Zone allowed foreign businesses to open up financial institutions and run some types of industries. The Zone also meant that Shanghai could set up a stock exchange and allow foreign banks to deal in renminbi. The Zone also offered a tax reduction of 10 percent and more to foreign direct investors coming to Pudong. As early as 1990, the city had established the Caohejing high-tech special development zone; in 2001, Shanghai opened the Zhangjiang Science Park.

And so the city's extraordinary renaissance began. Over the past 15 years in particular, we have seen remarkable growth in both Shanghai's urban area and in real per capita GDP (Exhibit 1.8.1). Shanghai's economic profile has changed dramatically in a few short years. Today the majority of economic activity is in services; the employment profile has also shifted from one dominated by industry to one in which nearly 60 percent of workers are in the services sector (Exhibit 1.8.2). Shanghai is also China's largest trading center, accounting for 25 percent of the country's trade. Because of the success of the Shanghai stock market, which accounts for 87 percent of China's national stock market, the city receives 25 percent of the country's national financial investment.

Exhibit 1.8.1

Shanghai's vital urban statistics

MAP NOT DRAWN TO SCALE

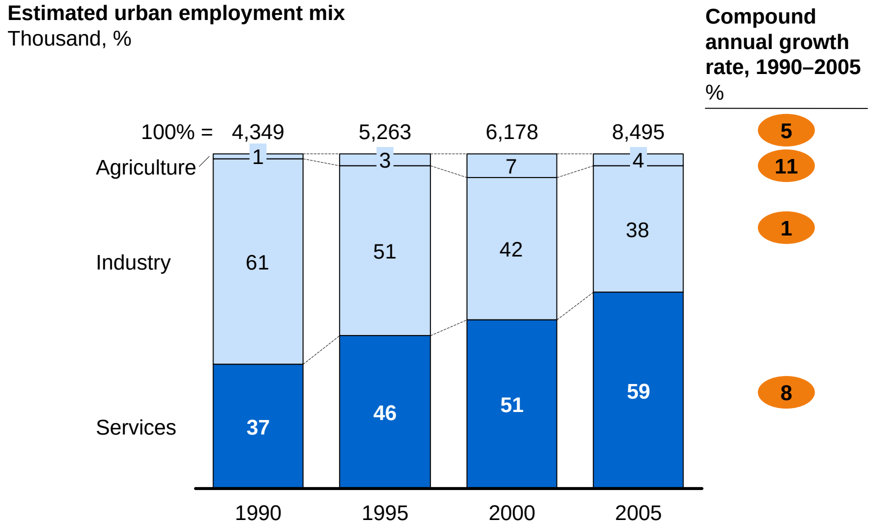


Vital statistics	1990	1995	2000	2005	2025
Urban area* km^2	750	2,057	3,924	5,299	5,299
Urban population Thousand	8,206	11,103	14,349	17,130	25,075
Real GDP/capita Renminbi thousand	12.30	19.15	28.56	45.19	157.72

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; in the case of Shanghai, its urban area was updated by the National Bureau of Statistics in 2001.
Source: National Bureau of Statistics; McKinsey Global institute analysis

Exhibit 1.8.2

Shanghai's employment profile has shifted dramatically toward services over the past 15 years



Note: Numbers may not sum due to rounding.
Source: Census 1990; Census 2000; Shanghai Statistical Yearbook 2006; China Urban Statistical Yearbook 2006

In 2005, Shanghai's real per capita GDP was about 45,200 renminbi, attaining the rank of 19th among all of China's 849 official and unofficial cities. However, annual growth in the city's real per capita GDP of 9.1 percent over the past 15 years has outstripped the all-China city average of 8.5 percent. By 2025, we project that Shanghai's real per capita GDP will be about 157,000 renminbi—vaulting the city to 9th in the rankings. The city's population expanded at an annual rate of 5.0 percent over the past 15 years, somewhat slower than the average of Chinese cities of 5.6 percent. By 2005, the population had reached 17 million, and we project this to grow to 25 million by 2025—second only to Beijing.

SHANGHAI IS CHINA'S ONLY TRULY MODERN CITY THUS FAR

Shanghai separates itself from the rest of our case cities in several respects. It has "denser" land planning focused on vertical growth, promotes the private sector more actively, and pursues urban planning on a metropolitan-wide and region-wide level. Shanghai has been more successful than Beijing, the next-closest case city to Horizon 3 status, in improving the quality of life of its inhabitants even as the city has expanded rapidly. Shanghai's subway today is the longest in China and has more stops than the system in Beijing, which reduces—but does not eliminate—congestion, and it spends substantial amounts on education and health care. Shanghai rates as a Horizon 3 city on all seven dimensions we studied.

Land. Land available for industrial development is now becoming very scarce in Shanghai, and land prices have soared. Over the past five years, the price has more than doubled to 6,478 renminbi per square meter for commercial buyers and 3,973 renminbi per square meter for residential land in 2005.[7] These are the most expensive prices in China, and many businesses have already moved out to surrounding cities for this reason.

The fact that Shanghai no longer provides any preferential policies for businesses to attract them to the city is evidence that land is becoming scarce. In the late 1990s, the government had offered a "blue-stamp *Hukou*" for people buying homes in Shanghai—a temporary *Hukou* upgraded to official *Hukou* status within five years. The idea was to boost the real-estate industry, but this policy ended in 2002. The city is no longer expanding aggressively horizontally; instead, the authorities are building vertically a skyline that rivals that of New York. The private sector is increasingly involved with decisions about development. For instance, the city government invited the chief executive of a prominent local real-estate company to make representations on the positives and negatives for industry in the 11th Five-Year Plan, as well as to participate and provide input to development planning in key private-public collaborative initiatives that shape the urban future of Shanghai.

The city has in some cases started to regard the development of land as a tool for attracting business as well as enhancing the city's aesthetics. For example, because the area was home to the First Communist Party Congress and Chairman Mao Zedong ordered the hall to be preserved, the city strongly supported a property development company restoring the old tenement buildings instead of replacing them with another skyscraper. This area called Xintiandi is now a popular entertainment and nightlife haunt and is held up as a development model to emulate. Last, the city is also considering implementing rent controls and stabilization in the future in order to ensure housing remains affordable for those employed in lesser-paying jobs—a practice seen in many dense, modern cities such as New York.

Infrastructure. Shanghai already had the most advanced infrastructure in China, but, as its reputation grows as an international business center, the city has been spending 10 percent of its GDP on infrastructure in recent years, of which 40 percent has been on transportation. Transport efficiency is a top priority. One major project is the extension of the city's subway with six more lines due to open in 2010; the length of track will quadruple in size by 2020. Even

7 We derive these land prices from China's land-price dynamic monitoring system.

at its current size, the city's subway carried an estimated 640 million people in 2007—equal to some 40 percent of the entire population of China. This accounted for 13 percent of Shanghai's total transit in that year. By 2012 some estimates project that the subway will account for 45 percent of total transit in the city. While such an increase over a five-year period is certainly admirable, to some extent it is necessary for a modernizing megacity such as Shanghai if the city is to avoid severe congestion issues. In Tokyo, for instance, nearly 80 percent of transportation is public. In our interviews, government officials confirmed this necessity, with one saying, "As a megacity, Shanghai should develop advanced and large capacity transportation system relying on rail."

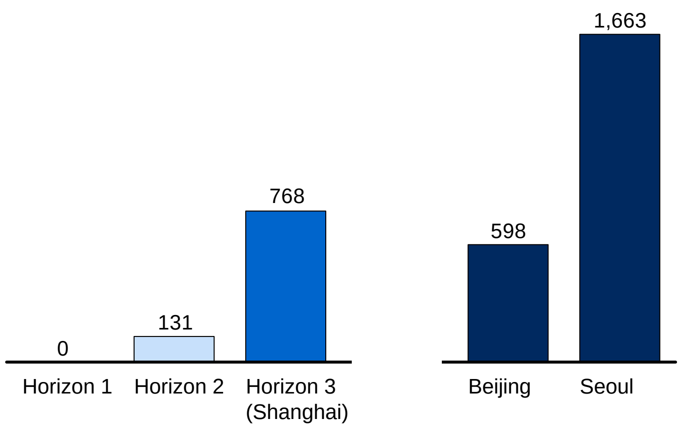
Urban planning. Shanghai's urban planning has gone well beyond the city "proper." Planning now embraces not only the city center but also the surrounding nine counties that make up its metropolitan region and covers issues including intercity transportation and the location of factories. Indeed, Shanghai's planning is taking on the character of a regional policy that includes neighboring cities such as Nanjing with current policy favoring the location of factories or other businesses in such cities as long as there are efficient transport and communications connections with Shanghai. Within the urban area itself, Shanghai has already created Pudong as a new city center to ease the pressure on the city's northwestern districts commonly referred to as Puxi west of the Huangpu River. Building restrictions, the protection of green space, and the encouragement of entertainment or shopping zones all provide evidence that city officials are trying to encourage sustainable growth and development within its urban plan. Additionally, the upcoming Shanghai Expo 2010 has a buzz of urban renewal activities (e.g., the new international expo center promises state-of-the-art facilities for trade shows, exhibitions and conferences) that would further enhance Shanghai's status as a world-class urban center.

Industrial strategy. Shanghai has been moving traditional manufacturing outside the city in a sustained way at the same time as welcoming services and modern manufacturing into the city center. The share of the city's GDP taken by services has accordingly risen from 37 percent in 1990 to 50 percent in 2005—and its share is around 75 percent in the city "proper." While this is still short of international services centers such as Tokyo (83 percent) or New York (92 percent), the services share of the economy is high by Chinese standards. The financial sector alone accounted for 10 percent of GDP in 2005 as the Shanghai stock exchange is the largest one in mainland China. More than 300 of the global Fortune 500 companies have a presence in Shanghai, and in 2006 alone 154 multinational companies located their regional headquarters in Shanghai. Among the city's other attractions, Shanghai offers businesses, including those engaged in international trade, the most consistent and thorough legal protection of all the major cities in China. Last, consumption has become a driving factor in the economy, increasing by more than 30 percent since 2000 to about 11,800 renminbi on a per capita basis in 2005.

Networks. Shanghai's networks both domestically and internationally are world class. Within China, Shanghai and the Yangtze River Delta are arguably the best example of an efficient hub-and-spoke model. The city sits in the middle of a very close-knit cluster of economic centers on the delta, which has driven growth in the entire region. An example of this success is the city's cooperation with Zhejiang on the Yangshan deepwater port project that has enabled Shanghai to overtake Singapore to become the biggest cargo port in the world in terms of volumes. Economic links extend to every continent of the globe, such as the recent signing between the Yangtze River Council and the Bay Area Council from San Francisco for a $200 million fund that will focus investment in Shanghai's region. Shanghai's transport links are extremely well developed. For instance, by 2006, 100 international airlines were flying 768 weekly flights to the city, the most in China (Exhibit 1.8.3). Shanghai's ports connect to 300 other international ports.

Exhibit 1.8.3

Shanghai has the most international flights of any Chinese city
Weekly international flights, 2006



Source: OAG (Official Airline Guide) Worldwide Limited; McKinsey Global Institute analysis

Beyond its economic and transportation ties, Shanghai's cultural network is quite strong, due in part to its success in building international brand recognition through its hosting of major international events such as Formula 1's Grand Prix, the Special Olympics in 2007, MTV's Asian Music Awards in 2007, the Tennis Masters Cup in 2008, and the World Exposition in 2010. All of these events encourage tourism and business to the city.

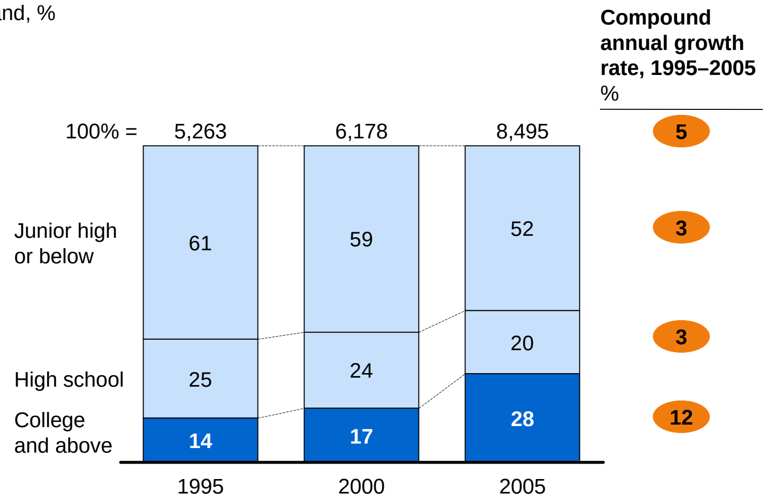
Labor and skills. Shanghai has all the skills it needs to feed current growth. Many high school graduates come to Shanghai for their college education every year while Shanghainese students are reluctant to go to other cities. Not only does the city have access to 100,000 or more graduates from 60 higher-education institutions every year but it also sees huge migration from surrounding cities and provinces. Shanghai has actually put in place a scoring *Hukou* system designed to give residency only to migrants with sufficient skills so that the city attracts only the best. One recent university graduate in Beijing told us, "All of China's talents want to go to Beijing or Shanghai for jobs. That is why there is such an oversupply in these cities." And a leading academic said, "Everyone wants to move to Shanghai." As a result, more than one-quarter (28 percent) of Shanghai's labor force has a college education—double the proportion a decade ago (Exhibit 1.8.4). The city is also beginning to attract talent from overseas—the expatriate community is half a million strong.

Exhibit 1.8.4

The share of Shanghai's labor force with college degrees has doubled in the past decade

Employment breakdown by education

Thousand, %



Source: Census 2000; Shanghai Statistical Yearbook 2006

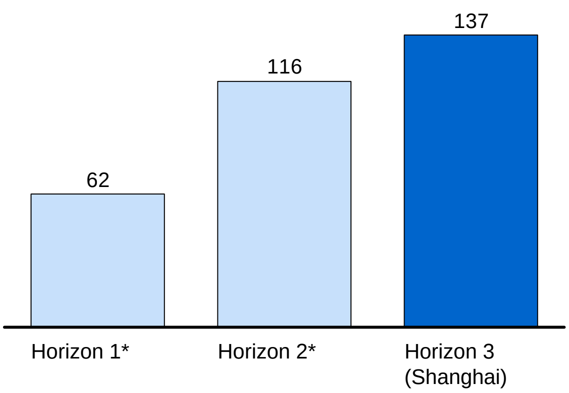
Quality of life. Shanghai has taken a number of initiatives to improve people's quality of life, especially that of migrants. The city launched a social security and health care program for migrants in 2003, and the coverage rate of this scheme has increased from 15 percent at the beginning to 43 percent in 2005. Higher spending on health care and education is typical of cities as incomes increase, and Shanghai's spending on these social benefits has responded accordingly (Exhibit 1.8.5). Moreover, the city has now made education compulsory for migrants' children, giving parents certificates to help them pay for schooling.

Exhibit 1.8.5

City government investment in education and health care increases across the horizons

Government per capita spending on health care and education

Renminbi thousand, 2005



* Horizon 1 data from Suzhou, Taiyuan, and Taizhou; Horizon 2 data from Chengdu and Beijing.
Source: Field interviews; China Urban Statistical Yearbook 2006; China Financial Statistics Yearbook 2006; McKinsey Global Institute analysis

In spite of the mass influx of people, average living space per capita in the city has increased from 6 square meters in 1990 to 22 square meters in 2005 as the city's vertical construction boom has provided more and more housing. The city is also attempting to combat congestion with a bidding system for car number plates to limit ownership of private cars, which has been growing at more than 30 percent a year over the past three years. Measures taken so far have not appeared to have much impact on traffic volumes, and the city is considering more drastic action including a possible congestion charge.

* * * * *

If Shanghai continues to reap the advantages of its enviable position at the center of the Yangtze River Delta by deepening its regional networks, possesses relative autonomy to set its own economic course, and succeeds in its efforts to combat the pressure points of rapid urbanization, the city, already a Horizon 3 city, is on course to become one of China's first supercities with a population of 27 million by 2025—putting it on par with some of the greatest cities in the world.

9. Shenzhen: From village to megacity

Once a little fishing village in the Pearl River Delta, Shenzhen has been unique in its urbanization and economic-development story having enjoyed unparalleled comparative advantages. Due to its proximity to Hong Kong to the south, China's late paramount leader Deng Xiaoping singled the city out to become China's first-ever SEZ in 1979, pioneering his policies of economic reform and renewed openness. In the slightly less than three decades since it became an SEZ, Shenzhen's urban population has grown from 94,000 at the end of 1980 to an astounding 8.3 million in 2005—roughly 80 percent of whom are migrants. This annual growth rate of 19.6 percent is one of the fastest rates of population expansion registered by any city in the world.

Shenzhen is a hub city in one of China's most dynamic clusters that includes Guangzhou and Hong Kong and will become one of the major megacities shaping China's urban future. As one of China's most dynamic economic powerhouses, Shenzhen has a strong entrepreneurial spirit and attracts talented workers from all over the country. "One high-rise a day and a boulevard every three days" is a famous quote summing up the city's astonishingly rapid development in the 1990s.

As the first SEZ, the city has long enjoyed strong central government support, preferential policy incentives, ample capital injections, and an extremely advantageous location, all of which have fueled its dynamic growth and vaulted the city into the late stages of Horizon 2.

SHENZHEN WAS CHOSEN TO PIONEER ECONOMIC REFORM

The city's development began in earnest in 1980 when Shenzhen became an SEZ and subsequently, in 1988, was designated a provincial city by the State Council of China. This latter development meant that the city gained a provincial-level economic administration and the right to offer many preferential policies including the rights of tax reduction and exemption to business entities. The results were dramatic—between 1980 and 1992, FDI flooded into the city at an annual rate of 26 percent from $27 million to $448 million. More than 70 percent of this FDI came from Hong Kong, with a focus on low-value-added and labor-intensive manufacturing. From this base, Shenzhen rapidly industrialized, and real GDP soared at an annual rate of 40 percent from 0.9 billion renminbi in 1980 to 47.5 billion renminbi in 1992. Real fixed investment grew by 39 percent a year during this period from 0.46 billion renminbi to 24 billion renminbi.[8] As the economy grew and employment opportunities expanded, massive waves of migrants started flooding into the city. In 1980, the urban population was less than 100,000 people, but by 1992 Shenzhen had 2.33 million urban residents.

By 1992, when Deng Xiaoping urged the city to continue to act as a pioneer of China's economic reform, Shenzhen's growth spurt had begun to run out of steam as land prices and labor costs were increasing substantially and quickly and the unique policy support from central government was fading as the focus shifted to other regions. Many manufacturing companies started to move out to neighboring cities, and manufacturing's share of Shenzhen's real GDP fell from 60 to 49 percent while low-value-added services took up the slack. However, these services were not sufficient to prevent real GDP growth decelerating to an annual growth rate of 19.3 percent.

The city decided that it needed to move up the value chain. It put considerable effort into boosting its financial sector, establishing the Shenzhen Stock Exchange in 1991, and into developing high-tech industries. In 1996, the city established its High-Tech Industrial Park, one of five such high-tech zones in China. Since then Shenzhen has successfully cultivated leading Chinese high-tech companies, and, in 1999, the city hosted the first-ever China high-tech fair. By 2005, Shenzhen's high-tech industry accounted for an estimated 50 percent–plus of the city's industrial output, and the value of Shenzhen's trade in electronic information products reached 100 billion renminbi, making the city the largest electronic information industry hub in China.

From 2000 to 2005, Shenzhen's real GDP took off again with annual growth of 21 percent to reach 423 billion renminbi in 2005 from 166.5 billion renminbi in 2000. Three pillars of Shenzhen's modern economy drove this robust expansion—

8 Sources for this chapter include the Shenzhen Statistical Yearbook 2006; Shenzhen Bureau of Trade and Industry, *International Trade Statistics, 2005*; Shenzhen Stock Exchange financial database; interview with Shenzhen Planning Bureau; Shenzhen Power Supply Bureau; and the Shenzhen 11th Five-Year Plan, 2006.

high-tech services and manufacturing, financial services, and logistics. At the end of this period, for instance, the assets of the city's financial-services industry stood at 1.3 trillion renminbi, some 3 percent of China's total financial assets. The market value of the Shenzhen Stock Exchange has reached 1 trillion renminbi as of 1998—some 45 percent of the total value of China's stock markets. In 2005, the city had 8.3 million urban inhabitants and its real per capita GDP reached about 51,000 renminbi, 13th highest among cities in China.

SHENZHEN'S URBANIZATION HAS RUN UP AGAINST CRITICAL PRESSURE POINTS

Shenzhen's population is projected to swell to more than 12 million people by 2025, making it a megacity. At that point, real per capita GDP is expected to be almost 107,000 renminbi and overall real GDP 1.3 trillion renminbi (Exhibit 1.9.1). Shenzhen has undoubtedly experienced a condensed version of the process that may arguably take up to a century to complete in many other cities and has many lessons for others to learn. While the city's high-tech industry and financial sector actually are rather modern, its land use, urban planning, and quality of life, for instance, show that the city is still transforming and has come up against a number of serious pressure points. How Shenzhen tackles these may become a model for the rest of urbanizing China.

Exhibit 1.9.1

Shenzhen's vital urban statistics

MAP NOT DRAWN TO SCALE

Vital statistics

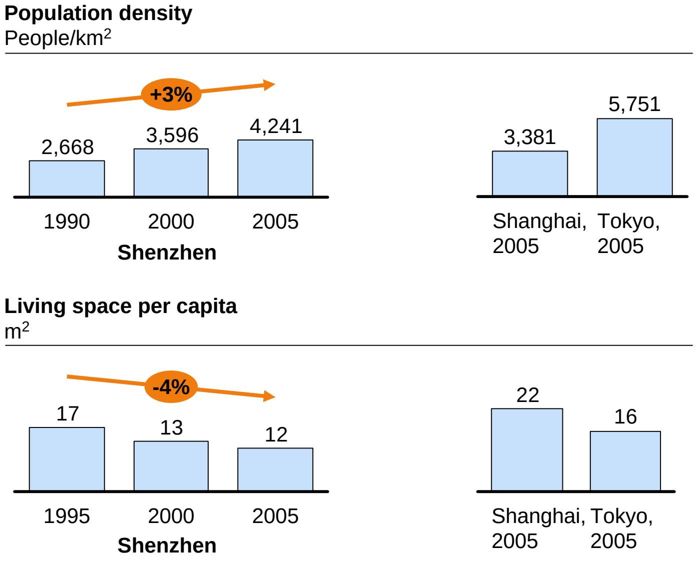
	1990	1995	2000	2005	2025
Urban area* km²	328	2,020	2,020	2,020	2,020
Urban population Thousand	875	3,740	7,009	8,278	12,445
Real GDP/capita Renminbi thousand	24.15	22.97	23.76	51.11	106.98

* Urban area is defined using the census total concept as of the full census conducted in 1990; in the case of Shenzhen, its urban area was updated by the National Bureau of Statistics in 1992.
Source: National Bureau of Statistics; China regional administration (www.xzqu.org); McKinsey Global institute analysis

Land. Until 2004, Shenzhen offered land discounts of up to 30 percent exclusively to high-tech and other high-value-added industries, and these preferential land prices are available only outside the city center. However, Shenzhen is increasingly running up against land constraints. Shenzhen has a total land area of 2,020 square kilometers as of 2005 (of which some 900 square kilometers is ring-fenced as an "ecology" area), which is less than one-quarter of the area of Shanghai and one-eighth of that of Beijing. The stock of land available for development was less than 200 square kilometers in 2005. As a result, the city has had to implement strict land policies that restrict land use for non-high-tech companies and low-value-added manufacturing. Many such companies have had to reach out to neighboring cities to expand their operations. Additionally, the shortage of land has meant that living conditions in Shenzhen are very crowded. Thus far the city hasn't responded by implementing planning that allows the city to grow vertically, and as a result the city's per capita living space is only 12 square meters, a steady decline from its 1995 level of 17 square meters. This pales in comparison to Shanghai's 22 square meters (Exhibit 1.9.2).

Exhibit 1.9.2

Shenzhen's population density is in line with that of other international cities, but its per capita living space is lower



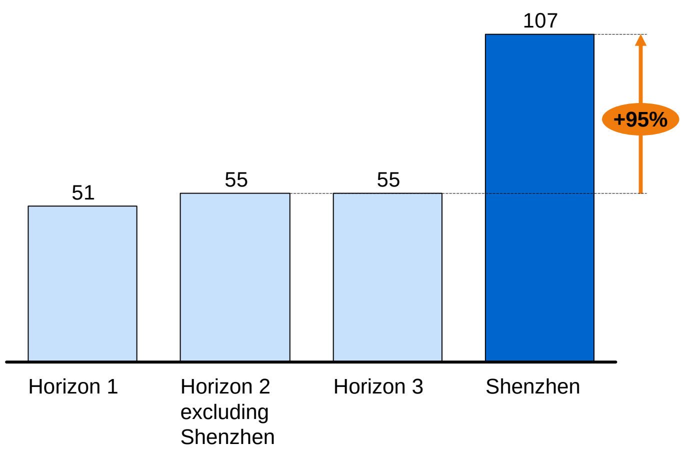
Source: Shenzhen Statistical Yearbook 2006; Census 2000; Census 1990; 1% Census 2005

Infrastructure. Shenzhen is one of the seven Chinese cities most badly affected by water shortages. Fresh water per capita is only one-quarter of the national level and one-fifth of the level in neighboring Guangdong Province. In addition, it has an urgent electricity shortage. In 2006, the city's demand exceeded its capacity by as much as 15 percent during peak periods. Shenzhen has to impose periodic power cuts to entire sectors of its economy, a major issue with some of the CEOs of small and medium-sized enterprises in the city (see "Interview with a director of an electronics company"). One CEO told us, "Once a week is the best you can hope for. Sometimes we get power cuts three times a week, and this seriously jeopardizes our production. Even worse is the fact that the government often cuts off the power without notification and much of our equipment is damaged as a result." The city is well aware of this bottleneck and has already managed to more than double electricity supply since 2001, but the problem still lingers and will definitely require the swift location of additional supplies (Exhibit 1.9.3).

Exhibit 1.9.3

Shenzhen has more than doubled its electricity supply since 2001

Total increase in electricity supply
%, 2001–05



Source: Field interviews; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; McKinsey Global Institute analysis

Urban planning. Shenzhen has torn down all the factories in the city center over the past decade in favor of services and high-tech businesses. The city's urban planners aspire to "one high-tech industrial chain, four functional industrial zones, six trade and logistics parks, and nine industry clusters" in the hope that such clustering will create synergy for companies operating facilities in the city.

Interview with a director of an electronics company

We interviewed the CEO of a supplier of innovative lighting solutions that established itself in Shenzhen in 1996. In ten years, the company's payroll has grown from only 15 people manufacturing lamps and tubes to more than 370 people covering sales, research and development, design, manufacturing, marketing, and special project services. By 2006, the company's sales revenues had reached some $50 million.

The CEO talked a great deal about not only the advantages of doing business in the city but also the growing pressures. In 2001, the city's government invited the company to relocate to the Shenzhen High-Tech Industrial Park at a preferential access cost and provided a ten million renminbi tax deduction for innovative products. These measures encouraged the company to move up the value chain, and it invested heavily in R&D. Today, more than 70 percent of its products are own-brand, and the company's high-tech edge has enabled the company to penetrate some 50 countries, including many European markets with strict quality requirements. Despite all these successes, the CEO is finding it difficult to penetrate the local market. He explained, "We don't want to enter China's overly competitive market now. One simple reason is that high-tech energy-efficient lighting solutions are not well recognized in China now. We cannot sell at a good price, and every time we come out with a new product, our competitors immediately copy it. A system for protecting intellectual property is not yet in place."

This is a China-wide problem, but the company's location in Shenzhen also causes difficulties. Like many other power-intensive companies, the firm has to deal with power cuts. The CEO said, "Because we are located in the high-tech zone, the situation is not as bad, but we still have to have our own electricity generator. But even that poses problems because we are not allowed to transport diesel oil used for the generator because it is a restricted dangerous item." Rising labor costs are another headache. "We used to pay 600 renminbi to 800 renminbi a month for migrant workers, but now we have to pay 1,000 to 1,500 renminbi, and even then we can't find enough people. Every year after Spring Festival, 20 percent of these workers don't come back," the CEO remarked. Another problem is a shortage of land for expansion, and rising land prices are forcing him to open new facilities elsewhere. In 2005, he bought a piece of land in Heyuan city for 175 renminbi a square meter compared with 250 renminbi in Shenzhen.

Despite these multiple difficulties, the CEO said that he intends to keep his headquarters in Shenzhen because of the city's excellent information- and logistics-services facilities and its effective access to overseas markets. Most of the company's procurement is within the region, and Yantian port serves his export business well.

Industrial strategy. To build on its current momentum, Shenzhen plans to continue to optimize the structure of the local economy around its four pillar industries—high-tech services and manufacturing, finance, modern logistics, and culture. The city estimates that the contribution of these four industries to GDP will be 35, 15, 12, and 10 percentage points respectively. The city intends to continue its drive toward more innovation. Shenzhen is already the base for six new national high-tech industrialization projects. It plans to invest 100 billion renminbi to build an entrepreneurial start-up zone for small and medium-sized enterprises (SME), coinvest with local companies on major R&D projects, and build new educational facilities (e.g., labs). Even before such policies bear fruit, the makeup of Shenzhen's industry is closer to Horizon 3 than to Horizon 2. The city's financial sector already accounts for more than 10 percent of the local economy, and Shenzhen is home to the second-largest stock market in China (Shanghai has the largest).

Networks. Shenzhen has good transportation connections including a railway line connecting the city to Beijing, Guanzhou, Xiamen, and Hong Kong. Shenzhen has lower rail and highway transport volumes than one would expect for a Horizon 2 city, but this is largely because its harbor is the city's main form of transport to the rest of China. Shenzhen's Yantian port is the fourth-busiest international port in the world. Shenzhen also has the fourth-largest airport in China with 37 weekly international flights. In terms of its profile, while Shenzhen does host a high-tech fair each year that is renowned in China, the city has yet to break through in the same way as Beijing or Shanghai as a host of major international events or as a serious tourist destination.

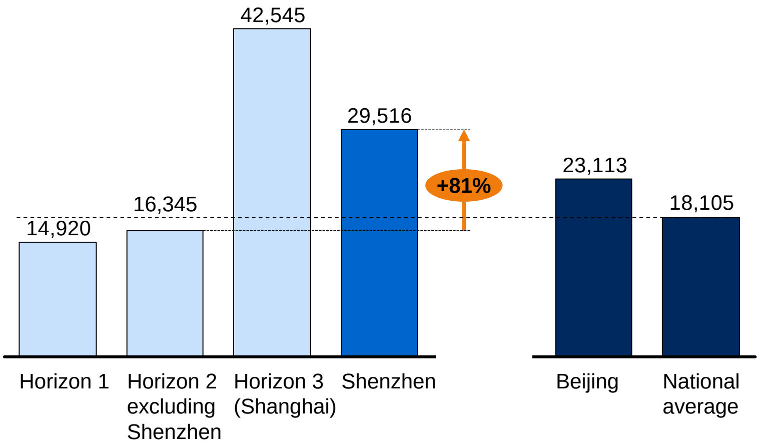
Labor and skills. For a large, prosperous, and developed city, Shenzhen's educational provision is surprisingly limited. The city has only nine local colleges with fewer than 50,000 students enrolled—compared with 100,000 graduates each year in Shanghai—and all the companies that we interviewed cited difficulties in recruiting and retaining workers. These companies estimated turnover of up to 30 percent. Companies therefore have to rely on getting skilled and unskilled workers they need from outside the city. As a result, wages have increased dramatically, and unskilled labor rates in Shenzhen are the highest of any Horizon 2 city (Exhibit 1.9.4).

Exhibit 1.9.4

Shenzhen's average unskilled wage rate is second only to that of Shanghai

Unskilled labor annual average wage*, 2005

Renminbi



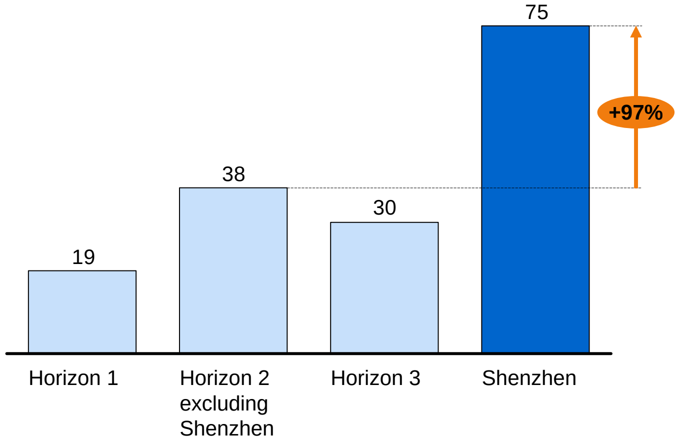
* Unskilled labor includes mining, manufacturing, and construction; skilled labor includes finance, IT, and science.
Source: China Urban Statistical Yearbook 2006; McKinsey Global Institute analysis

Quality of life. The combination of a rapidly growing indigenous population and mass migration into the city has put a strain on Shenzhen's social security provision (see "Interview with Shenzhen taxi driver Zhao"). The city is taking serious steps to tackle this issue, gradually increasing coverage to migrants (e.g., provision of health insurance and pensions), and claims to be the city with the highest migrants' social benefits coverage in China. In addition, all of the city's nine rivers suffer from serious pollution. The amount of untreated water per capita in Shenzhen is the highest among our 14 case cities (Exhibit 1.9.5). Although the city shut down 435 heavily polluting companies in 2006, and despite claiming the highest real per capita GDP among the 14 case cities studied, Shenzhen spends only 0.1 percent of its GDP on pollution treatment—the lowest of the 14 case cities (Exhibit1.9.6).

Exhibit 1.9.5

Shenzhen has the highest level of untreated water per capita of the case cities

Annual quantity of untreated water, 2005
m^3 per capita

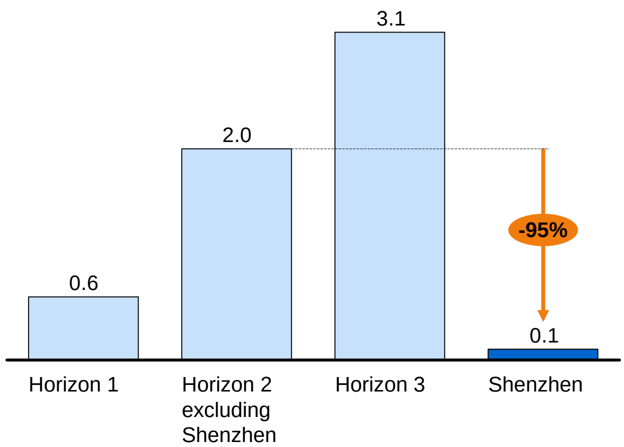


Source: Field interviews; China Urban Statistical Yearbook 2006; China Zoning Economy Statistical Yearbook 2006; McKinsey Global Institute analysis

Exhibit 1.9.6

Shenzhen spends the least on pollution treatment of the case cities

Investment in pollution treatment as share of GDP, 2005
%



Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Interview with Shenzhen taxi driver Zhao

Zhao has been a taxi driver in Shenzhen since 1998 after friends from his home city of Zhuzhou in Hunan Province advised him to move to make more money. Zhao says that around 60 percent of the taxi drivers in Shenzhen are from Hunan Province. Shanghai and Beijing are simply not options because neither city allows migrants to ply the taxi trade. Zhao works 12 hours a day and makes between 3,000 and 4,000 renminbi a month. On top of this, the taxi company provides him with basic health care insurance and a pension. His son goes to secondary school in Shenzhen, but because Zhao is a migrant and doesn't have a Shenzhen *Hukou*, he has to find an extra 2,000 renminbi each semester. His wife and family live with him in the city in a 30-square-meter apartment for which they pay a monthly rent of 900 renminbi.

After ten years of driving in Shenzhen, Zhao now plans to move back to his home province once his son has finished high school. Back home, he has about 0.5 hectare of arable land. His parents are too old to take care of the land nowadays, so he rents it out to neighbors when he can. Zhao is disappointed with life in Shenzhen. The taxi business is getting harder because of traffic congestion and high oil prices. In the late 1990s, taxi drivers could make about 10,000 renminbi a month but not now. Zhao knows that he will never be able to afford a permanent home with prices at 15,000 renminbi a square meter. In any case, he feels that migrants are not made to feel welcome in the city. Without a *Hukou*, life is just too expensive.

* * * * *

Shenzhen's rapid and dynamic urbanization has served as a leitmotif for China's extraordinary transformation into a modern economy in recent decades—but the pressures it now faces also say much about the challenges that many other Chinese cities face. Shenzhen has already laid out a policy agenda that aspires to allow the city to help the city truly modernize as its economy matures. How Shenzhen navigates the tests ahead will be of intense interest to other Chinese cities as they tackle their own urbanization.

10. Suzhou: Diversifying away from agriculture

Suzhou is a small and fast-growing city in the most northern part of Anhui Province.[9] Its economy has remained anchored in agriculture but is also rich in mineral resources including coal, limestone, and marble. Many celebrated artists have hailed from the city, and the area is also famous for its craftwork in media such as rice paper, ink stone, and Chinese ink.

In 1980, Suzhou's urban center was very small, comprising only 1.5 square kilometers. By 1990, the city had sprawled outward dramatically to cover 2,868 square kilometers in one district and four counties (Exhibit 1.10.1). For many years, Suzhou had been primarily an agricultural center, and this had left its real GDP growth lagging far behind the performance of China as a whole. As a result, throughout the 1980s and 1990s, Suzhou saw many of its locals—particularly the talented ones—move away in search of good jobs.

China officially recognized Suzhou as a city in 1999—an exception to the government's tightening up of city designations in 1996—and the city began to industrialize. The past five years have seen something of a sea change as the city has worked proactively to attract business investment and expand its industrial base. Still, Suzhou is a relatively new city and remains in the early stages of urbanization. We classify the city as early Horizon 1.[10]

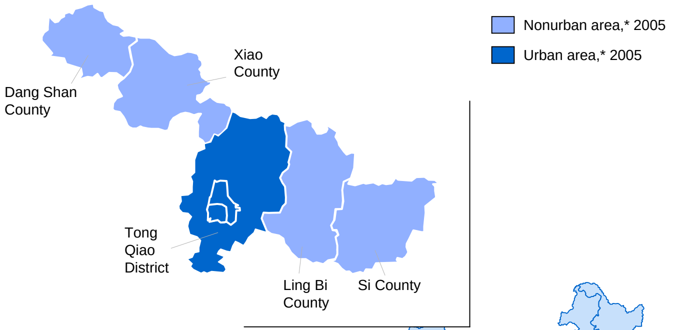
9 Suzhou in Anhui Province should not be confused with the city of Suzhou in Jiangsu Province on the lower reaches of the Yangtze River.

10 For this case study, MGI interviewed, among others, the vice president of the Institute of Suzhou; an admissions officer from the Suzhou College; Jian Wu, director of Suzhou's environment bureau; and the senior engineer of Anhui Snow Dragon Fibre Technology Co., Ltd.

Exhibit 1.10.1

Suzhou's vital urban statistics

MAP NOT DRAWN TO SCALE



Vital statistics	1990	1995	2000	2005	2025
Urban area* km²	2,868	2,868	2,868	2,868	2,868
Urban population Thousand	172	736	1,601	2,402	5,195
Real GDP/capita Renminbi	1,685	2,354	3,556	4,248	8,937

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; as of 2005, no change in the urban area was applied by the National Bureau of Statistics.
Source: National Bureau of Statistics; McKinsey Global institute analysis

SUZHOU HAS BEEN MOVING AWAY FROM ITS AGRICULTURAL HERITAGE

Unlike other cities that received SEZ status from the central government or the location of large SOEs, the provincial government traditionally positioned Suzhou as an agricultural base. Given the fact that China's agricultural sector tends to be low value added, Suzhou has remained relatively poor compared with other urban centers of similar size. The city's economic and industrial progress has been rather limited, with the exception of the development of a large food-distribution industry.

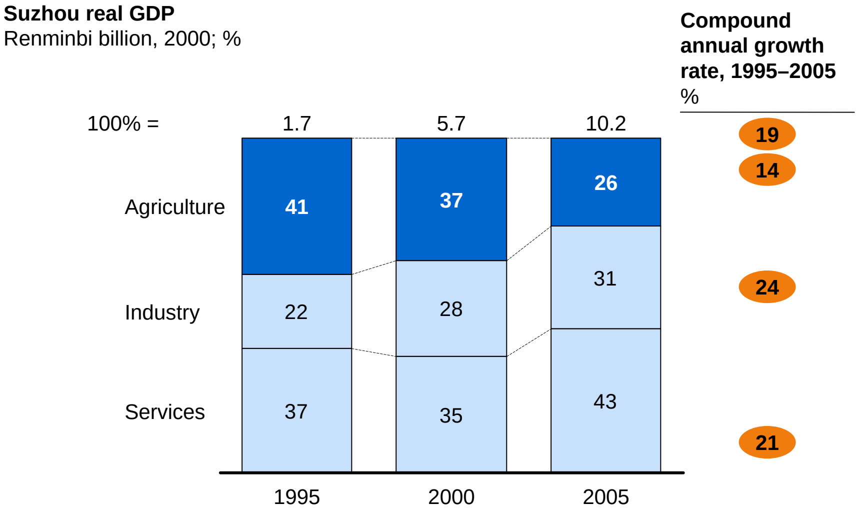
Opportunities for the skilled graduates coming out of the local university have been scarce, and many of them have sought jobs elsewhere. This has created a vicious circle. The city needs the business investment that would persuade talented graduates to stay at home, but businesses have been reluctant to invest in the city because it cannot see enough skilled people to make it worth their while.

Today, however, there is plenty of evidence that the city has been playing catch-up, although from a very low starting point. The city's population has expanded quickly during the past decade at a rate of 12.6 percent to stand at 2.4 million, and the economy has finally begun to expand strongly. From 1995 to 2005, Suzhou's real GDP growth of 19.4 percent has also significantly outperformed the national urban average of 14.6 percent.

Clear evidence that the city is beginning to industrialize is the shrinkage in the share agriculture takes of Suzhou's economy from 37 percent of real GDP in 2000 to 26 percent in 2005 (although this was still the highest preponderance of agriculture of any city of two million) (Exhibit 1.10.2). For Suzhou's long-term prosperity, this shift away from agriculture is important because the dominance of agriculture goes some way toward explaining why Suzhou's real per capita GDP is only around 4,200 renminbi compared with the average of all cities of about 20,900 renminbi. Moreover, in 2005 the central government implemented a nationwide agricultural tax cut that has greatly reduced the revenues that the local Suzhou government raises.

Exhibit 1.10.2

Agriculture's share of GDP has dropped over the past decade



Source: China City Statistical Yearbook 2006; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

The effort on the part of the city's leadership to diversify the local economy through new investment has begun to bear fruit. Key initiatives include a drive to improve the city's basic infrastructure including roads and bridges, a dedicated marketing budget to promote investment, and the simplification of the city's investment and new-business-approval process. The city's governance has clearly improved—with a positive effect on industrial development and economic growth—since 2003 when several city officials went to prison for corruption.

Fixed investment flowed into the city at a rate of 40 percent between 1995 and 2005, rising to 38 percent of real GDP at the end of this decade. And the city has been successful in attracting new business into the city. FDI has more than doubled in Suzhou over the past five years.

SUZHOU NOW NEEDS TO BUILD ON EARLY INDUSTRIALIZATION

Over the next 20 years, Suzhou's real per capita GDP is expected to begin catching up with the rest of urban China, growing at a strong 13.8 percent annually to reach 56,532 renminbi in 2025. This growth will coincide with agriculture declining even further as a share of Suzhou's economy to just 5 percent in 2025. However, to realize this rapid real per capita GDP growth rate, the city will need to continue its recent work of transforming itself from an agricultural center to one that is also creating prosperity through business and industry. There are a number of actions that the city is taking to try to maximize its potential, including leveraging its abundance of coal, improving its education system, and expanding its array of connections by road, railway, and river. Today the city ranks as Horizon 1 on all seven levers.

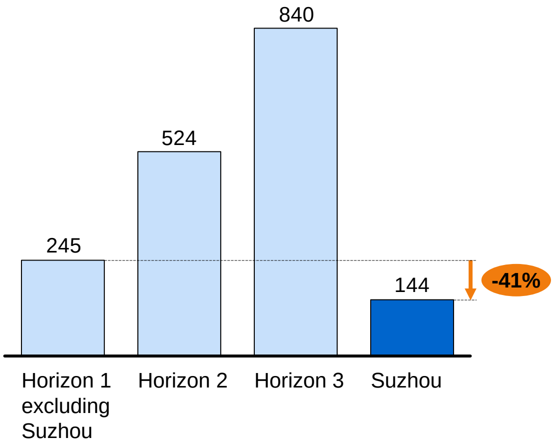
Land. Set by the central government, the standard price of land for the city remains relatively inexpensive at 144 renminbi per square meter for most of its land compared with the Horizon 1 average of 245 renminbi (Exhibit 1.10.3). The central government tends to set such low standard prices (e.g., less than 150 renminbi per square meter) only in cities that are in the early phase of industrialization and thus need business investment to grow. According to 2000 data, the city at that stage was offering discounts for companies locating in its economic development zone of between 20 and 50 percent, depending on the size of the investment. In spite of these high discounts, one government official confirmed that land sales had been a "huge revenue source to fund urban growth." The tax base of an inland city with a poorer population tends to be quite limited, so the city faces the challenge of raising resources from elsewhere given central government restrictions on land acquisition since 2005.

Infrastructure. The city has been spending nearly half of its infrastructure budget on building basic roads and bridges. In 2005, Suzhou invested 48 million renminbi or 0.4 percent of real GDP on roads surrounding the city. One year later the city had stepped up its investment in basic infrastructure, spending 600 million renminbi or some 4 percent of GDP on 12 inner-city roads, bridges, and other basic city utilities. One government official told us, "Infrastructure projects can help Suzhou to become better connected economically and develop into the trade center of northeastern Anhui."

Exhibit 1.10.3

Industrial land prices are among the lowest of the case cities

Lowest industrial land price allowed for each city by central government, 2007
Renminbi per m^2



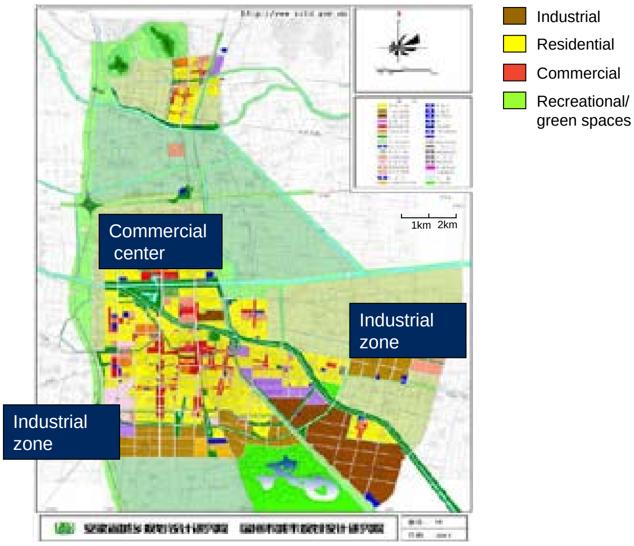
Source: China Land Resource Bureau; McKinsey Global Institute analysis

Urban planning. The government has established two main industrial zones and created incentives for businesses to locate there (Exhibit 1.10.4). These zones occupy 20 square kilometers and are open to businesses from any industry. However, as the city continues to grow urban planning will become increasingly important and more sophisticated planning may be needed. When interviewed, companies indicated they are worried about urban sprawl and that poor city planning in the years ahead will force them to relocate their facilities further outside the city center. Even city officials recognize the need to better zone the city into designated industrial and residential areas as the center of Suzhou grows. One city official acknowledged that too many factories remain located near the city center. To ensure good urban planning, these officials are interacting more frequently with external institutes such as Beijing University to help them ensure that they succeed in extending the city in a balanced way.

Exhibit 1.10.4

Industrial zones are within two kilometers of the city center

Suzhou urban planning, 2006–10



Source: Suzhou Urban Planning Bureau

Industrial strategy. The explosion in FDI over the past four years is evidence that Suzhou's investment incentives for businesses as well as fixed investment in infrastructure that has lowered transport costs are paying off. These incentives included an exemption from local income tax for FDI and a scheme whereby the city pays a 50 percent tax refund to incoming investors. As a result of such measures, a number of companies have chosen to locate in Suzhou (see "An interview with the CEO of a chemical company"). Interviews with local businesses revealed satisfaction with the low cost of doing business in Suzhou, which bodes well for future growth. As yet Suzhou remains undiscriminating about the kinds of investments the city attracts—one city official said, "Just go ahead with your investment and we'll do the rest." However, there is clearly a great deal more scope for increased FDI into the city—in 2005 FDI accounted for less than 1 percent of real GDP.

Networks. As the city continues to improve its roads and transportation infrastructure, it should be able to increase its connectivity to the large nearby cities of Nanjing and Xuzhou. Interviews with city officials revealed that, despite Suzhou's proximity to these cities, it has limited economic ties with them beyond the agricultural sector. Interviews that we conducted with businesses also indicated a lack of connections between these cities. Going forward, Suzhou wants to develop a hub-and-spoke model by working more closely with its two neighbors. It has recently campaigned to become a designated economic zone for Xuzhou in the hope that major companies from its larger neighbor will opt to establish their manufacturing facilities in Suzhou. Given transportation connections, low labor costs, and new business investment incentives in the city, there is certainly grounds for hope for increased economic ties with these neighbors.

An interview with the CEO of a chemical company

This private chemical company was founded in 2001 with 800 full-time employees in Shandong Province to the east. The CEO told us in an interview that it was after much deliberation that the "board decided to open up a branch in Suzhou due to its comparative advantages." He cited the convenience of transportation and the low cost of labor and land—lowering the company's overall costs. "The city's infrastructure has been developing tremendously in recent years. More and more roads are well built, and this has brought a huge convenience to our company," the CEO said. The company's move to Suzhou has brought benefits to the city, too. Only 30 out of the company's 800 employees are from neighboring Shandong Province; the company hired the rest locally or from Anhui Province.

The CEO does, however, have a number of worries about the future. His greatest anxiety is the company's skills shortages. He said that not only does the company currently lack well-educated employees but it is also extremely hard to recruit domestic talent because the overall business environment in Suzhou is relatively weak. He also sees pollution and the city's urban sprawl as troubling. There is a real possibility that, as the city expands, his factory may end up in a highly built-up area—creating a pollution hazard that could even mean that the company has to move its facilities further out in future. Overall, the CEO is satisfied with the company's current situation and hopes that by careful advance planning, he and his colleagues will be able to adapt to and tackle such pressure points as they emerge.

Labor and skills. Although Suzhou does have a few higher-education institutions, local companies find it extremely challenging to recruit from among the few thousand annual graduates or to attract well-educated employees from other cities. Businesses also cite a high turnover among those that they do recruit as educated employees find better opportunities elsewhere. But this presents somewhat of a quandary—local university representatives from Suzhou College say that the city's graduating students seek employment elsewhere because of the underdeveloped business environment. Some 60 percent of students leave Suzhou after graduation. The city has to persuade businesses to come and graduates to stay in the city—to their mutual benefit. For basic labor, the local government's main focus is to provide its citizens with jobs—and this effort includes helping workers to seek work opportunities outside of the city today as Suzhou has an oversupply of labor.

Quality of life. Water pollution has become a serious issue for Suzhou due to years of insufficient investment in treatment systems. There is only one wastewater-treatment station in Suzhou, and the total investment on the treatment of pollution accounted for only 0.2 percent of real GDP in 2005. The public authorities and the private sector are both taking action to tackle pollution. The city authorities have recently set up a "recycling economic zone" and are consolidating smaller-scale paper-production facilities to improve efficiency. The city is also planning to move heavily polluting factories to a less central urban area as well as to build up to four more wastewater-treatment stations due to start operations in 2008. The government is also working with the private sector on this issue. One firm, Anhui Snow Dragon Fibre Technology Co., Ltd., is even building a wastewater-treatment station under its own volition. Several other enterprises are working on improved technologies for dealing with wastewater. All this activity should curb the growing pollution issue in Suzhou. Per capita investment on education and health care was less than 500 renminbi in the city in 2005. Green space currently amounts to only two square meters per capita—expanded provision of this "luxury" should follow once the city increases its standard of living.

* * * * *

Suzhou has come late to urbanization but has done much in recent years to begin rebalancing the local economy away from low-value-added agriculture in order to boost real GDP growth in the longer term. The action the city has taken to attract new businesses has clearly been effective in a few short years. The challenge now is to continue to ensure that the city is an attractive option for companies with a sizable pool of skilled labor and a hospitable environment. Providing jobs, attracting investment to industrialize, and managing its pollution will continue to be the city's focus in the coming years.

11. Taiyuan: Steel to services

An ancient city founded more than two millennia ago, Taiyuan is the capital of Shanxi Province in China's Midwest (Huabei region). The city lies on the middle reaches of the Fenhe River, a tributary of the Yellow River, surrounded by hills on three sides, and it has a long established track record as one of China's premier producers of specialized steel.

Rich in iron, coal, and other minerals, the city is home to the largest stainless-steel plant in the world as well as to a major launch site for polar-orbiting satellites. The city's heavy industry meant that in the past the Fenhe River was one of the most polluted in China, but the city has been working hard in recent years to clean up the waterway. Taiyuan spent 560 million renminbi on building Fenhe Park, an ecological haven on the riverfront that has won praise from the UN Environmental Program.

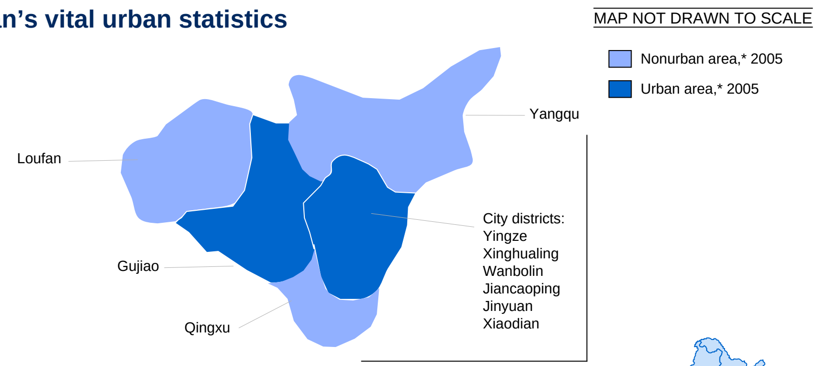
In 2005, Taiyuan had a population of 2.7 million and an urban area of 1,460 square kilometers (Exhibit 1.11.1). Although as a center of coal and metals the city has a reasonably well-developed infrastructure and displays a few qualities typical of a Horizon 2 city, overall we classify Taiyuan as late Horizon 1.

ENERGY RESOURCES MADE TAIYUAN AN EARLY INDUSTRIAL CENTER

Steel dominated Taiyuan's history long before the People's Republic of China came into being when a local warlord set up the company in 1934 that is now the Taiyuan Iron and Steel (Group) Co., Ltd., to serve his military aims. In the 1950s, the central government began investing in the city, setting up SOEs focused on heavy industry including mechanical engineering, chemical and pharmaceuticals, weapons, and light industry such as the production of sewing machines and bicycles. At this time there were no privately owned and operated companies in Taiyuan.

Exhibit 1.11.1

Taiyuan's vital urban statistics



Vital statistics	1990	1995	2000	2005	2025
Urban area* km²	1,460	1,460	1,460	1,460	1,460
Urban population Thousand	2,051	2,315	2,558	2,722	3,924
Real GDP/capita Renminbi	7,056	9,279	11,523	24,434	78,586

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; as of 2005, no change in the urban area was applied by the National Bureau of Statistics.
Source: National Bureau of Statistics; McKinsey Global institute analysis

In the 1980s central government designated Shanxi Province as China's energy base due to its abundance of coal. Between 1978 and 1998 Beijing invested at least 100 billion renminbi in coal mining and related industries. Shanxi Province's coal output increased from some 70 million tonnes a year to around 600 million tonnes in 2000 and 700 million tonnes in 2005. Related industries including coke production and power generation developed rapidly, although, despite the legendary entrepreneurial character of people from Shanxi Province, technological innovation including the refining of coal didn't get under way until the 1980s and 1990s.

In more recent years the ownership of many mines transferred to the private sector, the first joint venture with private investment being set up in 1983. At this stage, however, FDI contributed little to Taiyuan's real GDP. This began to change in the early 1990s when the city set up a High-Tech Industry Development Zone in 1992, which was to prove an incubator for start-ups and an attraction for FDI. Taiyuan persuaded private capital to move into this zone by offering tax breaks and free office space.

By 2000 energy-related industries were still contributing 88 percent of real provincial GDP. Increasing energy demand across China ensured that the city's real GDP has grown strongly. Between 1990 and 2005 real GDP grew at an annual rate of 10.7 percent, rising from 14 billion renminbi to 67 billion renminbi. Despite this strong growth, the city's population has expanded relatively slowly compared with that of other Chinese cities, mainly because of constraints on land expansion. In the period between 1990 and 2005, the population increased at a compound annual rate of 2 percent. In 2005, Taiyuan had a population of 2.7 million, of which 2.6 million were on the *Hukou* register, while only 0.1 million were migrants.

The state has continued to dominate the city's industrial profile—in 2005, SOEs contributed some 70 percent of Taiyuan's real industrial GDP. The downside of this situation is that the city's industrial concerns are creating serious pollution with a lack of alternative industries to drive growth. This has prompted the city government to consider whether Taiyuan's heavy reliance on coal output and energy industries is the long-term answer for sustainable development. New thinking has started to emerge with some force since the recent arrival of a former mayor of Shenzhen as the city's governor. His focus is on building up services and tackling pollution through, for instance, equipping factories with environmental-protection technologies. The city government has organized exhibitions in eastern China to attract investment and usher in a new era in which SOEs admit some outside shareholders. The results to date include some world-famous brands such as Coca-Cola and FoxConn Technology Group, one of the world's largest producers of electronic and computer components, which have located plants in the city. In 2006 Taiyuan attracted 140 million renminbi of FDI.

Compared with the city's still-dominant SOEs, the private sector and FDI have remained a relatively modest part of the overall city economy, but both these have grown rapidly over the past five years. Since 2000, the city's real GDP has been growing at a real annual rate of 17.7 percent, significantly faster than the 10.7 percent rate posted over the past 15 years. Since 1990 agriculture has steadily declined as a share of real GDP from 3.1 percent to 1.0 percent, and industry's share has dropped from 59.0 percent to 44.5 percent as the share of services has risen from 37.9 percent to 54.5 percent. Taiyuan's real per capita GDP had reached almost 24,500 renminbi by 2005, compared with China's urban average of about 20,900 renminbi and the average for midsized cities with populations of between 1.5 million and 5.0 million of about 20,500 renminbi.

TAIYUAN IS ALREADY HORIZON 2 ON THREE LEVERS

The city already displays some of the hallmarks of a Horizon 2 city in terms of its extensive industrial base, its established infrastructure, and its advanced connections in terms of both transport and its economic networks in its home region. However, on other levers the city still has the qualities of a Horizon 1 city—albeit a relatively advanced one. We thus classify Taiyuan as a late Horizon 1 city that can continue to grow and reach its projected real GDP of 306 billion and population of 3.9 million in 2025 while transforming itself into a Horizon 2 city.

Land. Up until 2004, Taiyuan offered a large range of discounts on land from 20 percent to as much as 70 percent, depending on the size of the investment and timing of payments—for example, it paid larger discounts for upfront payments. However, the city has a shortage of available land, and land acquisition has been slow in comparison with other peer cities, which means that Taiyuan's urban area expansion has been relatively slow. Moreover, only 10 percent of local government revenues has been derived from land sales—modest compared with many Horizon 2 cities.

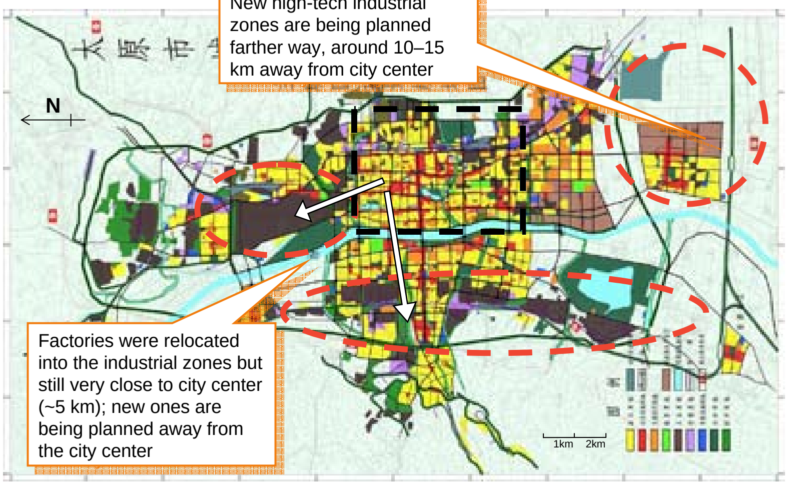
Infrastructure. Taiyuan has made great strides in terms of building the city's infrastructure. To support its role as an energy hub, the city has developed an extensive road and rail network with convenient connections with cities including Beijing and Zhengzhou. The city is now in the process of building additional inner-city roads to ease traffic congestion and to improve travel in and out of the city. The city already has a relatively high rate of public transport use at 121 uses per person a year compared with the average of only 37 uses in Horizon 1 cities. In addition to its investment in roads, Taiyuan plans to invest five billion renminbi or 1 percent of its real GDP between 2006 and 2010 on the basic infrastructure in its high-tech development zone to promote the growth in that sector.

Urban planning. Taiyuan is a good example of a city that is in transition from Horizon 1 to Horizon 2 in terms of its urban planning (Exhibit 1.11.2). While there are some factories still quite close to the city center, the city is in the process of tearing them down and moving them farther away to new industrial zones. For example, in 2007 the city began closing some small power factories and also began to move five of its most polluting factories away from the city center to special economic zones to the north and west of the city. However, these current zones are only some 5 kilometers from the center, and Taiyuan is now planning to build a new industrial zone and other high-tech zones some 10 kilometers to 15 kilometers out of the urban center to the south of the city.

Exhibit 1.11.2

Industrial zones remain close to the city center but are being moved farther away

Taiyuan urban planning, 2006–10



Source: Field interviews; Taiyuan Urban Planning Bureau; McKinsey Global Institute analysis

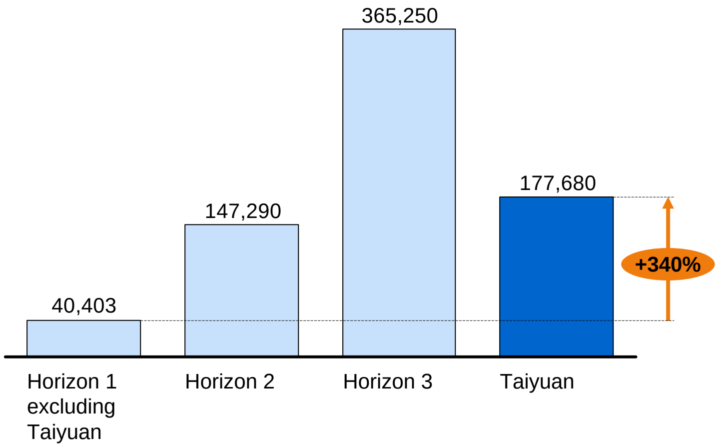
Industrial strategy. Although the coal mining industry contributes 12 percent of the city's real GDP and city officials say that "all industries are welcome," it is clear that Taiyuan's leadership is keen to diversify. An official from Taiyuan's Development and Reform Commission said, "Taiyuan will continue to try to diversify its industries, especially tourism, intermediary agents, and logistics, all of which can utilize Taiyuan's function as the central city of Shanxi Province." The city is beginning to develop an industrial sector based on magnesium, another natural resource in the area, and has an emerging financial sector that accounts for 5 percent of real GDP. There is also an opportunity for the city to embrace technological innovation in its core industries, for instance, in mining and processing coal in an environmentally more sustainable way.

Networks. As the coal center of China, Taiyuan is already a significant rail and road hub. Almost 180 million tonnes of freight passes through the city a year—which is even higher than the Horizon 2 average (Exhibit 1.11.3). Moreover, Taiyuan has close business links with its neighbor Yuci and has transferred some of its heavy industry there. Taiyuan also has just over 350 weekly domestic flights, which is the highest among our Horizon 1 cities.

Exhibit 1.11.3

Taiyuan's freight tonnage is even higher than the Horizon 2 average

Railway and highway freight, 2005
Thousand tons



Source: Field interviews; China City Statistical Yearbook 2006; literature search; McKinsey Global Institute analysis

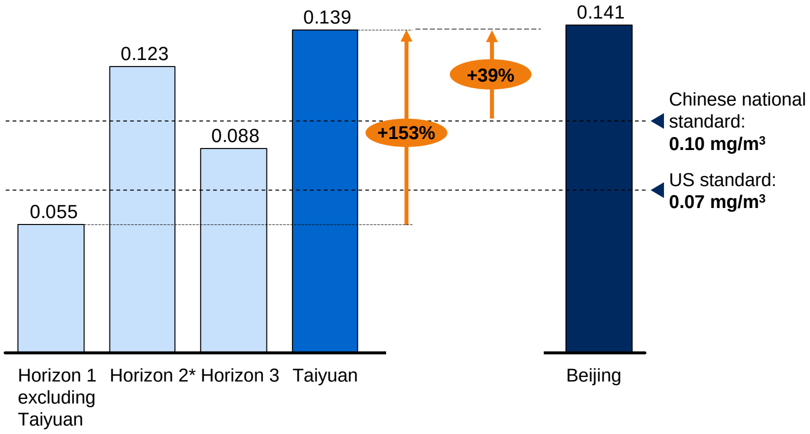
Labor and skills. Because of its role as a provincial capital, Taiyuan has several universities, although currently none of them count among China's top-ranking higher-educational institutions. Despite its significant flow of graduates, the city finds that local universities are not producing the managerial talents it needs to staff growing local businesses. For this reason, like many other midsized cities feeling the "talent crunch," Taiyuan is providing special incentive packages to attract top talent, including providing land and 100,000 renminbi in initial capital for entrepreneurs. Some companies are themselves taking measures to attract talent. One departmental director at RocKontrol Industry Co. Ltd. said, "We attract university students and experienced engineers from around China by providing a free and promising research and develop environment. We also offer competitive compensation in the region" (see "RocKontrol"). Taiyuan's labor pool is somewhat limited by the fact that more than 95 percent of its population is *Hukou*-based and the city currently sees limited inward migration.

Quality of life. Significant pollution was a clearly observable problem during our visit to Taiyuan, and there is a tough challenge ahead if the city is to turn around years of neglect that saw the discharge of effluents into the Fenhe River, which left Taiyuan one of the most heavily polluted cities in the world. The city has already made progress in cleaning up the urban stretch of the river, and Taiyuan now has a great deal of green space. According to the Taiyuan Environmental Protection Bureau, the city has been fitting enterprises with basic antipollution technology since 2000, and local factories already recycle water and discharge less waste. However, the bureau acknowledged that the city needs to do more on pollution. The city, alongside Beijing, has the most polluted air among our 14 case cities (Exhibit 1.11.4). In terms of social provision, the city reconstructed a slum that housed more than 10,000 miners' families in 2006 and has built apartments with cheap rents for poor citizens. However, the city still spends only some 500 renminbi per capita on health care and education.

Exhibit 1.11.4

Taiyuan's air quality is—along with Beijing—the worst among the case cities

PM_{10} level, 2005
mg/m³



* Horizon 2 average excludes Changsha and Shenzhen because of incomplete data.
Source: Field interviews; China City Statistical Yearbook 2006; China Zoning Economy Statistical Yearbook 2006; McKinsey Global Institute analysis

RocKontrol

RocKontrol Industry Co. Ltd. is a Sino-American joint venture whose core business is intelligent control systems centered on automatic solutions, founded with an initial investment of more than $15 million. The company is located in Taiyuan's high-tech development zone and has a 40,000-square-meter plant. RocKontrol services markets including mining, metals, chemical, power, environment protection, public works, transportation, and infrastructure.

The reason RocKontrol chose to locate in Taiyuan was primarily because there was a very substantial market for automatic solutions in power equipment and environmental-protection devices in the city. RocKontrol's technologies have found willing customers not only among companies but also in government. The company attracts talented people from all over China because it offers a liberal research environment for engineers. In interviews, company managers expressed no desire to explore markets outside of Shanxi Province.

* * * * *

Taiyuan has a considerable agenda of work ahead as it attempts to modernize its heavy industrial base and to clean up the pollution caused over many years of neglect. However, the city leadership is well aware of what it needs to do to sustain and diversify growth and to do so in a way that achieves a higher quality of life for residents.

12. Taizhou: Embracing private enterprise

A young and rapidly industrializing city with a population of just over two million, Taizhou stands in the middle of Zhejiang Province on China's eastern seaboard and is one of the 16 cities that make up China's dynamic Yangtze River Delta area centered on Shanghai. For many years the city's growth had been limited. However, in recent years the city has reinvented itself as an industrial center and is now one of China's largest producers of motorcycles, refrigerators, and machinery for the manufacture of clothes, and it has a large and expanding port.

In 1994, Taizhou was elevated to a prefecture city, and today we classify Taizhou as a late Horizon 1 city, although on three of the seven levers of urbanization—land policy, industrial strategy, and labor and skills—the city already qualifies as Horizon 2.

OPENNESS TO PRIVATE ENTERPRISE HAS DRIVEN DEVELOPMENT

Before the 1980s, Taizhou was relatively underdeveloped. China's central government invested little in the region because of its proximity to Taiwan, and no significant SOEs were located in the city. At the same time Taizhou lacked a substantial agricultural sector with farmland limited to an average of only half an acre per capita. Overall, Taizhou was a relatively poor city with a real GDP of only about one billion renminbi in 1990—making the city only the tenth largest by real GDP in Zhejiang Province. Because the local economy was so weak, many Taizhou natives left for other provinces to earn a living. In 1995, Taizhou's *Hukou* population of 1.4 million was much higher than the 692,000 recorded as actually living in the city, indicating an "outward migration" of its inhabitants toward cities with a more promising economic outlook. But in 1995 the tide turned. Citizens began returning to Taizhou and the city's renaissance began.

Taizhou's transition toward being an urban center began in 1982, the year that the central government established its more open economic policy encouraging development along China's eastern coast—and also the year that the first multifamily businesses were allowed to incorporate. Gradually, the city built up economic vigor, starting with fish and fruit packing and later developing an industrial base with many manufacturing firms setting up in response to the city's establishment of regular water freight transportation to Shanghai. As the city industrialized in the 1980s and early 1990s, the five main industry sectors that it established were automotive and related parts, chemical and pharmaceuticals, sewing machines, plastics and patterning, and household appliances. The small trade market in Luqiao District became famous throughout the region.

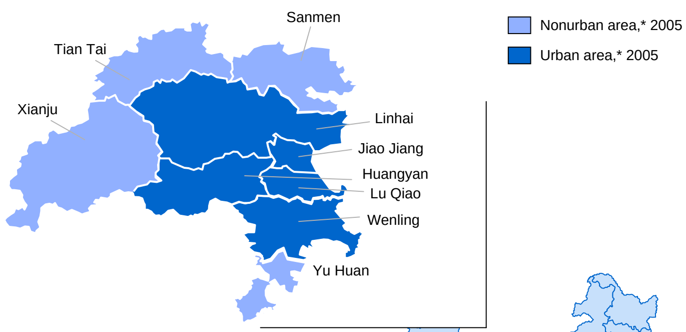
The central government recognized the strides the city made in developing into an urban industrial center in August 1994 when it designated Taizhou as a prefecture city, giving it more say over its own administration. At this point, Taizhou crafted a plan for urban expansion and began to build a city center comprising three separate city districts connected by a broad highway. The city created economic development zones and invested in infrastructure including roads, piping, and wiring. Taizhou's government created an easy licensing process for private companies, which served to encourage entrepreneurship among its residents, and private enterprise developed swiftly. Some famous brands emerged including Feiyue sewing machines and Geely cars (see "Feiyue Sewing Machine Group").

Driven by the entrepreneurial spirit of its residents and the local government's support of the private sector, Taizhou has grown steadily from 1995 to 2005 with its real GDP growing at an annual rate of 11 percent, driven largely by private enterprise. Between 2000 and 2005 the city's real urban GDP grew at an annual rate of 9.3 percent to hit 40 billion renminbi. Per capita real GDP in 2005 was about 17,900 renminbi, some way below the average of China's cities of about 20,900 renminbi and the average of about 20,500 renminbi for midsized cities with populations of between 1.5 and 5.0 million people (Exhibit 1.12.1).

Industry had become the largest component of the city's real GDP by 2005. The share of Taizhou's economy based on agriculture has declined steadily from 21.5 percent in 1990 to 4.7 percent by 2005. Industry's share of the city's real GDP peaked at 62.4 percent in 2000 but has since declined to 52.4 percent as services have grown rapidly. Services had accounted for 30.0 percent of Taizhou's real GDP but has since shot up to stand at 42.9 percent in 2005 (Exhibit 1.12.2).

Exhibit 1.12.1

Taizhou's vital urban statistics



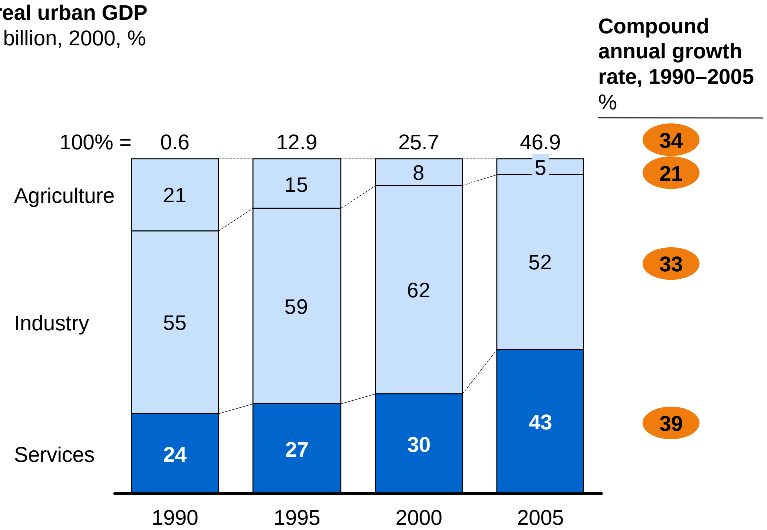
Vital statistics	1990	1995	2000	2005	2025
Urban area* km²	1,536	1,536	1,536	1,536	1,536
Urban population Thousand	175	693	1,492	2,238	4,850
Real GDP/capita Renminbi	4,660	20,123	17,200	17,920	77,205

* Urban area is defined using the census total concept as of the most recent full census conducted in 2000; as of 2005, no change in the urban area was applied by the National Bureau of Statistics.
Source: National Bureau of Statistics; McKinsey Global Institute analysis

Exhibit 1.12.2

The services sector has taken off in the past five years

Taizhou real urban GDP
Renminbi billion, 2000, %



Note: Numbers may not sum due to rounding.
Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

The city comprised 1,536 square kilometers in 2005 and had a population of 2.24 million urban residents in 2005. Of these, roughly 1 million are migrants. The number of *Hukou* residents of the city grew at an annual rate of only 1 percent between 1995 and 2005. At this time, Taizhou's population growth came almost entirely from migration and the return of many *Hukou* holders from elsewhere in China. As Taizhou's economic activity expanded, many citizens who had left the city to find jobs started to return, and, at the same time, the city attracted migrants looking for work. By 2000, the number of people living in the city exceeded its *Hukou* population.

Feiyue Sewing Machine Group

Feiyue, a private company founded in 1986 and based in Taizhou, has grown into the largest manufacturer of sewing machines in China with an annual output of some 2,500,000 units. The company now sells to more than 120 countries all over the world. It boasts a staff of more than 5,000 in Taizhou, as well as more than 500 foreign employees in its overseas offices.

Feiyue already has joint ventures with capital from Singapore and Germany and aims to be the top producer of sewing machines globally with the help of planned annual investments of $300 million to $500 million. Feiyue has modern plants using German-made machinery and standardized workflow processes.

The company believes in social responsibility and has already spent 20 million renminbi on various charities. Feiyue's CEO is Taizhou born and bred, vaulting himself and his family out of poverty through his entrepreneurial flair. When interviewed, he noted that the get-up-and-go attitude of the local people was a real strength for the city. He cited difficulty in attracting and retaining management talent as the company's toughest obstacle.

RETURNING CITIZENS BOOST GROWTH BUT BRING CHALLENGES

Like many other developing medium-sized cities in China, Taizhou is currently facing the simultaneous challenges of pollution, shortages of water and power, and a lack of social provision for its army of new migrant workers. Moreover, the city faces competition in attracting talent and new businesses from cities such as Ningbo to the north and Wenzhou to the south, both of which share Taizhou's reputation for entrepreneurship. We project Taizhou's population to more than double to 4.8 million and its per capita real GDP to quadruple to 77,205 renminbi, but to attain these milestones the city will need to face the pressure points of its urban expansion.

We classify Taizhou as a late Horizon 1 city, but in some regards, particularly in its use of land and its abundance of unskilled migrant labor, the city is further along the urbanization path.

Land. Unlike the typical Horizon 1 city, Taizhou offered relatively limited land discounts of 30 percent up until 2004 and then only to high-tech industrial investors. In the past, the government has benefited greatly from selling land commercially, with one official noting that the sales accounted for a "substantial" portion of revenues.

Infrastructure. Taizhou faces potential shortages in water, energy, and land—all of which are critical for the city's long-term growth. The city has tried to counteract its shortage of fresh water by accessing water from a nearby lake and is undertaking a new project to connect a reservoir in the west to the city. As the city's population continues to expand, the amount of water available per head is set to decline sharply in the near future, an evident pressure point for the city's leadership. Some individual factories have begun to desalinate water, but this is not the most efficient process. The city has also been trying to expand the amount of land available for development by reclaiming land from the sea. One of the most notable strains on the city's infrastructure has been in the provision of electricity, which has been compromised by poor wiring. In an effort to improve the city's power supply, new transmission lines are under construction to bring in more energy from the state grids. With these efforts, the city has managed to increase its electricity supply by 78 percent over the past five years. The city has been spending heavily on building roads to network the main urban center to all towns within Taizhou's jurisdiction, and capacity has increased by 19.4 percent since 2000. In addition, Taizhou's already large harbor is increasing in capacity by 20 percent a year. In terms of telecommunications, the city has doubled capacity since 2000, and the whole of Taizhou now has Internet coverage. The number of mobile phone users has quadrupled in the past five years.

Urban planning. Upon its designation as an official city in 1994, Taizhou crafted an urban plan that focused on building up a city center and creating both residential and industrial zones. However, as in many of China's newer cities, many of Taizhou's factories are still located close to the city center. The local government has started to move some of these factories and plans to move others to new economic zones on the outskirts of the urban center. The city's more recent urban plan created in 2000 does call for more consolidated industrial zones farther from the city center. However, as we observed during our field visit, the city still has more work ahead to rid its center fully of heavy industry.

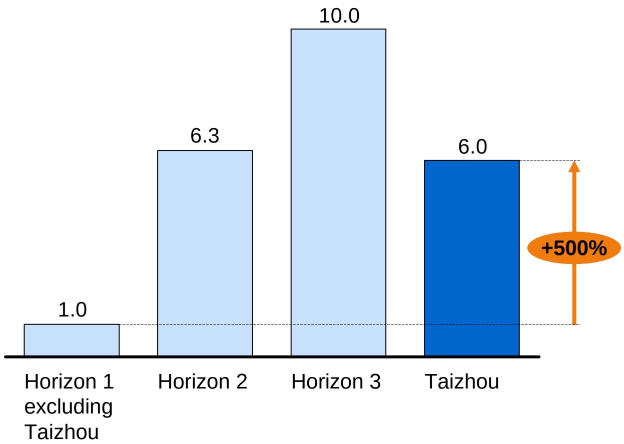
Industry. Taizhou aims to continue to expand the city's industrial base by supporting investment in its key industries and continuing to encourage entrepreneurialism in enterprises. The city has the advantage of working from a relatively dynamic private-sector base. In 2005, more than 507 new enterprises started business. To support continued growth in its small-business base, Taizhou has plans to ensure that its business incorporation process is as fluid as possible and to work cooperatively with the city's commercial organizations, sharing ideas and debating business issues. The city already has a relatively well-developed financial sector that accounts for 6 percent of real GDP—the highest share among our Horizon 1 case cities (Exhibit 1.12.3). The local leadership is currently examining how to make this sector more effective and ensure that businesses have more capital available for expansion. Taizhou's investment in improving its infrastructure, including the city's rail network, should help reduce overall transportation costs for businesses and enhance Taizhou as an attractive investment location.

Exhibit 1.12.3

Taizhou's financial sector is ahead of its Horizon 1 peers and on a par with the Horizon 2 average

Finance sector share of GDP, 2005

%

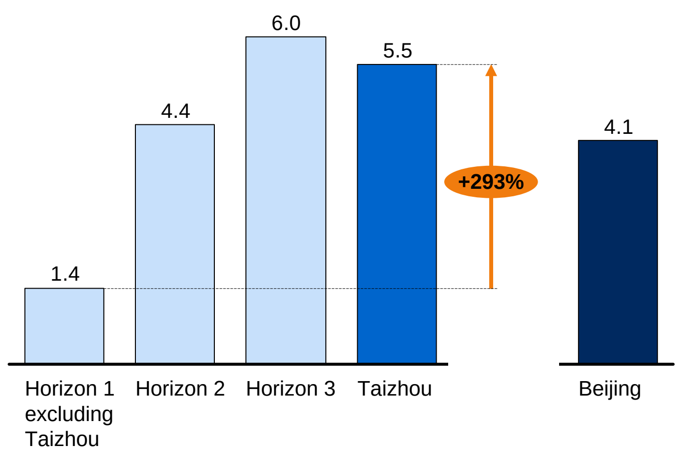


Source: Field interviews; Economist Intelligence Unit; China City Statistical Yearbook 2006; China Statistical Yearbook 2006; McKinsey Global Institute analysis

Networks. Because the ocean or mountains hem in Taizhou on all sides, land travel between the city and the rest of China has historically not been easy, but Taizhou is working hard to improve its transportation connections. Today the city boasts a significant harbor and also a small airport that offers nearly 100 weekly flights to major domestic cities including eight of mainland China's largest ten cities. Rail and highway freight from and to the city is only one-third of the Horizon 1 average, but this is partly because of the role of the city's growing harbor. Together with the substantial port of Ningbo to the north, the region is well served in terms of transportation by boat. Taizhou has been relatively successful in attracting FDI, which, at 5.5 percent of real GDP, is among the highest of our case cities, driven mainly by the dynamism of private business (Exhibit 1.12.4). The city hopes to attract more than $2.5 billion of FDI by 2010.

Exhibit 1.12.4

Taizhou has a relatively high level of foreign direct investment
Foreign direct investment share of GDP, 2005
%



Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Labor and skills. Although Taizhou has become a destination for migrants, the city still faces difficulties in attracting the talent it needs to fuel its growing economic activity. One city official said, "Migrants come from afar to work here in basic jobs, but it is tough to attract talented people." Taizhou is currently short on local skilled labor and has only one college. Its 4,000 annual graduates often seek work elsewhere in China with one local expert estimating that 70 to 90 percent leave Taizhou upon completion of their studies. In the long term, city officials believe developing a better university network in the city is the answer to this shortcoming. In the short term, however, the government is responding to the challenge of skills shortages by working with the private sector to offer better packages—including provision of housing and training for talented workers who relocate to the city. Local companies have also been raising wages in an effort to recruit and retain such workers. The average salary fetched by a skilled worker is 49,000 renminbi, not far behind Shanghai's 56,000 renminbi. This is particularly noteworthy given the cost-of-living differential between the two cities—with costs in Shanghai much higher.

Quality of life. Like many of its industrializing peers, Taizhou has had an unfortunate recent history of rising pollution and has made strides in attempting to tackle this issue. The city has set up an environmental protection agency and started making a positive shift away from polluting industries such as chemicals, actively limiting the number of such enterprises. The number of chemical and pharmaceutical businesses in the city has dropped from some 1,000 to only 280, and growth in this sector has slowed to some 18 percent over the past five years from some 30 percent. The government says that it plans to shut down more polluting plants and that it is increasing pressure on enterprises to conform to pollution standards by stepping up city inspections—confirmed in our interviews with private-sector firms. In addition, the city has installed desulphurization technology in its coal power plant, but five to six chimneys on this plant continue to pollute. Some statistics show an improvement in pollution trends over the past few years. However, enforcement appears to remain an issue, and the fact is that only a small proportion of the city's factories have thus far converted to technology that cuts polluting emissions. Taizhou has also started designating land for new businesses focused on greener activities and is making sure that urban plans include more green space. Nevertheless, green space per capita of nine square meters per person in 2005 was less than half of the average that we saw in Horizon 2 cities.

Another major challenge for the city as it strives to improve living conditions is the lack of social provision for migrant workers. Like many other Chinese cities, Taizhou guarantees its *Hukou* population with basic levels of social security but does not currently offer the same provision to migrant workers. These newcomers must, for instance, pay higher fees to send children to the better schools, and health care insurance is extremely limited. The city is planning to increase the social benefits it provides to the migrant community but only in small increments of 10,000 migrants per year, which means that full coverage for the one million migrants will take many years. Currently, Taizhou is considering a "green card" type of system to migrants in which they will receive identity cards that will not entitle them to residency with a *Hukou* but will allow them to claim other social benefits. The advantage for the city of this scheme is that it will be a more effective way of keeping track of and therefore managing its migrant population. Still, government officials acknowledge that the city's relationship with its migrant workers is largely transactional. These people come to the city to work, live, and save money to return to their farms; the city benefits from their labor and is able to grow its economy. The city's leadership today views social benefits as a luxury unnecessary to sustain this relationship.

* * * * *

Taizhou faces many pressure points due to rapid urbanization including significant pollution, difficulties in absorbing migrants, and shortages of skilled labor. The city has begun to make strides in tackling such issues and will need to implement new policies effectively. At the same time, Taizhou needs to continue to leverage the competitive advantages that the city has secured through its openness to private enterprise.

13. Xiamen: Leveraging its geographic advantages

A frequent vacation destination and home to an extremely temperate climate, Xiamen is a city on China's southeast coast with a long history of openness to trade. Today the city stands to profit from its position directly on the narrow strait that separates the Chinese mainland and Taiwan. The city is also host to 20 million tourists a year, of which 1 million come from abroad. Xiamen has also garnered awards both nationally and internationally for being an extremely "livable" city as well as for its attitude toward environmental protection.

The city's geography is unique, straddling Xiamen Island—with an area of a little over 130 square kilometers—and the mainland where urban Xiamen is some 1,440 square kilometers. The city lies almost equidistant from Taiwan, some 400 kilometers away to the east over the Taiwan Strait, and from the major city of Nanchang some 500 kilometers inland. It is also almost exactly halfway between the Pearl and Yangtze River deltas, all of which goes to explain why this is such an outward-looking city.

From its blank-sheet urban planning to its increasing investment in fighting pollution and its strong industrial base, Xiamen displays Horizon 2 qualities across the board with the exception of its prioritization of quality of life for its residents, which is more modern than a typical Horizon 2 city.

OPENNESS TO TRADE AND INVESTMENT HAS DRIVEN GROWTH

Xiamen was one of the first Chinese cities opened up to international trade by the Treaty of Nanjing after the first Opium War in 1842, a landmark in its history that has set the tone of its economic development since. It has a long track record of openness—arguably due to its proximity to Taiwan. Along with the Pearl and Yangtze River deltas, China's central government designated Xiamen as a SEZ in 1980, giving the city some autonomy over economic policy, freedom from government regulation and intervention, and the ability to set favorable tax rates in order to attract foreign investment. The city, which also worked hard to improve its shipping facilities, began to attract significant business investment (foreign and Chinese) once tax incentives were in place in the mid-1990s. A prominent example of a domestic investor in the city is Xiamen Overseas Chinese Electronic Co (XOCECO), which is today one of the leading Chinese exporters of televisions (see "Xiamen Overseas Chinese Electronic Co., Ltd.").

In addition to its favorable tax regime, the city has relatively low labor costs compared with peer cities in the Pearl and Yangtze deltas, giving it the edge in attracting companies to set up manufacturing facilities. By 2005, the city had built up contracted foreign capital valued at 8.2 billion renminbi. The city's Taiwan connection has been highly significant. As of 2006, more than 2,500 Taiwanese companies had invested in Xiamen to the value of more than $4.5 billion. Other foreign companies have also invested in Xiamen, including Wal-Mart, Carrefour, Citigroup, and Toyota. The result is that Xiamen has won itself a reputation for being far more of an international business hub than most cities of comparable size in China.

On the back of such investment, the city has developed and urbanized at a rapid pace. Its population expanded by 9 percent a year between 1990 and 2005, mainly driven by aggressive land expansion. During the same period real disposable incomes rose at a rate of 8.3 percent, increasing from less than 4,300 renminbi at the start of that period to more than 14,000 renminbi at the end.[11] Real disposable income growth grew at a 6.7 percent rate between 2002 and 2005. Real consumption grew at an annual rate of 3.5 percent between 1996 and 2001 but then slowed to only 2.3 percent between 2000 and 2005.[12] Between 2000 and 2005, Xiamen's real GDP grew at an annual rate of 11 percent to hit the 86 billion renminbi mark. The city's real GDP grew at an annual rate of 11 percent between 2000 and 2005, much below the all-China urban average of 15 percent. On a real per capita GDP basis, however, Xiamen compares well with other cities with real per capita GDP in 2005 of 38,193 renminbi, considerably higher than the urban average of about 20,900 renminbi and the average of midsized Chinese cities with populations of between 1.5 and 5.0 million people of some 20,500 renminbi (Exhibit 1.13.1).

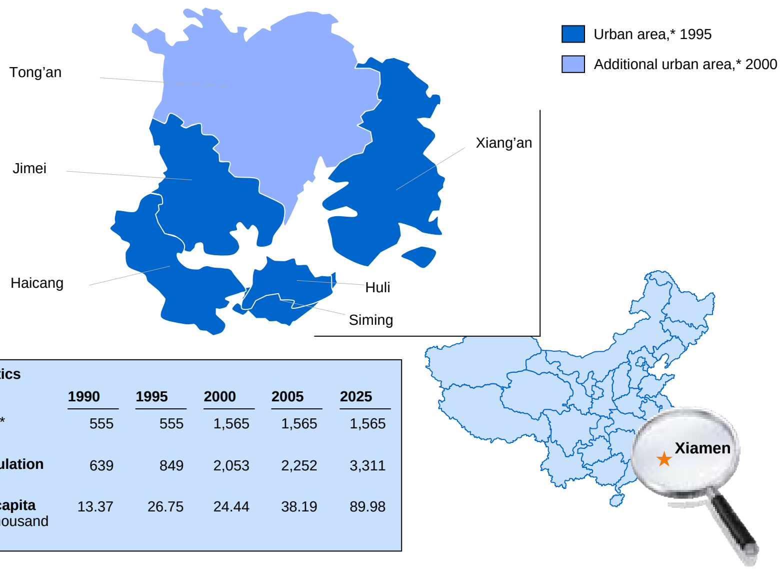
11 Xiamen Special Economic Zone Statistical Yearbooks 2003 and 2006; McKinsey Global Institute China All City model.

12 Xiamen Special Economic Zone Statistical Yearbooks 2003 and 2006; Fujian Economy and Society Statistical Yearbook 2005; McKinsey Global Institute China All City model.

Exhibit 1.13.1

Xiamen's vital urban statistics

MAP NOT DRAWN TO SCALE



Vital statistics

	1990	1995	2000	2005	2025
Urban area* km²	555	555	1,565	1,565	1,565
Urban population Thousand	639	849	2,053	2,252	3,311
Real GDP/capita Renminbi thousand	13.37	26.75	24.44	38.19	89.98

* Urban area is defined using the census total concept as of the full census conducted in 1990; in the case of Xiamen, its urban area was updated by the National Bureau of Statistics in 1996.
Source: National Bureau of Statistics; China regional administration web; McKinsey Global institute analysis

The portion of the economy based on agriculture has declined sharply from 7 percent to 2 percent. Industry's share has remained steady at some 55 percent, while the share of services in the city's economy has risen slightly from 38 percent in 1990 to 43 percent in 2005.

Xiamen Overseas Chinese Electronic Co., Ltd.

Founded in 1985, this company chose Xiamen as its headquarters and quickly became a major domestic producer of color televisions. Taking advantage of Xiamen's location on the coast near Taiwan, Xiamen Overseas Chinese Electronic Co. (XOCECO) began to export televisions abroad, averaging about 300,000 televisions to the European Union (EU) a year as early as 1993. Although the EU had in place policies aimed at blocking such imports, the company managed to work its way around these. In 1995, XOCECO listed on the Shanghai Securities and Exchange House. Since then, the EU has withdrawn its antidumping policies. Part of the reason for the company's success is that Fujian Province opened the company up to foreign investment in the mid-1990s, providing preferential policies for foreign investors. By 1996, XOCECO became China's leading color TV exporter and later launched the first domestically produced Chinese cell phone. In 2006 revenues reached more than 8.1 billion renminbi, and the company's overseas brand name PRIMA is becoming a better known brand.

MAIN PRESSURES INCLUDE CONGESTION AND ARABLE LAND LOSS

Xiamen's real GDP is projected to grow at 6.4 percent per year between now and 2025 but, to achieve this growth rate, the city will need to leverage its competitive advantages while also addressing key pressure points. Like many fast-growing Chinese cities, Xiamen confronts multiple environmental and infrastructural pressure points including burgeoning traffic, the rapid depletion of available arable land, a scarcity of affordable housing, tough competition for skilled labor, and increasing pollution.

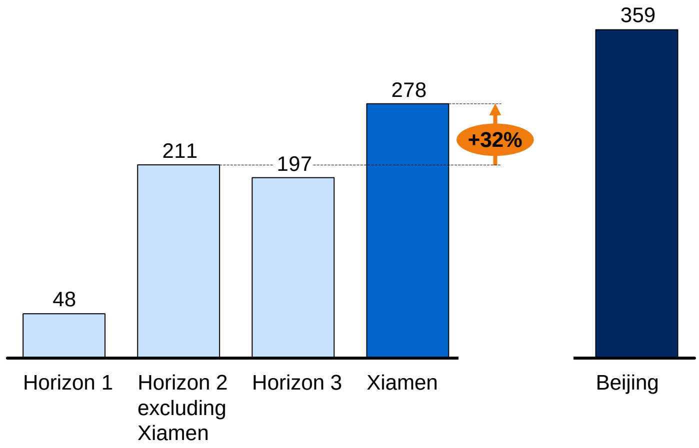
Land. Because mountains hem the city in on one side and the sea is on the other side, there is a limited area of developable land, and commercial land prices have soared to more than 2,500 renminbi per square meter. The risk is that rising prices for land will discourage investors from locating their businesses in the city. On top of this the city simply doesn't have enough land to acquire and sell at a discount to potential investors, as it did in the past, even if tougher regulations on such activities had not been introduced. Today Xiamen offers preferential terms on land only to high-tech factories and to the tourism industry. Rising land prices are also affecting the city's residents by increasing house prices, particularly on the island. An interview with one migrant worker in the city revealed that, despite a high level of satisfaction with her life in Xiamen, she wanted to return to her hometown because house prices in the city were too expensive (see "Interview with Miss Zhan—massage tools saleswoman").

Infrastructure. Despite the fact that the island part of the city makes up only 10 percent of Xiamen's total area, it is home to 60 percent of the city's cars, and this part of the city suffers from a degree of congestion (although not as severe as in other Chinese cities) despite the fact that Xiamen has the second-highest public-transit use of the 14 cities we visited at 278 uses per person each year (Exhibit 1.13.2). The city has significantly stepped up its investment in its transport infrastructure, building the Xiang'an undersea tunnel, the Xinlin and Jimei bridges, and other inner-city roads in 2006. An academic expressed the view to us that the city might consider developing an efficient bus-based rapid-transit system, especially on the island, as well as a light-rail system connecting the island to the mainland and linking different mainland districts. Improving the city's transport infrastructure is likely to be the most effective way for the city to tackle the shortage of affordable housing. With better transport between the island and the mainland, the city could encourage more people working on the island to live on the mainland with its more affordable housing options.

Exhibit 1.13.2

Xiamen's public-transit use is second-highest of the case cities after Beijing

Public-transit use, 2005
Annual uses/person



Source: Field interviews; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; McKinsey Global Institute analysis

Xiamen is trying to cope with increased electricity consumption that has been rising at 12.9 percent annually. Over the past five years, the city has spent 2 billion renminbi or some 2 percent of real GDP on upgrading its power grid and managed to increase its electricity supply by 81 percent. The city is also planning to double its power capacity between 2006 and 2010. In 2006, the city kicked off this task by starting the construction of 14 power transformers.

Urban planning. With a congested island and limited mainland space, urban planning is becoming increasingly important but difficult for Xiamen. City officials are currently responding by enacting stricter zoning laws aimed at achieving a specialization of economic activities suited to the city's geography—with industry located mainly on the mainland and tourism and services on the island. The new city plan has located all four economic zones off the island and away from the city center, and over the past five years the government has shifted all factories off the island and onto the mainland. Today the city permits only services (with a focus on tourism) on the island.

Industrial strategy. Xiamen already boasts a relatively solid high-value-added industrial base with 56 percent of total real industrial GDP derived from high-tech companies. Xiamen's location so near to Taiwan, which facilitates swift communication and travel between the two, is a major element in the city's favor. Xiamen has already received more than 2,500 investments from Taiwan.

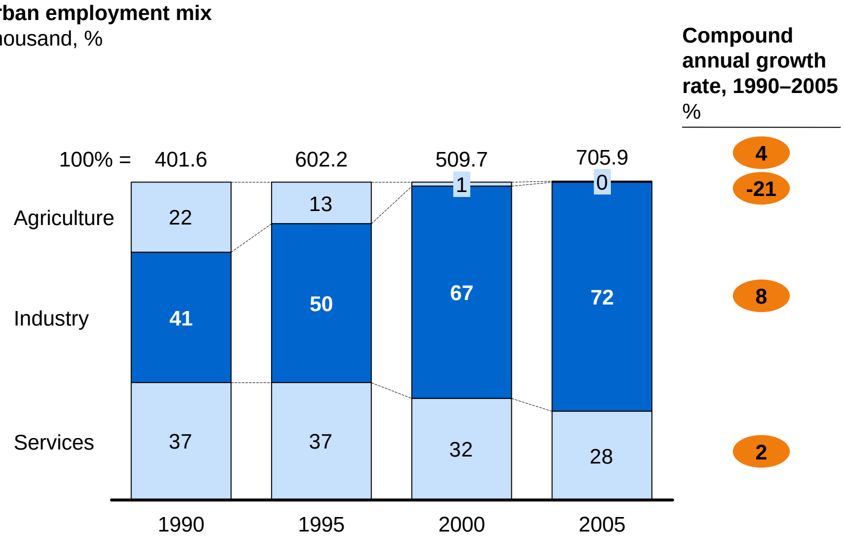
However, rising land costs threaten to overshadow the city's scenic beauty and relatively cheap labor costs and to discourage foreign investment from Taiwan and others. Xiamen therefore needs to examine how it can manage land costs through efficient land use as well as favorable tax and zoning benefits for foreign investors. One option would be for Xiamen to focus more on services and manufacturing industries that require less land. The cornerstones of the city's industrial economy today are the petrochemical, mechanical, and high-tech industries, with overall more than 70 percent of the labor force having industrial jobs (Exhibit 1.13.3). But Xiamen may do better to develop financial-services, logistics, and tourism industries instead.

Exhibit 1.13.3

The majority of Xiamen's employment is in industry

Urban employment mix

Thousand, %



Source: Census 1990; Census 2000; Xiamen Statistical Yearbook; China City Statistical Yearbook

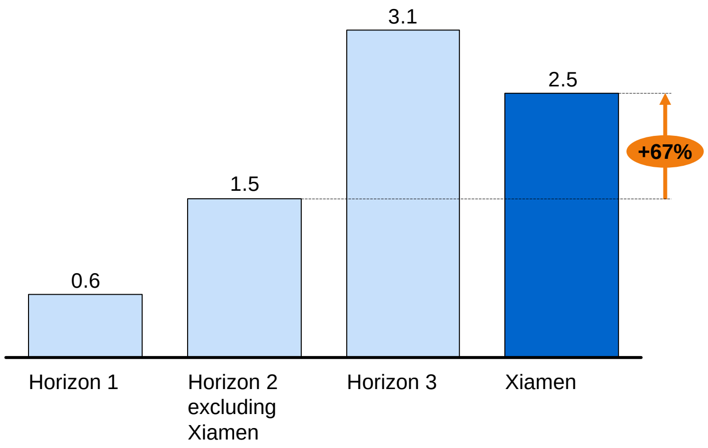
Networks. Xiamen has the 6th-largest port in China and 22nd-largest port in the world by tonnage; it is the key port in the region, with smaller neighboring cities channeling their goods through Xiamen. Nevertheless, government officials conceded in interviews that the city could arguably do more to develop its natural oceanfront location and its port and shipping industry—particularly given the built-in advantage of being just across the sea from Taiwan—with some observers arguing that the city is losing out to competition from the Pearl and Yangtze River deltas. Xiamen's airport has 90 international flights per week—more than double the number offered by Shenzhen and trailing only Beijing and Shanghai among our case cities. Additionally, the city has received much recognition for being environmentally friendly and a good place to live. These awards have come both nationally and internationally and have included the UN Habitat Scroll of Honor Award. Such recognition, combined with Xiamen's nearly 20 million tourists annually, has made Xiamen a relatively well-known city within China.

Labor and skills. Xiamen's citizens are proud of the relatively slow-paced and relaxed lifestyle that is their city's hallmark and claim that this already attracts many experienced and educated workers to relocate there. However, the fact is that the city faces significant competition from the Pearl and Yangtze River delta business clusters in its efforts to attract talent and needs to work even harder to make itself an attractive place to live and work. One local CEO told us, "It is difficult for us to attract skilled workers because of the city's difficult position between the economic clusters of the Yangtze River Delta and Pearl River Delta, both of which offer fierce competition." The skilled-labor shortage has driven up skilled-labor wages in 2005 to 52,480 renminbi annually, more than three times the wages of an unskilled worker. This three-to-one ratio is the highest among the 14 case cities. High-paying jobs are paramount, of course, and Xiamen needs to develop more high-value-added industries that pay better compensation than those in surrounding cities. But there are other magnets to attract skilled people including housing incentives. The city already offers a *Hukou* to anyone with an undergraduate degree or who purchases a house of a certain size—a system that is much more lenient than most cities. Continuing to keep its *Hukou* policy as open and generous as possible will be important if Xiamen is to attract and keep top graduates.

Quality of life. In spite of the city's focus on industrialization, the government and people alike still are keen to maintain the city's historic attitude to preserving a healthy environment and good quality of life. Xiamen's government continues to try and provide its residents with adequate social benefits—including education, health care, and green space—and to limit pollution. For its efforts, the city has received official recognition in China as a "National Sanitary City," a "National Garden City," and a "National Model City for Environmental Protection." Citizens of Xiamen are generally happy with their lives. Health care is generally available, and rents are reasonable. Xiamen's government spends a lot on pollution treatment—equivalent to 2.5 percent of real GDP and fourth highest among the case cities (Exhibit 1.13.4). As a result, untreated wastewater levels in Xiamen are the third lowest among case cities (Exhibit 1.13.5). Xiamen's residents are also active in trying to preserve the environment. In June 2007, in a campaign organized on the Internet, citizens took to the streets and sent more than one million text messages to the government protesting against plans to site a polluting chemical plant in the Haicang district of the city and in favor of more environmentally sustainable development of the city's economy. The government responded by suspending plans to build the plant. The city's introduction of stricter zoning laws designed to keep industry in the mainland sector of Xiamen may go some way toward assuaging public concern about pollution. In the longer term, city officials are including in their development plans action to take away the current focus on petrochemicals and refocus on more environmentally friendly economic activity.

Exhibit 1.13.4

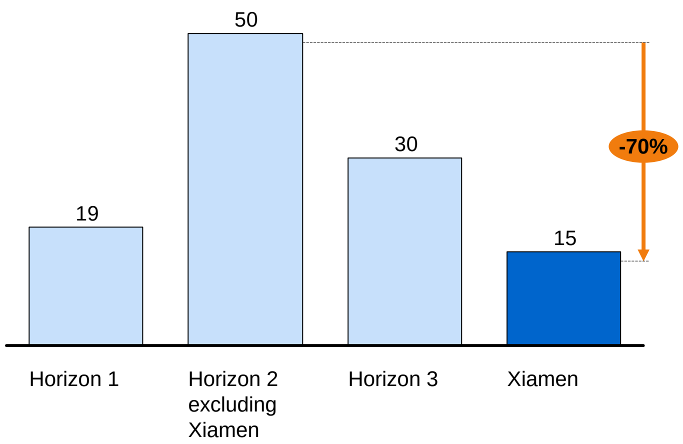
Xiamen's investment in pollution treatment is high
Investment in pollution treatment as share of GDP, 2005
%



Source: Field interviews; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Exhibit 1.13.5

Untreated wastewater levels are much lower than other cities in Horizons 2 and 3
Annual quantity of untreated water per capita, 2005
m^3



Source: Field interviews; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; China Zoning Economy Statistical Yearbook 2006; McKinsey Global Institute analysis

Key pressure points today include rising housing prices and tough competition in attracting investment and skilled workers. Another key quality-of-life issue that the city is looking at is the hardship caused by the dislocation of farmers due to the development of former agricultural land. The city already has in place a "three ones" plan under which it provides a house to live, a house to rent, and a store to run for every plot of land taken away from a family because of development.[13] The city is also providing increased social benefits to dislocated farmers.

Interview with Miss Zhan—massage tools saleswoman

Amid the dazzling lights of Xiamen's biggest mall, Miss Zhan stands surrounded by various massage tools from chairs to back scratchers—and some appliances that are so unique they have no name. She was born in 1984 in the city of Longyan, about 300 kilometers from Xiamen, the youngest of five children. Her family used to farm but now run a small business in her hometown.

She graduated from high school and immediately moved to Xiamen to work as an assistant at a television shopping network. After the network went bankrupt three years ago, she found work as a saleswoman at this kiosk in Xiamen's biggest mall. She makes between 1,000 renminbi and 2,000 renminbi a month depending on commissions from sales. She rents an apartment for 200 to 300 renminbi a month and commutes to work by company shuttle. It takes about 20 minutes to get from her house to work, although she still complains that she lives too far away from her job. She feels that Xiamen is a much cleaner city than her hometown and is generally pleased with the conditions, despite complaining about the traffic.

However, she doesn't intend to live in Xiamen in the long run because buying a house is so expensive, and she plans to move back to her hometown when she is ready to settle down and start a family.

13 Information about this plan came from the Xiamen city government.

* * * * *

Xiamen's long-term development as a successful city will depend on responding creatively to the pressure points created by urbanization—as it has begun to do—and managing a transition from an industrial and trading center to one that capitalizes fully on its position near Taiwan and on its coastal location and that is focused on investment in services, tourism, and high-value-added economic activity. A progressive city with a people that pride themselves in how they live, Xiamen will need to continue to balance industrialization and growth with preserving quality of life to keep its people happy.

14. Xingping: A spoke in China's Great Western Development Strategy

Xingping is one of China's ancient dynastic capitals and a long-established magnet for tourists because it is the site of the biggest tomb of the Western Han dynasty. It is now a small new city in Shaanxi Province, lying in the middle of central China's fertile Kuan-chung Plain and enjoying a moderate climate.

Promoted by the government to a county-level city in 1993, Xingping is 20 kilometers away from Xianyang and 50 kilometers from Xi'an, the provincial capital. With its very close economic and business relations with these two cities, Xingping is effectively a spoke to their hubs. Xingping displays the qualities of an early Horizon 1 city across all seven levers of urbanization.

XINGPING IS STILL SEEKING SUSTAINED GROWTH MOMENTUM

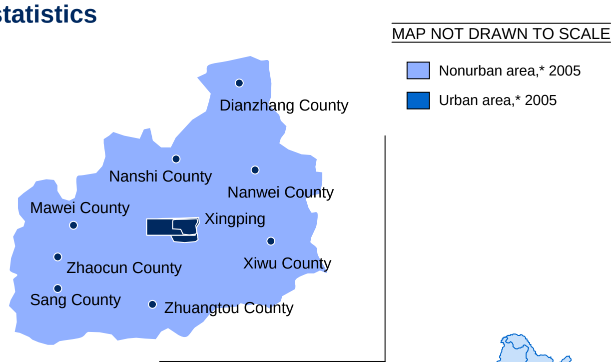
Compared with other small cities, Xingping started early on the path to urbanization in the early 1950s when its industrialization started to supplement the development of the city's rich agricultural resources. During that decade, the government chose to locate three large SOEs manufacturing aircraft and ships in the city (which is near the Wei River), followed closely by the establishment of what is now the largest chemical manufacturer in the region. These enterprises meant that there was an influx of labor into the city for some three decades. This flow of people to the city did not just constitute full-time employees of these factories; the communities that sprung up around these enterprises also created employment as well as schools, hospitals, and other amenities.

After a strong start under state economic planning, however, development in Xingping slowed as China started its transition to the market economy in the 1980s. Like many other SOEs around China, Xingping's large SOEs all underwent financial crises leading to massive retrenchment and rising unemployment. As a result, many people moved out of the city in search of jobs.

Having lagged behind other Chinese cities in its rate of urbanization for some 20 years, however, Xingping's real GDP growth has begun to gain momentum over the past five years. However, although its economy has grown by about 5 percent annually in real terms since 2000, Xingping's economic performance has fluctuated and the city has not posted two consecutive years of growth during this period. In order to achieve more sustained growth, the city is therefore searching for continued investment and more consistent industrial output. Xingping's 2005 real per capita GDP of about 4,500 renminbi was well below the national urban average of about 20,900 renminbi. Its population in 2005 totaled some 385,000 and has expanded modestly at 0.5 percent annually since 2000 (Exhibit 1.14.1).

Exhibit 1.14.1

Xingping's vital urban statistics



Vital statistics	1990**	1995**	2000	2005	2025
Urban area* km^2	N/A	N/A	509	509	509
Urban population Thousand	N/A	N/A	376	385	539
Real GDP/capita Renminbi	N/A	N/A	3,660	4,537	26,989

* Because Xingping's status is that of an unofficial city, its urban area is defined using the census total concept as of the most recent full census conducted in 2000 but estimated within the McKinsey Global Institute China All City model.
** No data is available until 2000 as Xingping is an unofficial city.
Source: National Bureau of Statistics; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Xingping's recent return to growth has come about partly by virtue of the city's being part of the government's Great Western Development Strategy priority area. In interviews conducted in August 2007, citizens also cited the fact that today's generation of city leaders had improved governance significantly, introducing strict new anticorruption policies as well as a coordinated program of new construction.[14]

14 Field interviews.

Fixed-asset investment, which increased at an annual rate of 37 percent from 1997 to 2005, has also played a major role in driving the city's economic growth. As a percentage of the city's real GDP, fixed-asset investment reached 24 percent by 2005 from 14 percent in 1999.

As a proportion of real GDP, industry remains the most important sector for the city, but services have been growing more rapidly lately—at an annual growth rate of 13 percent between 2000 and 2005 compared with 6 percent for industry and -1 percent for agriculture.

URBANIZATION STILL HAS A SIGNIFICANT WAY TO GO

Xingping's real GDP is projected to grow at 11 percent per year from 2005 to 2025 with the city's population increasing at 2 percent annually over this period to reach some 540,000. Although Xingping enjoys a number of comparative advantages as it continues on the path to urbanization—including its ties to hub cities, its benign climate, and its relatively low-cost environment—the city faces a number of challenges including increasing pollution and relatively substandard provision of education and health care. An overarching concern for the local government is that the city has limited scope to improve matters because of a lack of administrative autonomy—its hub city Xi'an has the final word on key decisions about Xingping's development, such as urban planning, land acquisition, and allocation of financial resources across different projects.[15]

Land. Xingping has the lowest standard land price—at 120 renminbi per square meter for most of its land—of the 14 cities we studied. In the past, Xingping offered investors substantial discounts on top of these cheap prices. Today, given government regulations of such discounts, the city has shifted toward providing other incentives to attract investors, often through the tax system. Companies investing in Xingping can secure land at a 30 percent effective discount due to these preferential policies as well as a 50 percent discount on other expenses related to land such as additional infrastructure investments. Even more generous incentives are available for some "important" projects (i.e., larger investments), and Xingping has also extended land leases from 40 to 70 years.

Infrastructure. Some 54 percent of the government's infrastructure investment is on basic roads and bridges, which is higher in relative terms than any

15 In China, county cities such as Xingping need to obtain approval on the most relevant matters by their prefecture cities, in this case Xi'an. This is supposed to change under the 11th Five-Year Plan, which delegates this responsibility to the provinces.

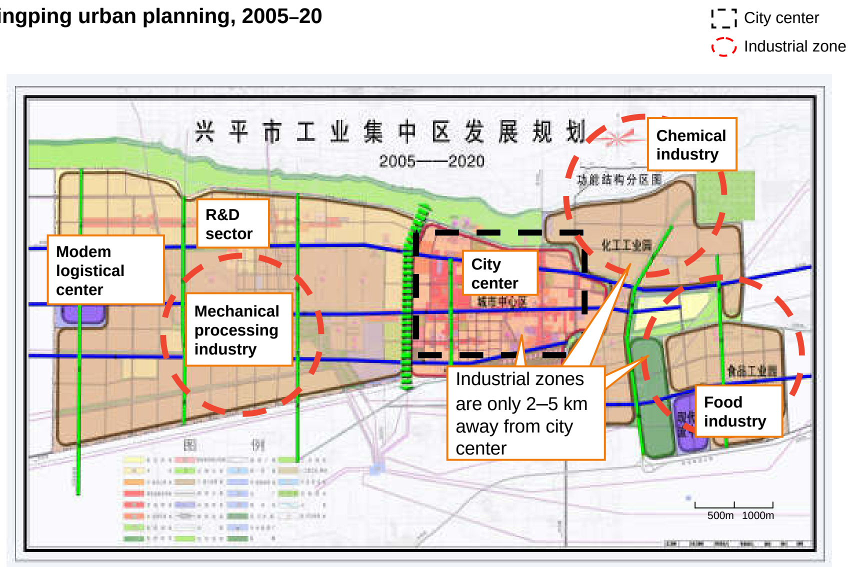
other Horizon 1 city. In 2006 Xingping invested around 120 million renminbi or 5 percent of real GDP on the expansion of its highway system, which now connects Xingping to 14 neighboring towns. In addition, the city invested 40 million renminbi or 1.6 percent of real GDP on basic infrastructure in its special economic-development zones to improve basic services for industrial companies that locate in them.

Urban planning. Xingping's current urban plan designates three industrial areas, each serving a specific function, surrounding the city center (Exhibit 1.14.2). Within each sector, the government plans to cluster new businesses around already well-established factories and enterprises so that existing and new plants can interact positively with each other. Unlike Horizon 2 cities, however, Xingping's special economic zones are still within 5 kilometers of the city center, and the city will likely need to move these in the future in order to keep these zones separate from residential areas as the city expands.

Exhibit 1.14.2

Xingping's industrial zones remain close to the city center

Xingping urban planning, 2005–20



Source: Field interviews; Xingping Urban Planning Bureau; McKinsey Global Institute analysis

Industrial strategy. Several factors have underpinned the city's accelerated urbanization since 2000 and are likely to continue to do so. Xingping's large SOEs have emerged from crises situations and have returned to profitability. In addition, the city has seen an increased pace in inflows of private capital and business investment. Xingping is seeking investment from other sources beyond its hub cities and can offer indirect encouragement to potential investors such as improved infrastructure and preferential policies related to land pricing. Such an approach has already yielded some successes (see "Fumanduo Cup Noodle Limited Co.").

Fumanduo Cup Noodle Limited Co.

Founded in March 2007 by Taiwanese capital, the Fumanduo Cup Noodle factory is the first—and so far only—joint venture in Xingping. This company typifies the hub-and-spoke strategy of many businesses. The Taiwanese investor established a manufacturing facility for high-end products in Xi'an with a management team and a sales department, and the factory in Xingping was established to manufacture products for the low-end market. Xingping offered four major attractions for this investment: the city's abundant agricultural resources, its low labor cost, its close connection with two hub cities, and convenient transportation to other medium and smaller cities in the region.

After the initial site visit in 2005, the investor had to tackle several issues before the factory actually opened. The investor had to determine a favorable site in a suburban area that would allow for further city growth, construct four roads linking the factory to the city, and win the cooperation of those local citizens who stood to lose arable land in the transaction. The company overcame this latter challenge relatively easily as those residents who had lost their land could see that new job opportunities would arise from the deal. Nevertheless, Fumanduo responded to resident concerns by introducing a higher-quality water-treatment system.

The manager of the factory is optimistic about future development in Xingping and confident that the factory will be able to offer a diversified array of products to meet the growing demand in neighboring markets. One significant pressure point is a lack of skilled labor, but the company is working to improve wages and living conditions in order to attract the talent it needs.

Networks. Xingping has deliberately taken advantage of, and built on, its role as a spoke city. The city has coinvested with central government in highways connecting Xingping to Xianyang and Xi'an. Some local factories have set up their sales offices in the two hubs, while the hubs have in turn located their manufacturing plants in Xingping while maintaining their R&D branches at home. This makes sense because such a separation of roles takes advantage of the higher-quality talent that exists in the hub cities as well as the lower-cost labor force in Xingping. It is clear that the hub-and-spoke model is already allowing firms to tap into the comparative advantages of the different constituent cities. The government of Xingping already plans to continue promoting such ties not only through closer contacts with its official counterparts in the hub cities but also through direct contact with hub enterprises. Indeed, the government of Xianyang is discussing the possibility that it could designate Xingping to be a district of the larger city. While such a development would lower Xingping's administrative level, the closer hub-and-spoke relationship could help the city's economy to develop more effectively.

Labor and skills. Xingping lags behind other Chinese cities in several important areas. Education is one example. The city doesn't have a university, reflecting the fact that there are a great many good institutes located in the nearby hub cities. In addition, in a hangover from state economic planning, the city's middle and high schools are still affiliated with local SOEs—in the past, each local SOE acted as a society that provided schooling and other services to its employees.[16] This system does not ensure that all residents have access to sufficient education and thus leaves a substantial portion of the population undereducated. In order to get into a middle or high school in Xingping, residents from rural areas or outside Xingping still have to pay an extra amount of money on top of the standard fees to get their children enrolled, which is an economic burden to many families. This situation is leading to a shortage of the talented workers needed if more businesses are to locate in the city. According to our interviews, this aspect of the city's development is widely regarded as the most significant long-term pressure point and could mean that Xingping's growth is slow, at best, in future years. The trouble is that, according to those we interviewed, the government has limited ability to improve the situation as it delegates tax decisions to the upper-level government based in Xianyang. While Xingping has a shortage of skills, the city has a surplus of basic labor—80 percent of the local labor force is made up of local farmers. Xingping's government has actually been helping such people to find work in other cities if they cannot find employment at home by providing information on what jobs are available in neighboring urban centers.

Quality of life. Xingping stands out as the poorest of our 14 case cities. Real per capita income at about 1,960 renminbi in 2005 is barely above China's official poverty line at 1,700 renminbi (Exhibit 1.14.3). However, we found citizens broadly happy with the quality of their lives in Xingping, and it is doubtless the

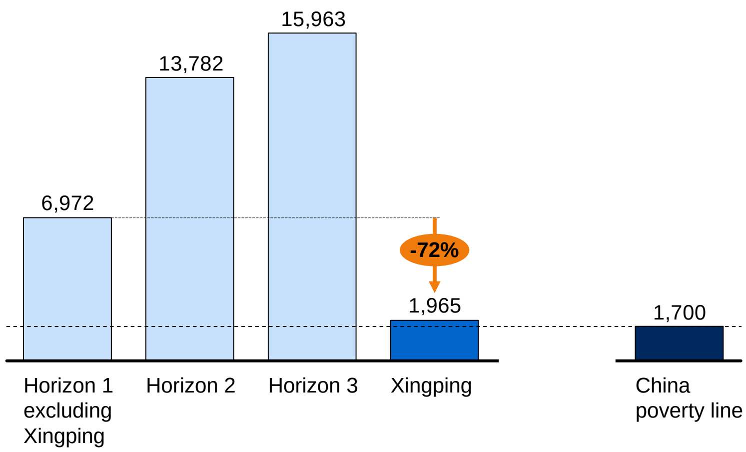
16 Field interview.

case that living conditions, incomes, and the city's economy more broadly have improved rapidly since 2003. The reason for this relative sense of satisfaction could be the fact that many *Hukou* residents and migrants alike in Xingping have lived in relative poverty and thus do have the same social benefit expectations of education, health care, and pensions. In the minds of local people, the building of new infrastructure has made a difference. So, too, has the fact that the government is covering more people with some medical insurance, although city residents still say that hospital visits are expensive (see "Wanyuan Wang—a migrant cook in Xingping"). One persistent public concern is that many industrial factories are located in the urban area—despite this being a relatively small city—and that they are generating pollution. The government has initiated some efforts to improve environmental conditions. It is, for instance, in the process of building two wastewater-treatment factories and has tightened up mechanisms to control pollution such as factory examinations.[17]

Exhibit 1.14.3

Xingping is the poorest of all case cities, with a per capita income just above the poverty line

Annual per capita disposable income
Renminbi, 2005



Source: China Population Information Network (POPIN); McKinsey Global Institute China All City model; McKinsey Global Institute analysis

17 MGI field interview with the vice director of Xingping Environmental Bureau.

Wanyuan Wang—a migrant cook in Xingping

Wanyuan arrived in Xingping at the age of 14 and is now 32. All his siblings also moved to the city, but his parents continue to live in their village in rural Xingping. He is broadly happy with the move, largely because he was able to find a good job, paying some 1,800 renminbi a year, which is somewhat higher than average for the city. Although he is optimistic about the future, he complains about some aspects of city life. As a migrant, he still has to pay extra money to get his children into Xingping's schools, and health insurance is a "headache." Despite the government offering improved health insurance coverage to residents, health care remains expensive for him and his family, particularly any visits they have to make to the hospital. He is also worried about how to survive financially in his old age as he doesn't have an assured pension.

* * * * *

In the long run, Xingping's prosperity will depend on its ability to continue to leverage its comparative advantages and at the same time to deal with the pressure points of public-services provision, labor shortages, and pollution. It remains to be seen how the city will be able to overcome the relative lack of control over key policies, the solution arguably lying in deepening cooperation between Xingping and its two hub cities.

2. MGI China City model (CCM) system

This chapter provides an overview of MGI's top-down econometric model system and details its components. We began from the national level, developed the evolution of macroeconomic and demographic variables, and from these developed city-level insights in the context of the broader Chinese economy.

MGI's urban model consists of two subsystems (Exhibit 2.1). The first of these is the China National model (CHN), which provides projections at the national level.[18] We discussed the data methodology for this model in previous reports. Here, we focus on the second subsystem—the China City model (CCM) system that we have employed extensively to derive city-level insights that form the backbone of our China urbanization analysis contained in this report. This system contains three submodels: the China All City model (CAC), the Indicators model (IND), and the Expenditures model (EXP). We organize the entire modeling system hierarchically.

The CHN model provides key macroeconomics, total urban data, and projections as input to the CCM system (Exhibit 2.2).[19] We estimate relationships between indicators in the CCM system using linear regressions and benchmark these relationships to corresponding data in the CHN model in order to maintain consistency between national- and city-level data and projections. In short, we model economic impacts at the city level to reflect the variation across cities in relation to the national-level benchmark.

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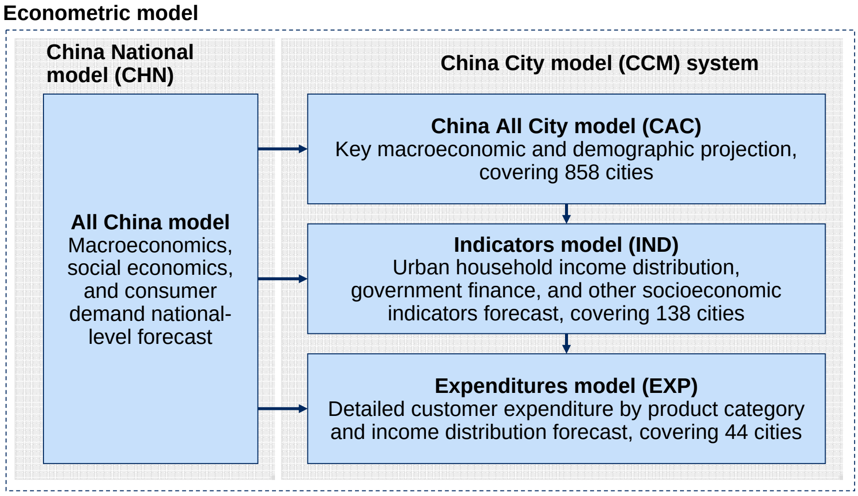
18 The forecast produced by the McKinsey Global Institute CHN model version 2.0 was published in Diana Farrell, Ulrich A. Gersch, and Elizabeth Stephenson, "The value of China's emerging middle class," *The McKinsey Quarterly*, 2006 special edition: Serving the new Chinese consumer, pp. 60–69 (www.mckinseyquarterly.com); also see *From 'made in China' to 'sold in China': The rise of the Chinese urban consumer*, McKinsey Global Institute, November 2006 (www.mckinsey.com/mgi).

19 In this report, the CCM uses national-level projections from the latest CHN model version 3.0, 2007.

Exhibit 2.1

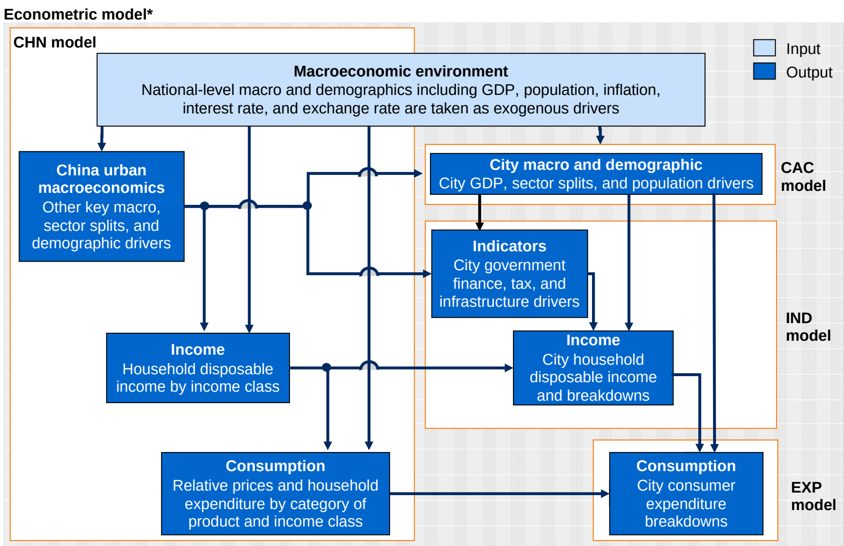
MGI's urban model system is organized hierarchically



Source: McKinsey Global Institute analysis

Exhibit 2.2

Blocks within each model are interlocked through economic relationships



* Data available for trendline only.
Source: McKinsey Global Institute analysis

Within the CCM, we also link the three submodels hierarchically. The CAC model describes the dynamics of city growth through the lens of macroeconomics and demographics. This submodel covers 663 official cities and 195 unofficial cities that we have screened to satisfy the economic criteria of a city as defined by China's National Bureau of Statistics (NBS) in 1996. CAC data then feeds into the IND model that describes urban development in terms of key social and economic indicators including the distribution of income for 138 cities. We then input the historical and projected information produced by the IND model into the EXP model that describes city-level consumption expenditure by income bracket and by product category for 138 cities, as well as detailed expenditure by income bracket for a subset of 44 cities.

We now discuss the endogenous and exogenous variables employed and detail the raw data used. We also describe the key methodologies harnessed to derive forecasts about GDP, urban population, and so on. Finally, we explain the sources of historical data and the techniques used to build up a complete and clean database. We will discuss our estimates of household size, number of households in per household income bands, and how we transform estimates from percentile to fixed-income brackets and further derive urban consumption distribution in MGI's next report.

This rest of this chapter covers the following:

- **Macroeconomic and demographic environment.** Provides background on the macroeconomic and demographic inputs we take as exogenous assumptions for the three city-level submodels.
- **Model-determined city-level macroeconomic drivers.** Develops forecasts for city macroeconomic variables.
- **Model-determined city-level demographic drivers.** Develops forecasts for city demographic variables.
- **Database methodology.** Explains the data sources of the study and the methodologies employed to ensure consistency in the development of a historical database.

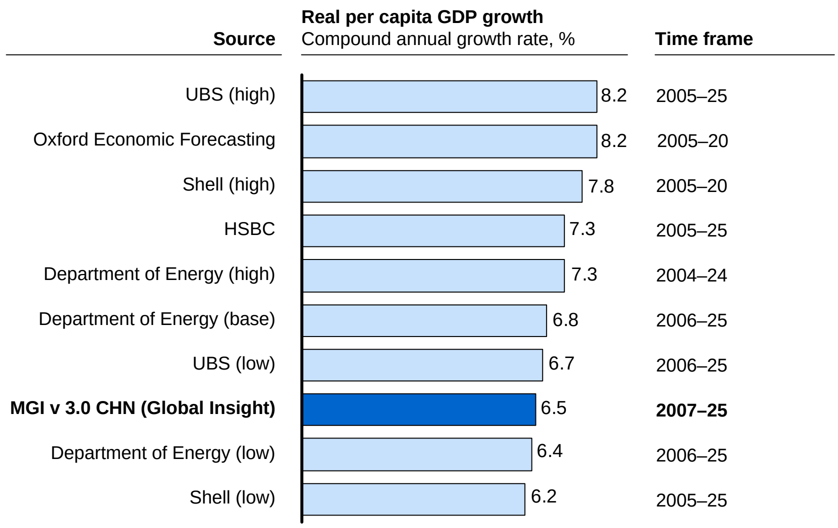
MACROECONOMIC AND DEMOGRAPHIC ENVIRONMENT

We generated our projections of the consumer markets in China's cities within the broader national economic and urban macroeconomic context.

We used projections from the international economic forecasting firm Global Insight (GI), including those for real GDP, population, inflation, interest rates, exchange rates, relative prices, and value-added sectors.[20] GI's macroeconomic estimates tended toward the mode of estimates among several well-known forecasts (Exhibit 2.3). Using these macroeconomic forecasts, we estimate future consumer demand at the national level in the CHN model. Then from the CHN model we further generate sector shares of GDP, population breakdowns by age group, capital, investment, total disposable income, and consumption to build an urban macroeconomic environment where we forecast city-level income and consumption in the CCM system. We benchmark all the economic relationships of urban cities to corresponding CHN projections. The following sections provide an outlook for each of these variables over the forecast period.

Exhibit 2.3

MGI's per capita GDP growth base case is in the lower range of forecasts



Source: *How to think about China*, UBS, January 2006; *Scenarios to 2025*, Shell; *China Economic Insight*, HSBC, January 2006; *International Energy Outlook*, Department of Energy, 2006; MGI CHN model v. 3.0, 2007

GDP growth

GI sees China's GDP growth remaining strong in the near term. From 2003 to 2007, annual growth was around 10.6 percent, but GI sees this rate of growth slowing to 8.2 percent between 2008 and 2010 and then drifting down further to 6.7 percent by 2025. This forecast assumes that China is able to engineer a soft landing, achieving a smooth transition to a more sustainable growth rate through adequate adjustments in credit creation, revaluations in the renminbi, and institutional development. GI forecasts real per capita GDP growing at

20 We use GI projections from April 2007.

6.5 percent annually from 2007 to 2025, assuming 0.5 percent annual population growth. We believe that this projection is a solid basis for our analysis given that it is very near to the middle of a range of per capita GDP projections from multiple sources and therefore close to what appears to be a consensus view as we noted in our previous report.[21]

Inflation

Given insufficient domestic demand after the Asian financial crisis, overall price inflation, measured by GDP deflator, remained surprisingly tame between 1997 and 2003 with an annual rate less than 2.6 percent. In the following period from 2003 to 2007, overall inflation climbed to a rate of 4.5 percent, mainly because consumer inflation measured by broader consumer deflator rises to 5.4 percent annually. The robust pace of economic growth at a rate of 10.7 percent, excessive money supply coming from all-along trade surplus and a vast hot-money influx, surging food and oil prices passing from the global market, and investment growth in export-oriented industries have all been cited as reasons for the inflationary pressure. After this upsurge, GI projects overall inflation will slow down from 2008 to 2025 to an annual rate of 3.3 percent, reflecting stable GDP growth and tepid consumer prices. Services prices will likely post greater gains than overall prices, with industrial and agricultural prices growing more slowly.

Interest rates

Interest rates were relatively stable to 2005, but GI sees overall monetary policy tightening in view of increasing consumer prices. The People's Bank of China (PBOC) has tried to cool off rapid growth in fixed-investment spending primarily through administrative controls such as increasing reserve requirements rather than through changes in the price and availability of credit in view of the bank's concerns about already-sluggish consumer spending. In an attempt to rein in credit creation, the PBOC has tightened monetary policy several times. The one-year lending rate now stands at 7.47 percent, while the reserve ratio is at 17.5 percent.[22] Further tightening of monetary policy is likely given the potential for serious consumer price inflation, and GI expects real long-term interest rates to rise to as much as 8.1 percent in the short term before easing back to a level about 6.9 percent by 2025.

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21 *From 'Made in China' to 'Sold in China': The rise of the Chinese urban consumer*, McKinsey Global Institute, November 2006 (www.mckinsey.com/mgi).

22 We used the latest one-year lending rate and reserve ratio from the PBOC from August 5, 2008.

Exchange rate

The renminbi appreciated modestly to 2005 but, after the PBOC initiated its new exchange-rate policy in July 2005, China's currency has appreciated by 16.4 percent against the dollar to 6.85 renminbi per dollar at the time of writing this report in summer 2008. The renminbi is now under upward pressure due to robust inflows of foreign capital (including hot-money flows betting upon significant revaluations that avoid capital controls) as well as international pressures to adjust policy due to record Chinese trade surpluses and the rapid expansion of domestic credit. In the longer term, GI expects this appreciation to continue but at a moderate pace, leaving the renminbi at 6.0 per dollar by 2025. GI's projection is similar to those of the US Department of Energy and Oxford Economic Forecasting.

Rest of world

We use GI's projections of rest-of-world economic activity to model the evolution of China's current account including trade, net transfers, and net income. Overall, GI expects China's economy to grow more than twice as fast as the rest of the world's economy and register slightly higher inflation.

- **Real GDP growth.** After a slight growth to 3.6 percent by 2009, projected rest-of-world GDP growth will remain at around 3 percent through 2025. The primary driver of this easing of overall growth is a slowdown in the major developing countries due to shifting demographics, as well as a general increase in the level of interest rates.

- **Inflation.** As GDP growth slows and prices of oil and other commodities moderate, rest-of-world inflation, as measured by GDP price deflators, is expected to slow from 3.8 percent in 2005 to 1.9 percent in 2025. Similarly, the rest of the world's import prices will fall from 3.8 percent in 2005 to 2.0 percent in 2025, with variations in the short term.

- **Interest rates.** Interest rates will rise from their near-record low of 3.3 percent in 2005 to 4.3 percent in 2025.

To enrich the macroeconomic picture painted by GI projections, we use forecasts from the CHN model to provide other national-level economic benchmarks.

Capital stock and fixed investment

Fixed investment has been the primary driver of China's rapid economic growth. During the past 17 years, the share of fixed investment in GDP rose from

26 percent to 41 percent. As growth moderates from the current intense pace, the CHN model finds that the investment share will increase at a steady pace to 45 percent in 2015 before easing back to a slightly lower share of 40 percent in 2025. Investment drives growth in the stock of productive capital. As its economy evolves, China is becoming increasingly capital-intensive. We see capital accumulation per worker growing by an average of 10.5 percent from 1990 to 2007, outpacing GDP per worker by 1.7 percent during this period. We expect this trend to continue to 2025, with capital growth outstripping that of GDP by 1.5 percent.

Sector development

Driven by robust economic growth, rising demand from domestic and foreign markets, and the increasing urban population, the share of industry and services in GDP is increasing steadily and will continue to do so over the next 20 years. From 1990 to 2007, the combined share of industry and services sectors surged from 73 percent of GDP to 90 percent; within this total, industry contributed 90 percent of the growth. During the next 18 years, the services sector will play a more important role than industry in China's economic development. The CHN model indicates that the share of industry and services will account for 95 percent of total GDP by 2025, of which services will have a 43 percent share. This forecast assumes that China is developing a more advanced economic structure through sectoral shifts, investment growth, and urbanization. Indeed, sectoral shifts will be a major driver of the urban development, as growth in urban-based industry generates migration and population growth, in turn increasing the demand for services.

Population growth

China's population will age in the second half of the forecast with a slow but steady rise in the dependency ratio, defined as the number of children (aged 0 to 14) and elderly (aged 65 and above) relative to the working-age population (aged 15 to 64). This ratio will begin to rise from 2010 to 2025. A fall in the child dependency ratio, from 30 percent to 27 percent between 2005 and 2010, tends to contribute to the spike of the overall dependency ratio during the first five years of the forecast period. The increased pace of the overall dependency ratio after 2016 will be fueled by the surging upward pressure of the elderly dependency ratio. The relative shares of population by age group will play an important role in determining overall government expenditures, primarily because of the need to provide pension support to the elderly and education to the younger portions of population. The 15- to 24-year-old age bracket in particular is a key determinant of secondary and higher-educational attainment rates at the aggregate level; these, in turn, are a crucial determinant of the national-level income distribution.

Urban population growth is one of the most significant components of urban development in China. Using the NBS definition of urban population relative to the overall population of China, the CHN model shows that urbanization has been growing rapidly and will continue to do so. From 1990 to 2007, the share of urban population increased from 26 percent to 45 percent and will likely continue to grow at a similar rate over the next 20 years. Using the NBS definition of urban, the CHN model projects that 60 percent of China's population will be urban by 2025. However, using MGI's urban definition, the CAC model projects the urban share at 64 percent.

Urban income distribution

As China continues to urbanize, per household real disposable income has grown at a steady 7.3 percent from 1990 to 2007, and MGI's CHN model finds a slowing down in this rate of increase to 4.8 percent through the next 18 years. The urban distribution of income in China changed sharply between 1990 and 2005. In 1990, some 98 percent of households were in the lowest-income category with disposable income per household of less than 25,000 real renminbi. By 2007, the proportion in the lowest-income group decreased to 33 percent, while the middle- to low-income class with incomes between 25,000 and 40,000 real renminbi largely expanded from 1 to 39 percent. The distribution of incomes will continue to shift upward with 53 percent of households belonging to the middle class with incomes of between 40,000 and 100,000 real renminbi by 2025. Despite these overall gains, income inequality as measured by the Gini coefficient has increased dramatically from 0.13 in 1990 to 0.33 in 2007 and will rise to 0.39 by 2025. Disposable income plays a primary role in determining household consumption and consumption by different product categories. The all-China average income and the distribution of income provide a top-down control to income distribution at the city level.

Urban consumption distribution

China's total private consumption share of GDP experienced a somewhat contrarian dynamic between 1990 and 2025, according to the output of the CHN model. This share decreased from past levels of around 51 percent in 1990 to 37 percent in 2007. We project that this share will drift higher to about 41 percent by 2025. MGI believes that China's economic growth will gradually transfer from investment-led to consumption-led through the forecast period. Thanks to China's urbanization, share of consumption by urban inhabitants will keep increasing from 41.9 percent in 1990 to 80.6 percent in 2007 and then up to 88.7 percent till 2025. Because of our top-down modeling approach, aggregate consumption and consumption by category data constrains our relative forecasts of consumption at the city level. We will detail the full methodology of this submodel and update our results in a forthcoming MGI report on consumption in China.

MODEL-DETERMINED CITY-LEVEL MACROECONOMIC DRIVERS

Using the top-line macroeconomic drivers exogenously and MGI's CHN model, we produced forecasts for a number of urban macroeconomic variables that drive urban income distribution and consumption. In this section, we detail how we arrived at per capita GDP for all 858 Chinese cities in aggregate and at the level of individual cities; real GDP per worker at the city level; fixed capital stock and fixed-asset investment at the urban aggregate and city levels; a sectoral analysis of urban GDP; and urban government expenditure, revenues, and taxes.

Average real per capita GDP for urban China

Driven by urban population share and the ratio of per capita value added in urban-based sectors of industry and services to all-China real per capita GDP, real per capita GDP for all cities reflects shifts to urban-based economic activity. Due to higher productivity in urban economic sectors, real urban per capita GDP increases more rapidly than real per capita GDP for China as a whole. From 1990 to 2007, a key period of industrial development for China, per capita urban GDP was 1.7 to 1.8 times that for all China. We project that, over the next 18 years, this discrepancy will decrease to 1.4 to 1.5 times, suggesting that a shift of labor from rural to urban areas will reduce the earnings premium currently favoring urban workers.

We do not expect China's unofficial cities to be as affected by growth in value-added sectors as official cities. We estimate that real per capita GDP in unofficial cities will tend to around 56 to 60 percent of that of official cities over the period of our forecast. This is primarily due to unofficial cities' retaining a relatively higher share of agriculture and therefore their real per capita GDP tending to grow more slowly than that of official urban areas. We use aggregate per capita GDP figures for official and unofficial cities as reference points for our analysis of these metrics at the level of the individual city.

City-level real per capita GDP

Real per capita GDP is a measure of overall living standards in China's cities. Our estimates show that China's economy-wide urban real per capita GDP has been growing rapidly by global standards. Urban China achieved the highest growth rate of 15.4 percent in 2005, but this then decelerated from 2006 onward and will show relatively constant growth of around 5.4 percent over the next 18 years. Output per worker, taking into account the share of the population in the 24-to-64 age group that constitutes the "labor force," determines per capita GDP. The trend of per capita output is consistent with that of output per worker, but it is more variable due to shifts in the shares of both the younger and older population. The labor force–to–population ratio also drives city-level per capita output. The larger the share of China's overall labor force in a certain city, the greater the output that will be generated by those of working age, in turn boosting per capita GDP for this city with a given total population. We construct city-level real GDP from nominal GDP using China's national GDP price index.

Real GDP per worker

Real GDP per worker measures average labor productivity and is the primary driver of increasing living standards. As we have noted, investment-led capital accumulation has largely driven China's rapid growth. We apply a neoclassical growth model with the Cobb-Douglas production function to simulate China's economic growth.[23] Within this neoclassical model, average productivity is determined by total factor of productivity and capital per worker. We expect a positive but waning effect of real capital accumulation on output per worker. So as the capital stock grows, the positive impact of higher capital per worker on output per worker decreases. Regression results estimate that the coefficient value of logarithmic capital stock per worker is 0.47; so for every $1 increase in capital per worker, real GDP increases by only 47 cents. Inversely, to increase real GDP by $1, more capital is needed than labor.[24] This result further indicates that output growth in Chinese cities is relatively capital-intensive.

The labor force includes the working-age population between 24 and 64. Because of decreasing returns to labor, the expansion of city populations due to the influx of migrants primarily of working age tends to reduce output

23 $GDPR\_L = TFP \times (KR/E)^{\alpha}$ where KR/E is capital per worker; E is approximated by population in the prime working ages of 25 to 64; TFP is "total factor productivity," the component of real output not explained by factor inputs; and coefficient α reflects the percentage change in real GDP per worker for a 1 percent change in capital per worker.

24 $GDPR = TFP \times KR^{0.47} * L^{(1-0.47)}$. The marginal effect of capital on real GDP is smaller than labor.

per worker. Total factor productivity is the third driver and works through the "agglomeration effects" of city size on GDP per worker. Our analysis shows that population generates a positive but decreasing effect on output per worker and indicates that, as city size increases, access to more diverse end markets and more specialized input suppliers generate agglomeration economies. In the case of larger cities, higher costs and congestion effects offset such gains.

The last driver of per worker output is changes in a city's land area, which has an impact on the mix of economic activity. We expect that geographic expansion has a negative impact on growth because this expansion tends to be accompanied by a shift to relatively low-productivity agriculture.

Fixed-capital stock and fixed-asset investment

Changes in fixed-capital stock directly impact city-level growth in output per worker and overall living standards. Our capital accumulation model generates stock from continuous investments via the standard perpetual inventory method; in other words, current capital stock is accumulated from the previous year's capital stock after depreciation plus the investment devoted in the current year.[25] We estimate that both drivers positively contribute to the total stock.

Fixed investment directly influences the growth of physical capital. The most important characteristic of China's economic growth is the extremely high ratio of investment to GDP. From 1990 to 2002, the urban investment ratio to urban GDP remained at around 30 percent. This ratio then surged to 39 percent in 2003 and kept climbing to 42 percent in 2007. Our model sees urban investment reaching a peak of 45 percent in 2011 before slightly decreasing to 39 percent by 2025. We construct real nominal city-level investment using the national-level investment GDP price index. At the city level, industry value added in real GDP primarily and positively drives fixed investment. This is due to the fact that industry is the most capital-intensive economic sector and a high industry share leads to a higher investment ratio. In addition, larger prime working-age populations (aged from 25 to 64) drive investment growth in cities. A city with access to a larger workforce that can leverage physical capital attracts more investment.

Sector shares of GDP

The mix of output by sector is an important determinant of the urbanization rate. We expect the agricultural share of real output for all cities to continue to

25 $KR = (1 - \delta) \times KR(-1) + IFR$, where KR is the real capital stock, δ is the assumed depreciation rate for China, and IFR is the real fixed investment.

decrease toward 2.9 percent, while the industry share will fall gradually from 58 percent to 46 percent by 2025. MGI forecasts the share of services in cities to rise to 51 percent by 2025 from 34 percent in 1990. This rise in the share of services assumes that China will transit from being an industrialized economy to a services-oriented one. Furthermore, because rates of industry and services growth are indicators of the degree of urban economic development, the total shares of industry and services have a significant impact on the urbanization rate and GDP growth. As with other urban variables transformed from the national level, we construct real city-level nominal sectoral data using the national-level sector price index.

- **Value added by agriculture.** Agriculture tends to be the largest sector during the early phase of economic development. With development, the agriculture share in China has dropped rapidly and will continue to decline. Our analysis suggests that two factors have a significant impact on this share—real per capita GDP and changes in land area. Real per capita GDP tends to exert a negative effect because when incomes grow, demand tends to shift from food and other agricultural commodities to industrial goods and services. By contrast, changes in urban land area have a positive correlation with agriculture share, because the expansion in the amount of urban land usually comes from rural areas that are relatively agricultural activity intensive.

- **Value added by industry.** The share of industry tends to peak during the middle stages of economic development. For urban China, a peak occurred during the early 1990s and is likely to occur again between 2003 and 2011. The high share of exports in China's GDP explains why the economy's share of industry is higher than would be the case if domestic demand was the sole determinant. The same two drivers that we described in the share of agriculture come into play but with different impacts. Real per capita GDP impacts on the growth of industry's share, depending on the trajectory of incomes. As incomes grow, demand shifts from food and other related goods to industrial outputs such as manufacturing, utilities, and construction, and then toward services. There is a negative correlation between changes in urban land area and the urban-based industry sector. This is because most changes to land area involve the annexation of rural areas—that are less industry- and services-intensive—into urban boundaries.

- **Value added by services.** Services typically come to dominate during the later phases of economic development. At the national level, China's share of the services sector is increasing gradually; this trend is more apparent in larger urban areas. At the national level, we project the share of services in GDP to rise only mildly at a 0.3 percent annual rate from 2007 to 2025. However, the share of services in urban China will likely grow at 0.9 percent annually during this period. At the city level, trends in urban population and developments in land area significantly impact growth in services as this sector is more "people-intensive" than the industrial or agriculture sectors. Population exerts a positive and increasing effect—as the population grows due to the impact of industrialization on net migration, demand shifts from industrial goods to services-sector outputs such as transportation and communication, trade, health, and education. As we saw in the case of industry, a change in the urban land area has a negative correlation with urban-based services because of the inclusion of agriculture-based rural areas during annexation.

City government finance

Government expenditure and revenue are the key determinants of the quality of urban China's education and social infrastructure and key components of cities' living environments. Government finances also affect tax policies as policy makers adjust tax rates according to historical government expenditure and deficit ratios. Government financial positions also have an impact on average household disposable income through the tax ratio—tax to urban GDP—which explicitly determines household income.

- **City government expenditure.** There are two main components of city government expenditure. The first comprises spending on capital construction, infrastructure, and public services including support of innovation within enterprises, science and technology, industry and transportation, urban maintenance, and so on. We include this type of expenditure in our model as a component of GDP. The second component comprises transfer payments from central or provincial government—not captured by the model so that we can show the status of the urban government deficit.

  Despite being a relatively low proportion of urban GDP relative to global standards, city government expenditure is a key determinant of public-service provision. Increasing infrastructure needs and pressures to provide health, education, and other social services will lead to increases in government spending relative to GDP. We forecast that the share of government spending in GDP in most cities will rise to rates of between 0.2 percent and 3.5 percent between 2007 and 2025. There are four key drivers of this share. First, real per capita GDP has a negative effect on the ratio of government spending to GDP. The growth of economy as measured by real per capita GDP reduces the share of goods and services provided directly by government, resulting in declines in this expenditure ratio. Second, the dependency ratio—the share of the population supported by the economic activity of the prime working-age population—has a large and positive effect on expenditure; the higher the dependency ratio, the more the public sector would need to spend on education and health. The third major driver is infrastructure costs. These capture the impact on public spending from the cost of, for instance, maintaining roads as well as power and water utilities not fully offset by user fees. The more substantial the infrastructure requiring maintenance, the higher is the imposition on city government spending. The fourth driver is urban population, which is negatively correlated with city spending as a share of GDP due to the effect of the implied economies of scale that derive from serving larger urban agglomerations.

- **City government revenue.** City government revenue comprises a combination of all tax revenues, other operating revenues including any profits of state-owned assets or enterprises and charges, and transfers from central government. For the same reason as we explained in the case of government expenditure, we do not include transfers from other levels of government that may significantly offset spending.

  Government revenue as a share of GDP is driven by real per capita GDP and the ratio of tax to GDP. Per capita GDP has a negative impact on government revenue share because of the negative correlation between government expenditure and per capita GDP. A lower share in the previous year is then built into a lower expectation of the current year's budget, and the city government adjusts the tax rate downward, leading to lower revenues. This negative relationship implies that government makes a smaller contribution to GDP in more developed cities and a larger contribution in less developed cities. The ratio of tax to GDP, which measures the effective tax rate, has a direct, positive impact on revenues simply because a higher tax generates higher operating revenues.

- **Tax rate.** Driven by the government's revenues requirement, China's national effective tax rate will gradually increase. At the city level as well, taxes will likely rise continuously over the next 20 years for 128 of the 138 cities in our model. Trends in production and government spending at the urban level have a broad impact on tax receipts. In terms of production, real per capita output positively drives tax rates because as output rises, urban residents have the ability to pay higher taxes. However, the share of agriculture in a city's GDP tends to have negative effects on tax revenues. The higher the share of agriculture, the lower the tax revenues because agriculture needs more subsidies and other support. In terms of government spending, the historical status of the government deficit will impose a positive effect on the next year's tax policy. This implies that an existing budget deficit generates pressure to raise taxes—acting as an important feedback that helps to control city government debt. At the same time, we also expect historical government expenditure to have a positive impact on the current year's tax rates because the government tends to adjust its financial budget according to the previous year's spending when it is adjusting taxation.

MODEL-DETERMINED CITY-LEVEL DEMOGRAPHIC DRIVERS

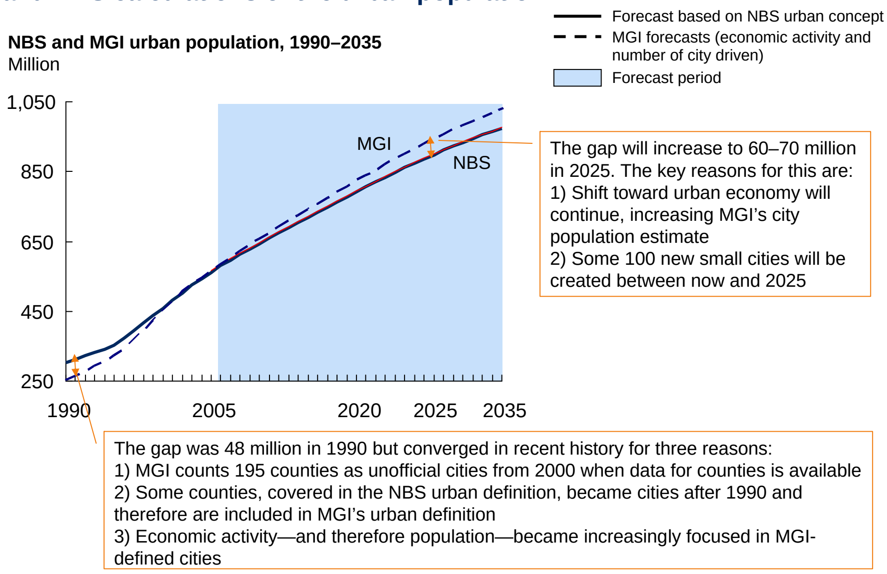
Using top-line macroeconomic drivers provided by GI together with our model-determined economic drivers, we forecast a number of additional national and urban demographic variables. We use these in turn to forecast the distribution of urban income.

Population

The urbanization rate reflects the proportion of the total population that lives in urban areas. The definition of urban areas varies widely across countries. We used the "census total" definition supplied by the NBS census survey (we discuss this definition in full in the last section of this chapter). This definition excludes primarily rural areas within official urban jurisdictions and includes primarily urban areas in officially categorized nonurban areas. At the city level, we note that conceptual differences between the NBS census total definition and NBS urban population data change over time (Exhibit 2.4). The census total tally of city populations was slightly lower than the NBS urban total before 2000. Since then, due to MGI's incorporating urbanization within "unofficial" cities and other urban-adjacent areas, the census total population generally converges to the NBS urban definition in recent history and then exceeds NBS urban from 2007 to 2025.

Exhibit 2.4

Economic and conceptual differences drive the gap between MGI and NBS calculations of the urban population



Source: McKinsey Global Institute analysis

Urbanization is an important driver of the distribution of income, which, along with changes in household size, determines the number of households in urban areas. For our forecast of the urban population, we use a top-down approach. First, we establish the urban population of all cities at an aggregate level, using national-level drivers such as the urban share of industrial activity. Second, we calculate the urban populations of individual cities, using city-level drivers but benchmarking against aggregate urban population figures so that the two sets of data are consistent.

Total population in all cities. The total population of the 858 cities including both official cities defined by the NBS and unofficial cities screened by MGI is primarily and positively driven by China's urban-based economic activity—the total value added to GDP by industry and services. Because the census total definition is more sensitive to urban-based economic activity, shifts in industry and services drive growth in the population of all cities. Another driver of growth in the total urban population is the increasing number of cities. From 1990 to 2005, the number of cities increased from 444 to 858, and this contributed to the more rapid growth of the census total population. Then urban population in China, by the census total definition, is expected to rise steadily at an annual rate of 2.4 percent over the next 18 years—less than half the 5.2 percent annual increase experienced between 1990 and 2005. According to the MGI urban definition, almost 64 percent of the total population will live in urban areas by 2025.[26]

- **Total population in unofficial cities.** Unofficial cities are screened using the same NBS criteria used for official cities; we therefore expect the population in unofficial cities to be determined by the same drivers as all cities. Although the unofficial cities that we have identified are smaller and more agriculturally based than official cities, shifts toward industry and services will still positively drive their population growth. From 1996 (the date we used as a starting point in our definition of unofficial cities) to 2000 (the cutoff for our calculation of unofficial cities and the start of our estimates for new cities) the increasing number of unofficial cities contributed to China's urbanization rate.

- **Urban population at city level.** For an individual city, stock-change dynamics in the urban population determine that city's growth. We model the city population using census total data from the 1990 and 2000 full censuses as well the 2005 1 percent censuses to fill in the full range of historical data from 1990 to 2005. We build our estimates of population developments between censuses by modeling the relationship between population growth and net migration.

  We base our forecast of urban population growth at the city level on three elements: natural incremental growth in the population, net migration, and land annexation. We look at recent population data to determine natural growth through births and expect these to have a positive effect on population growth because the previous population stock largely determines that of the current population. Migration is a very important driver of China's urbanization during the transition from being an economy based on agriculture to an industrialized country. Net migration positively drives changes in city populations. Land annexation captures the nonmigration impact of changes in city land areas. We expect the effect of this driver to be positive as an increase in urban land area generates an increase in urban population.

- **Net migration.** We model net migration by capturing the population growth due to the industrialization of cities, given that the necessary demographic

26 The 64 percent urbanization rate includes the urban population of existing and new cities (939 cities by 2025).

data is unavailable. We calculate an annualized migration rate based on the difference between *Hukou* and census totals in 1990, 2000, and 2005. We fill in the gaps between these dates using historical data for net migration and the relationship between economic factors and net migration.

Our forecast of net migration is driven by the shift in the composition of production in the economy, the historical population stock, and migration rate. A continued rise in the share of industry in total output increases the net migration rate, as migrants are attracted from rural areas and smaller cities to urban areas in search of industrial jobs that offer relatively higher wages but do not necessarily require education. Their arrival tends to contribute to a more prosperous economy. Population data for the recent past tends to have a positive impact on the migration rate in the current period. Migration flows into a certain city tend to reflect previous patterns, suggesting that a more developed city tends to attract a steady flow of migrants.

- **Population breakdown.** Using top-line control from population breakdowns by age at the national level, we forecast the urban breakdowns for individual cities and use these in turn to estimate some other macroeconomic factors such as per capita GDP. We break population down into four groups: age 0 to 14, 15 to 24, 25 to 64, and 65 and above. Historical data also comes from 1990, 2000, and 2005 census data based on the census total definition. We fill in the data gaps between these dates by modeling the relationship between population growth and net migration.

  Regional and prefectural variations in the character of cities, as well as China's national population policy, have an impact on population breakdowns. Beyond these impacts, net migration has a varied impact on the population share of different age groups. The urban population group aged 0 to 14 continues to decline due to low China fertility rates in urban areas resulting from the one-child policy. This youngest age group is relatively immobile and therefore has a lower share of the urban population. We expect the share of people aged 15 to 24 (the entry-level working group) to decline as well, although less rapidly than the youngest age group, due to China's low fertility rate. The net migration rate has a negative effect on the growth of this group because this segment of the population is less likely to migrate and, as migration to the city rises, the share of this population group is likely to decline. Positive net migration rates largely reflect inflows of people aged 25 to 64 (of prime working age). This age group has the largest share of the urban population, and we expect it to increase first but then to decline as the population ages due to the mixed impact of urban migrants and the declining pool of younger people. A positive net migration rate directly increases the share of this age group, as labor migrants attracted by economic growth are usually of prime working age. The oldest group, age 65 and above, will increase rapidly in the future due to greater longevity. Our calculations suggest that migration driven by developments in industry and urbanization do not significantly affect shifts in this age group.

Numbers of households and household size

The NBS defines a household as people living together and acting as one economic unit. Average household size and population at the national level as well as in specific urban areas determine the total number of households. In addition, average urban household size is an important driver of the distribution of households by income classes.

Between 1990 and 2007, the average household size at the national level fell from 4.4 persons to 3.4. We expect national household size to continue to fall but at a more moderate rate, reaching 2.8 by 2025. As in the past, continued increases in national per capita disposable income causes individuals to form new households.

The average size of urban households is consistently below the national level, reflecting higher incomes in urban areas. The average stood at 3.5 persons in 1990 but fell to 2.9 by 2007, and we expect that this average will continue to fall to reach 2.4 by 2025. We find that the gap between the average urban household size and national household size is driven by the relative cost of housing and utilities. A rising relative cost of these household expenses will tend to increase the average household size as the cost of forming new households becomes more expensive.

Using average urban household size as a control, we expect the household size for all cities to decline due to lower fertility and higher incomes. Given a particular size of urban population, the average household size determines the number of households at city level. Several economic factors determine the average size of the urban household, including disposable income, the dependency ratio, the urban population, and shifts between production sectors. We estimate that real household per capita disposable income is a negative driver of household size, which implies that higher incomes reinforce the ability to maintain a separate household or to live independently from relatives. The dependency ratio tends to have a positive effect on household size as it appears that the more dependents per prime-age worker there are, the higher the average household size. The population of a city has a negative impact on household size. The increasing level of urbanization in larger urban areas tends to enhance the social connection among inhabitants and therefore encourages the formation of independent households. In addition, a higher urbanization rate implies more advanced economic development and higher income to support individual households.

DATABASE METHODOLOGY

Understanding the fundamental concepts of the database—defining urban population

The most distinguishing feature of the CCM database is that all its indicators align with a single measure of "urban"—the census total urban concept that is fundamental to MGI's urbanization study because it guarantees the consistency, completeness, and credibility of the database structure. However, because we construct the CCM database from a number of different sources (including NBS and other statistical yearbooks) that provide only roughly consistent data for related concepts, MGI reconciled different concepts of urban into a single measure.

NBS urban versus MGI urban

There are distinct differences between the NBS measure of urban and MGI's measure. The NBS urban measure includes (1) population densities larger than 1,500 persons per square kilometer in any city district; (2) government locations, contiguous built-up areas, and all the streets in county cities and in city districts with population densities of fewer than 1,500 persons per square kilometer; and (3) government locations, contiguous built-up areas, and all residential committee areas in counties.[27] In contrast, MGI's census total definition of urban areas includes (1) the total area within city districts regardless of population density and (2) government locations, contiguous built-up areas, and all the streets in county cities.

The NBS urban measure reflects an administrative definition that includes those rural areas that form part of urban administrative districts. The MGI census total measure excludes these rural areas but includes viable "spillover" areas that are today not fully urbanized and classified by the NBS as rural but that might accommodate urban expansion in the future. Thus, MGI's census total concept takes into account economic linkages between already urbanized and yet-to-be urbanized areas within city districts.

27 We take this definition from the NBS 2000 census survey.

Census total versus other population concepts

It is essential to understand the key geographic dimensions for which data is available. NBS time-series data from 1990 to 2005 report four levels of urbanization: "census total," which we have described, but also "census region," "census urban," and "county." Census region refers to the total area of a city, including city districts and counties, regardless of the urbanization level in each of these. Census urban covers only those urbanized areas in city districts that have population densities larger than 1,500 people per square kilometer, and further includes areas with government locations, contiguous built-up areas, and all streets in city districts. County refers to all areas of a city that are not included in the census total measure, often including areas with city-like economic characteristics.

Within these four measures of urban provided by the NBS, there are some missing elements. While the NBS provides historical macroeconomic variables for most areas in census total, detailed economic data is available from the NBS only for the largest census urban areas. In the case of the county time-series, the NBS provides only a subset of macroeconomic variables.

Data sources

China's National Bureau of Statistics (NBS) is the primary source of data for the CCM system. We utilized three major sets of data:

1. Census population data
MGI used NBS population data from the census surveys of 1990, 2000, and 2005 (1 percent sample census).

2. Economic indicators data
GDP, GDP by sectors, and government finance data from 1990 to 2005 came from NBS city statistical yearbooks and the Chinainfobank.

3. Income and consumption data
The NBS Household Income and Expenditure Surveys (HIES) provided the underlying data for 2000 to 2005 on income by five percentile groups and eight expenditure categories. The definition and detail of the expenditure categories varies over time. Additionally, HIES provides information on household size by percentile group.

General methodology

We augment available historical data with alternative sources, using derived statistical relationships among variables, employing two core processes:

Reconciling sources. MGI uses a hierarchical splicing process to merge macroeconomic and sociodemographic data from multiple sources as well as different geographic concepts. We use a "ratio-preserving" method, which incorporates information from the source beyond the series of interest. This process includes the following steps:

1. Determine the benchmark source (typically an official source, such as the NBS).
2. Prioritize alternative sources by their data quality, measuring this by the consistency of these data with benchmark sources. We always begin with census total geographies. If these are unavailable, we then use census region geographies. We find that data from NBS statistical yearbooks is the most authoritative.
3. Use splicing techniques to incorporate economically relevant information from each successive alternative source. First, we construct a ratio using a reference series for each relevant variable and each source. Then we interpolate the gaps in the series using ratios derived from the preferred source. For each gap, we assess points of overlap between the new source and the base series and calculate a scaling factor. For example, to add additional history to an urban GDP series—using GDP data corresponding to census total—we use the ratio of census total to census region populations to rescale the census region version of GDP published by the NBS.

Backcasting history. We fill missing time-series data using model-based imputation techniques, which we also apply when we need to weed statistically unsupportable historical data. This process involves the following steps:

1. We use estimated statistical relationships among available data series to construct a preliminary "data model." We take into account the economic logic and drivers highly correlated with specific variables to estimate first-cut solutions.
2. We simulate the "data model" over history to "predict" patterns of variation for missing observations, given historical data for relevant variables. The predicted pattern aims to reflect the actual changes in drivers.

3. We use splicing techniques to incorporate predicted values for missing observations into available historical data. The imputations to reflect patterns are implied by variations in the drivers and are therefore much more accurate than would be the case, for example, if simple linear interpolation (a standard approach) were used to estimate missing observations.

Specific methodology for constructing population estimates

Constructing estimates of cities' urban populations that accurately reflect the impact of migration on urbanization is a major objective of our models. We use a multistep methodology to construct estimates of city-level population corresponding to the census total measure:

1. **Calculate a cumulative net migration measure.** We define net migration as the difference between the census total population—actual inhabitants according to a census—and the population of residents registered by the *Hukou* system for the year in question. We define the cumulative net migration rate as the ratio of net migrants to the total city population. Then we "annualize" these cumulative rates by assuming a constant average yearly rate over the intercensal period. Note that this measure is not a demographically based concept—that is, the difference between a change in the population and natural increase. Rather, the measure we use is a statistical instrument based on available data (the census and *Hukou* totals for specific census years) that we use to generate estimates with our econometric methodology.

2. **Construct an "annexation effect" index.** We then generate an estimate of the impact of annexation of adjacent land to existing urban areas. Due to the large-scale annexation of land by cities, there are discrete jumps in city data including cities' land areas, GDP, and *Hukou* populations. We use these data series to identify and quantify the impact of annexation on city populations. MGI uses city land area data to identify years when annexation takes place. Because land area changes only when there is an annexation, the dates of these changes indicate that at least some part of the change in population must be attributed to land annexation and not just economic factors manifesting themselves through net migration. We calculate average annual growth rates in *Hukou* populations for the years in which annexation occurs as well as for the years excluding annexations. We arrive at the annexation effect by observing the difference in growth rates of the *Hukou* population with and without annexation. We thus obtain an annexation effect of zero when there is no annexation in a particular year and an effect equal to the net growth rate in population when there is annexation, that is, the change in the population attributable to an annexation.

3. **Construct a cross-sectional model.** To arrive at a projection of the urban population between available census years, we use a regression model that links the ratio of net migration to GDP growth and the ratio of population to net migration, net of annexation effects. We use the model to construct intercensal population projections, which are driven by time series of actual GDP growth and estimates of annexation effects. Finally, we splice the intercensal predictions into census-year data to construct a time-series database of population for the entire historical period. Second, we combine these initial population estimates with all other historical time series in a much more complete data model to develop imputations for other missing macroeconomic and demographic data. Using the same broad approach, we use initial population estimates to develop a more detailed cross-sectional economic model of the interaction among population growth, net migration, and economic growth. Using this model, we project GDP, investment, and production by major sector and demographic variables, including population by age group for intercensal periods. As before, we splice intercensal predictions into available data by replacing initial-cut versions of population and net migration with second-step estimates. Finally, we use the predicted values of other economic and demographic variables to replace the missing values.

3. Impact of urbanization

1. Implications for economic growth

Between 900 million and 950 million people will live in China's cities by 2025 under all four urbanization scenarios. While China's total urban population would not be dramatically different in the different patterns of urbanization, economic outcomes—and living standards—would vary widely. These differences result from the stark variation in population distribution among scenarios, with more or fewer inhabitants in richer or poorer cities under different urbanization patterns.

In per capita terms, our research finds that supercities and hub and spoke would yield economic growth some 15 to 20 percent higher than the alternative dispersed forms of urbanization by 2025. In a supercities scenario, urban per capita GDP would be 76,000 renminbi—some 16 percent higher than our trendline scenario and 23 percent higher than our townization scenario. A hub-and-spoke model would produce only a slightly lower per capita GDP of 75,000 renminbi. A distributed growth scenario would yield per capita GDP of 66,000 renminbi, while townization would produce urban per capita GDP of 62,000 renminbi.

These results may be surprising. Observers tend to note that many developing-world megacities present worst-case scenarios of urban development, being associated with poverty and extreme deprivation, for instance. However, we believe it is possible for China to build supercities that can sustain continued growth and increase productivity levels—as they have been doing thus far. In fact, China's megacities of today and its supercities of tomorrow could still benefit from increasing scale in several ways. Direct scale benefits accrue from the size of local industry through, for instance, information transfer. Diversity in intermediate goods and services leads to more competition and lower prices, as well as economies of scale in local production. These cities are also greater magnets for foreign direct investment (FDI) and talent, and they enable greater increases in total factor productivity, all of which help to develop higher-value-added industries and activities. Positive feedback loops reinforce these effects—scale leads to greater wealth, which in turn leads to more scale and so on.[28]

While MGI has not separated out the relevant contributions of these factors, other research strongly suggests that the efficiencies in intermediate goods and services and a higher share of FDI (about 50 percent more than other cities in China as a percentage of GDP and investments) are the most significant benefits of scale in China's megacities.

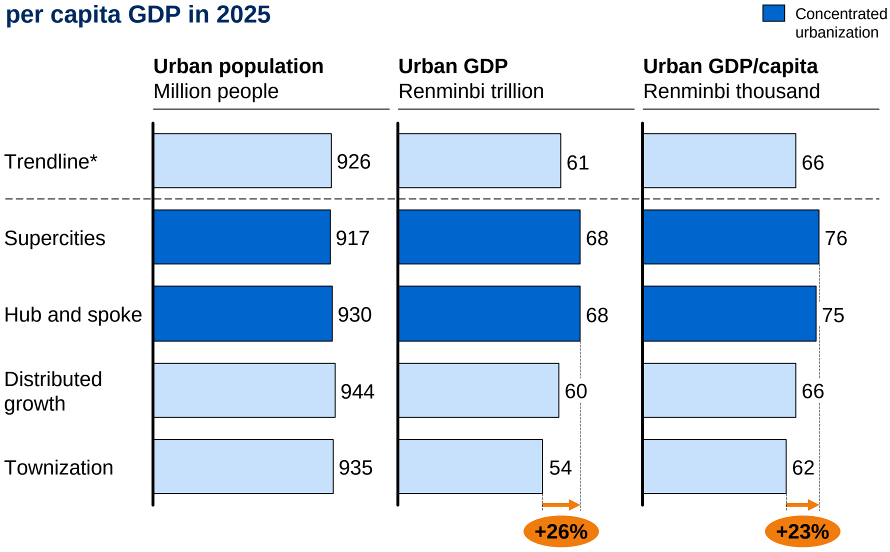
Of course, scale also has its downsides including congestion, pollution, and the challenge of building infrastructure and housing as well as providing social provision quickly enough to keep pace with inward migration. A concentrated model of urbanization would display pressure points, notably higher pollution and transport congestion, the latter having a potentially debilitating impact on productivity. However, these challenges are not necessarily intrinsic to size but rather to city management. We are confident that China's cities can address these issues and that larger cities in particular offer—and will continue to do so—some distinct economic advantages. These include higher specialization, less overlap in terms of infrastructure, and productivity gains from scale, primarily due to efficiencies in intermediate services.

Looking at examples around the world, there are indeed cases of struggling megacities. Yet others such as Tokyo and New York have become enormously successful by combining scalable, low- to midskill services sectors with spikes in a select few highly productive industries such as financial services. In an illustrative analysis, MGI finds that Shanghai's current industrial composition is such that under sectoral growth assumptions consistent with recent historical trends, the city could support a population of 34 million to 35 million at a per capita GDP of well above the national average.

28 See Chun-Chung Au and J. Vernon Henderson, "Are Chinese cities too small?" *Review of Economic Studies*, 2006, Volume 73, No. 3, pp. 549–76.

Exhibit 3.1.1

Concentrated urbanization scenarios would have the higher per capita GDP in 2025

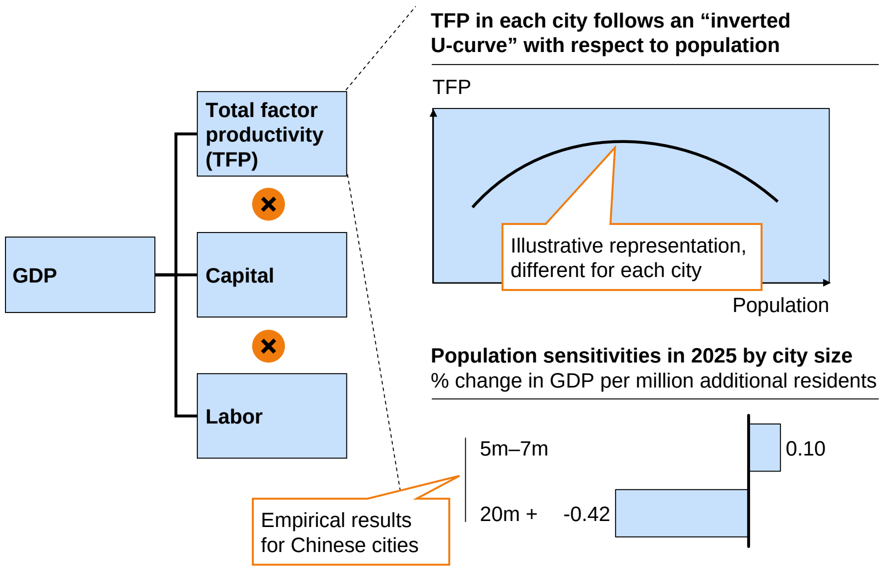


* Based on historical correlations and driven by the overall assumption that China's GDP compound annual growth rate between 2005 and 2025 is 7.2 percent.
Source: McKinsey Global Institute analysis

We project that urban per capita GDP in supercities would be 76,000 renminbi by 2025—some 16 percent higher than the 66,000 renminbi level produced by each of our trendline and distributed growth scenarios. A hub-and-spoke pattern of urbanization would produce a slightly lower per capita reading of 75,000 renminbi. The townization scenario would have the lowest per capita GDP at 62,000 renminbi. In each scenario, the pattern of per capita GDP across different-size cities would be broadly similar to the trendline in which per capita GDP rises from about 37,000 renminbi in "big towns" to about 120,000 renminbi in megacities. Interestingly, per capita GDP in megacities under the supercities scenario would in fact be lower than it would be in the case of our trendline scenario at about 110,000 renminbi. In fact, overall urban per capita GDP would be lower in almost all city size categories in a supercities scenario than under trendline—more people would live in higher-productivity (i.e., higher per capita GDP) cities under the supercities scenario, thus driving up overall GDP.

Exhibit 3.1.2

In China, per capita output depends heavily on local economics—more than on the profile of individuals



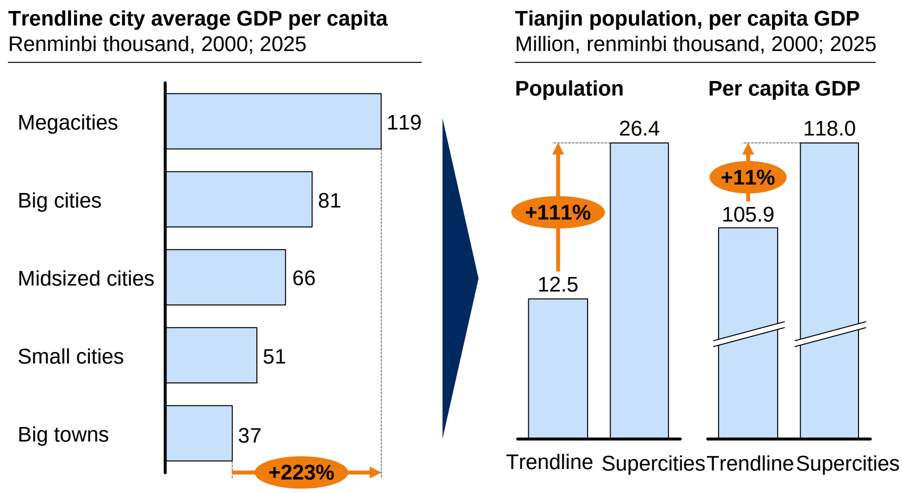
Source: McKinsey Global Institute analysis

Underlying the China City model (CCM) GDP projections is a Cobb-Douglas productivity equation—we show the relationships in a simplified manner. It is important to note that total factor productivity (TFP) relates explicitly to population, capturing some gains as population increases but then showing a decline at scale once the effects of congestion come into play (see chapter 2 of this volume for more detail). Over time there will be a range of influences on TFP, not least of which are improvements in the organization of economic activities and the deployment of new technology. As a result, even when holding such factors constant, the relationship between population and total factor productivity will vary by city (i.e., there is no such thing as a theoretical "maximum productivity size" that can be used for every city of the world in different periods of time), and it is captured as such in our modeling. MGI's sensitivity analysis shows that, for many Chinese cities, slight changes in population increase per capita GDP, evidence that many cities are still on the upward slope of the curve. By contrast, those cities that have already achieved megacity size will be on a slight downward trend under our trendline forecasts in 2025 (although other factors will still strongly boost their TFP year by year). However, the changes involved are quite small. For instance, MGI finds that a 1 million increase in the population of a city of above 20 million people decreases per capita GDP by only around 0.4 percent, all else being equal. The implication of this finding is that, in China's economy today and over the next 20 years, an individual's economic output will be determined by the economic characteristics of the place where he or she lives, much more than by his or her intrinsic qualities.

Exhibit 3.1.3

Most Chinese cities can gain economic benefits from scale

EXAMPLE



Source: Henderson and Lau, *Are Chinese cities too small?;* literature search; McKinsey Global Institute analysis

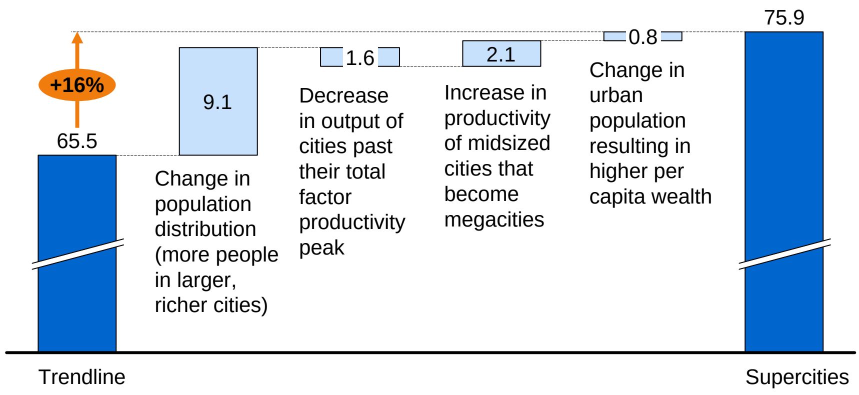
The results outlined in Exhibit 2 are relevant for moderate increases in population. However, some cities would have dramatically different populations between urbanization scenarios, and this requires an understanding of the effect of major shifts in scale. For China's cities, scale is clearly a benefit as shown by trendline per capita GDP in different-sized cities. All of the positive and negative effects we have noted manifest themselves in the differences in per capita GDP among cities, and we have therefore used those differences as proportionate inputs in estimating the effect of dramatic jumps in scale. In the case of Tianjin, for example, we would expect a doubling in scale under the supercities scenario to provide a net 11 percent improvement in per capita GDP (in line with other estimates that associate a doubling in a city's population to increases in productivity of 10 to 15 percent). However, Shanghai, which would see its population expand to 35 million under supercities compared with 25 million under trendline, would see a very slight decrease in per capita GDP due to the setting in of increasing diseconomies of scale. So even at Tianjin's 2025 trendline size, the city will still benefit from greater economies of scale. By contrast, Shanghai will have moved long past the point at which size would be a direct benefit.

Exhibit 3.1.4

A greater share of population in wealthier cities drives overall increases in per capita GDP

Shift in urban wealth between trendline and supercities

Urban per capita GDP, 2025; renminbi thousand, 2000



Source: McKinsey Global Institute analysis

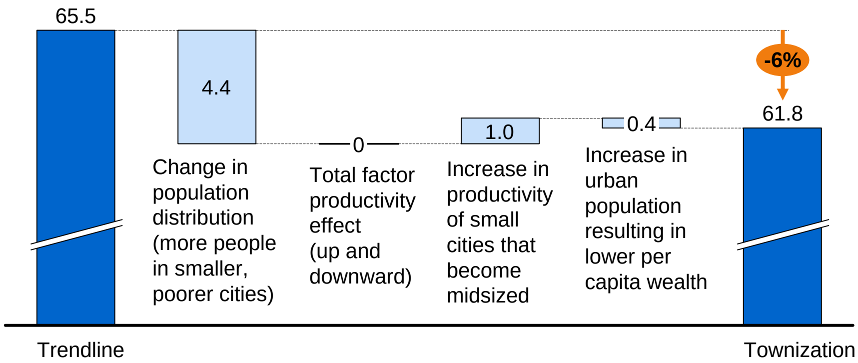
MGI finds a 16 percent gap between per capita urban GDP in our trendline projection and that in a supercities scenario. There are four factors in play: (1) differences in the population distribution across cities, (2) decreases to some megacities' per capita GDP, (3) increases due to scale in midsized cities becoming megacities, and (4) an overall upward adjustment of per capita wealth to reflect the lower urban population in this scenario. The first factor adds 9,100 renminbi to per capita GDP—the result of the different population distribution with all cities at their trendline per capita GDP. The second then depresses per capita GDP by 1,600 renminbi. The third results in another net increase in per capita GDP of 2,100 renminbi in midsized cities as they become megacities. Finally, the lower urban population under supercities then slightly increases the urban per capita GDP. The combination of these effects provides a full explanation for why each size category of cities in the supercities scenario has a lower per capita GDP than the same category under trendline, but the urban per capita GDP under supercities is higher.

Exhibit 3.1.5

Similarly, a higher share of the population in poorer cities would drive lower per capita GDP under townization

Shift in urban wealth between trendline and townization

Urban per capita GDP, 2025; renminbi thousand, 2000



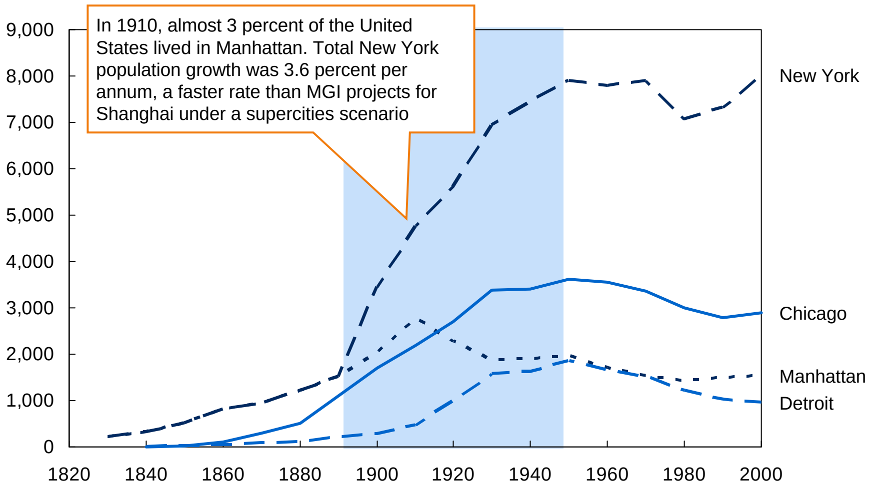
Source: McKinsey Global Institute analysis

Differences in the distribution of population similarly lie behind the fact that per capita GDP would be some 6 percent lower in a townization scenario than in our trendline projections. The lower proportion of urban residents in higher per capita GDP cities—in general, the larger cities—reduces the urban per capita GDP by 4,400 renminbi. A rise in productivity in smaller cities as they achieve much larger scale is not enough to compensate for this effect, adding only 1,000 to per capita GDP. Incremental differences in population have a net neutral effect, an indication that, on average, the economic structures of smaller cities closely match the "inherent" productivity of migrants. Finally, an increase in the overall urban population results in a marginal cut of 400 renminbi in per capita wealth.

Exhibit 3.1.6

New York's history shows that supercities can be successful even with rapid growth

Total population, thousand, MSA*



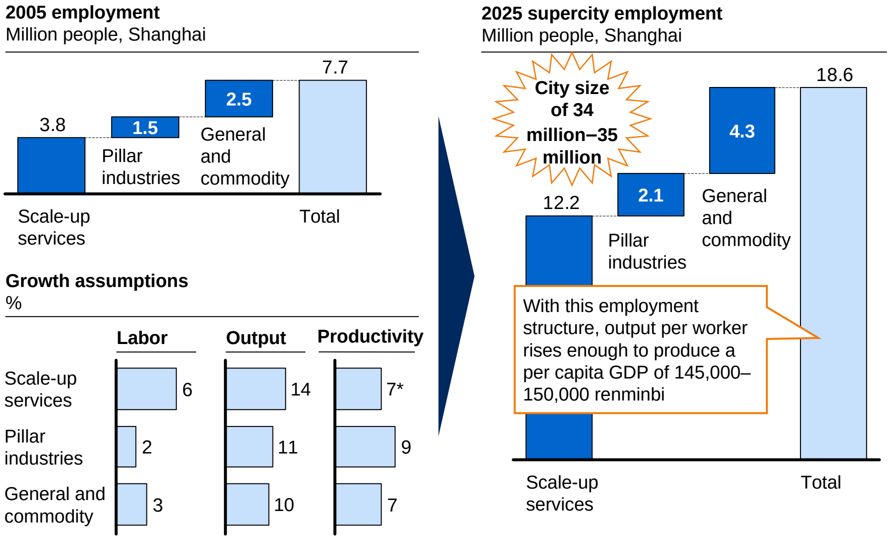
* Metropolitan statistical area.
Source: US Census Bureau; McKinsey Global Institute analysis

New York is a good example of a successful megacity. The city expanded particularly rapidly between 1890 and 1950 and managed to absorb large waves of immigrants while remaining an economic success.[29] During this period, New York's population grew at 3.6 percent a year, faster than the population expansion we project for Shanghai in a supercities scenario. By 1910, almost 3 percent of the US population lived on Manhattan (the equivalent in China today would be a city of some 40 million inhabitants). For most of this period, New York's labor earned a premium in wages of as much as 13 percent at its peak compared with the rest of the country. Services employment increased markedly relative to industry as the city's domestic and international demand ballooned. However, living standards also grew rapidly as New York's core industries scaled up even more quickly than the population—at a compound annual growth rate of 5 percent. New York invested early in public transport, instituting its first omnibus routes as early as 1820. Such steps indicate how early planning and action to head off congestion and other scale pressures can ensure the long-term success of even the largest cities.

29 Edward L. Glaeser, *Urban colossus: Why Is New York America's Largest City?* Harvard Institute of Economic Research Discussion Paper No. 2073, June 2005.

Exhibit 3.1.7

Shanghai could achieve supercity size while maintaining high per capita GDP



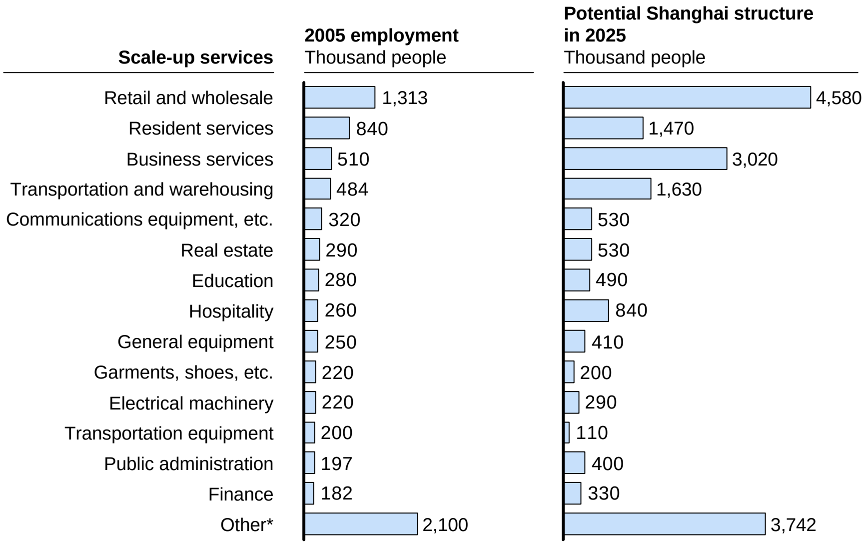
Note: Numbers may not sum due to rounding.
* Primarily driven by shift from "resident services" to retail and wholesale rather than fast growth within sectors.
Source: Shanghai Statistical Yearbook 2006; McKinsey Global Institute analysis

MGI's research shows that an evolutionary path similar to New York's is open to China's megacities. Our analysis of Shanghai's industrial structure—which we group into the four categories of scale-up services, pillar industries, commodity-driven, and general sectors (we combine the last two in the exhibit)—found that it could develop into a supercity with a population of between 34 million and 35 million and remain wealthy with a very large labor force of some 18 million to 19 million at the level of per capita GDP that we project. Employment in basic services would rise from 54 percent of total city employment today to 66 percent by 2025. Even carrying 5 percent unemployment, this industrial structure would support a city with a per capita GDP of around 150,000 renminbi—approximately the level of our supercities scenario projection for Shanghai. Even more upside is possible if the city deploys a wider range of high-value products by developing new, leading-edge industries through technological breakthroughs in pillar industries such as automobiles, or through the maturing of China's financial system. All of this, of course, assumes that key managerial challenges (e.g., congestion) will be overcome.

Exhibit 3.1.8

Shanghai's labor force would be increasingly concentrated in large-scale service sectors

EXAMPLE

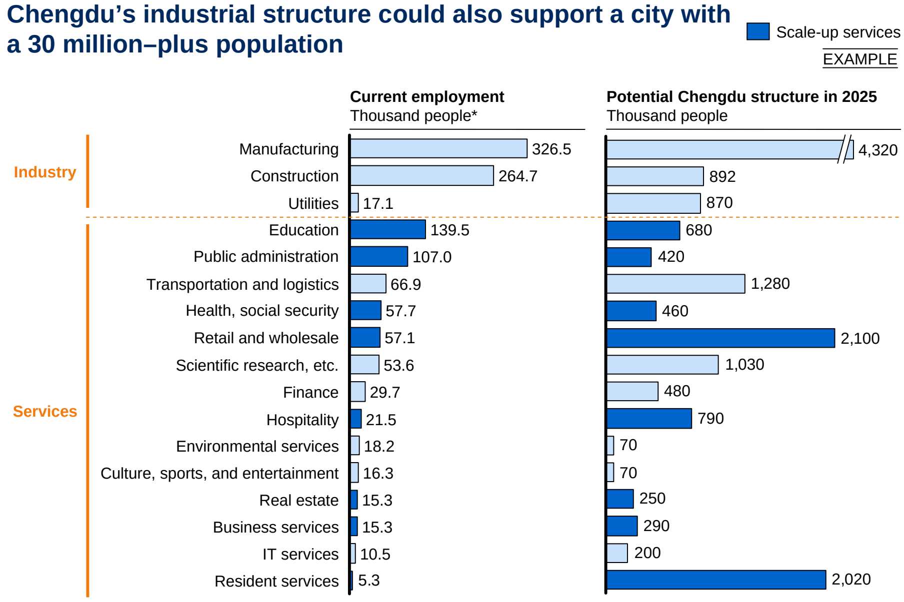


* Includes food manufacturing, water services, electricity, tobacco, etc.
Source: McKinsey Global Institute analysis

Under reasonable growth assumptions for each of Shanghai's industrial sectors that are consistent with historical sector performance, the overall macroeconomic trend of the city, and scenario population growth, Shanghai would see a greater concentration in scale-up services. For instance, business services and transportation and warehousing would overtake residential services. Basic scale-up services such as retail and wholesale in 2005 make up almost 50 percent of the labor force but produce only 27 percent of the city's average output per worker; we project that these industries would come to employ two-thirds of the labor force (see Exhibit 3.1.7). Overall growth in per capita output would remain very strong, supported by fast-growing, high-value-added or prioritized "pillar industries" such as electrical machinery and finance, which employ only 19 percent of the workforce but have twice the city's average productivity. We see these industries growing in line with recent rapid rates, but, due to their high productivity growth, we see their share of the workforce dropping to 11 percent. Commodity and general manufacturing services together would stay relatively stable at 23 percent of the labor force, down from a total of 31 percent today.

Exhibit 3.1.9

Chengdu's industrial structure could also support a city with a 30 million–plus population



* Weakness of current data (~20 percent representative) prevents firm conclusions on potential productivity and per capita GDP.
Source: Chengdu Statistical Yearbook 2006; McKinsey Global Institute analysis

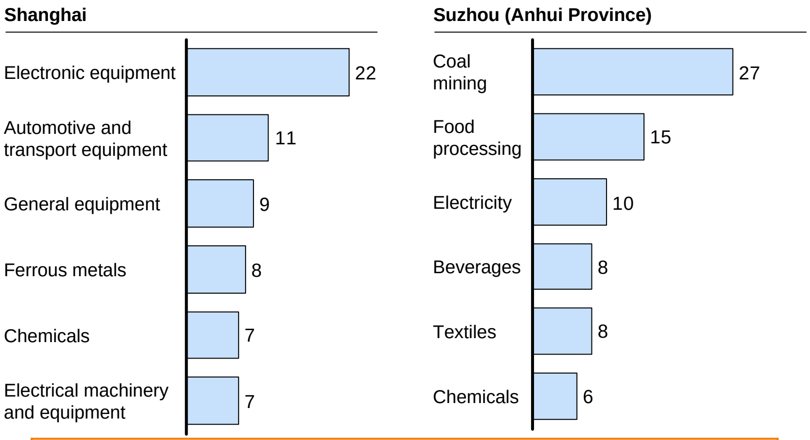
Chengdu could also become a supercity (although scarcity of data prevents full analysis—for instance, data on the city's industrial structure does not cover the entire labor force, and this makes comparisons difficult). With the same assumptions employed in the case of Shanghai, Chengdu's industrial structure could evolve to support a city of 30 million people at per capita GDP levels approaching 80,000 renminbi in 2025 compared with our 75,000 renminbi trendline projection. Chengdu would see a scaling up of retail and wholesale, transportation and logistics, and resident services at similar growth rates to those we project for Shanghai, but these sectors would account for only half the total workforce in 2025. The city would retain a greater focus on manufacturing than Shanghai, reflecting today's stronger focus on this activity and smaller local demand for scale-up services. Manufacturing would account for 27 percent of the labor force. Chengdu's challenge—and that of each potential supercity—would be to develop the sectors that have the most strength to generate the necessary high-value-added jobs.

Exhibit 3.1.10

In contrast, the industrial mix in smaller cities suggests they would struggle to scale up

Top six manufacturing subsectors, % of manufacturing output

EXAMPLE



Shanghai's manufacturing is more weighted toward higher-value products such as electronics and cars; Suzhou's focus is more on coal and food—therefore the city is less able to support large, domestic-demand-driven services industries* and population growth with high GDP per capita

* Absence of sectoral employment data prevents a direct comparison of output per worker.
Source: City statistical yearbooks; McKinsey Global Institute analysis

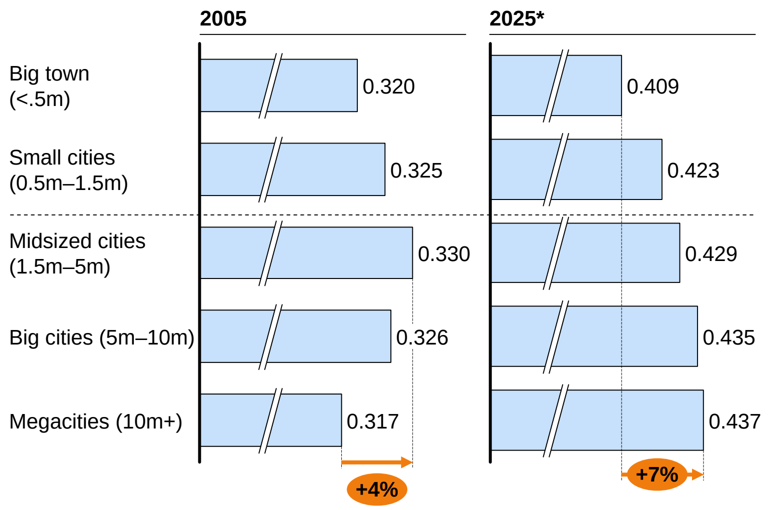
Most of China's smaller cities—we take the example of Suzhou in Anhui Province—have industrial structures weighted toward lower-value industries, and these urban centers will find it harder to scale up. Although sectoral employment data is not available and therefore we cannot compare cities on the basis of output per worker, we can show the proportion of output that comes from different industrial sectors and demonstrate stark contrasts between, for instance, Shanghai and Suzhou. The bulk of Shanghai's GDP is generated by sectors such as electronic equipment, automotive, and general industrial equipment—all targeted toward very large markets with clear scale potential. In contrast, Suzhou's GDP is heavily dependent on coal, food processing, and beverages—industries based on local resources that do not appear to have substantial potential to scale up. Because its core industrial sectors are not high value enough to support a large, local-demand-driven service sector, it is unlikely that Suzhou could emulate Shanghai.

Exhibit 3.1.11

Urban inequality will rise across the board, but larger cities will face the greatest inequalities

TRENDLINE

Average Gini coefficients of cities in size brackets



* Trendline; cities taken from the 136 cities for which income projections have been made.
Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

As measured by the Gini coefficient, inequality will rise substantially by an average of some 30 percent across Chinese cities, and larger cities will broadly tend to be more unequal than smaller ones across scenarios.[30] We estimate that the average Gini coefficient of megacities would be some 7 percent higher than that of a big town with a population of less than 500,000. A similar trend of underlying inequality increasing with city size is evident when we look at cities internationally, although this may relate more to the pattern and history of economic development. Indeed, we find no simple, linear relationship between income inequality and city size. In the United States, for instance, New York and Miami have substantially higher Gini coefficients than the US average, yet Atlanta, Georgia, has a lower inequality reading than Austin, Texas—a much smaller city. Academic literature shows that there is a strong correlation within urban areas between economic growth and inequality, but we have not seen any results proving the same for population growth.[31]

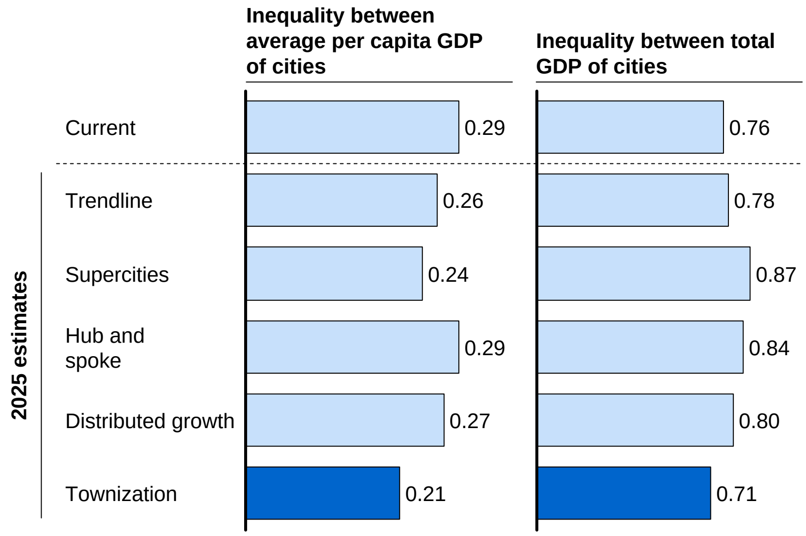
30 The Gini coefficient is an internationally recognized measure of statistical dispersion most prominently used as a measure of inequality of income distribution or inequality of wealth distribution. We are aware that its use is sometimes controversial but have used it here as an indicator of trends in urban inequality.

31 Belal Fallah and Mark D. Partridge, "The elusive inequality-economic growth relationship: Are there differences between cities and the countryside?" *Annals of Regional Science*, 2007, Volume 41, pp. 375–400.

Exhibit 3.1.12

Townization would likely result in the lowest inequality

Gini coefficient, 2025



Source: National Bureau of Statistics; McKinsey Global Institute analysis

Although it is difficult to draw firm conclusions about the impact of different urbanization scenarios on inequality because of technical complexities in calculating income distributions, it is clear that the townization scenario would tend to produce lower inequality than any of the others—no matter how inequality is measured. On the other hand, it is noteworthy that, in a supercities scenario, inequality between the average wealth of cities would not be significantly higher. Indeed, the Gini coefficient of the average per capita GDP distribution among all cities is the second lowest under the supercities scenario. This is likely due to a distribution in which a very large number of cities are relatively equal—but with the 15 megacities being clear outliers to the general trend. In general, the implication is that the average citizens of most cities will feel somewhat equal. The story is different in the case of the overall GDP of cities. On this measure, we project that we will see very large variations in the inequality of total city resources between scenarios and that this could potentially lead to political tensions.

2. Implications for labor and skills

As China's economy continues to expand, driven by massive growth in its urban centers, the question of how cities will meet their needs for labor is a critical one. Based on our case studies and our data-driven modeling, we have developed a view on several key labor and skills issues that are subject to current debate.

It is certain that we will continue witnessing a mass migration of labor from the countryside to cities. One point of debate is whether this phenomenon will be sufficient to fuel urban growth and, in turn, if cities will generate enough jobs to employ these newcomers. At the same time, some observers question whether the supply of excess rural labor is running out. We find that, although the rural population will decline significantly, the existing rural labor supply is big enough to continue to support large migrant flows, especially if the land reform announced in October 2008 will be fully enacted, allowing farmers to lease their plot and move with their families to the urban areas. A second, perhaps more pressing, question is whether China will have sufficient skills within its overall labor force to allow the economy to move toward higher-value-added activities and maintain the momentum of GDP growth.

New urban residents will account for very large shares of the workforce and population of the fastest-growing cities in all scenarios—up to an unprecedented 73 percent of the workforce in a supercities scenario. China has already indicated that it intends to extend social provision to migrants between 2010 and 2015. This will be important not only in terms of social cohesion but for attracting sufficient migrant labor to fuel economic growth. But it will be expensive. We estimate that providing services to migrants at the same level as services to the *Hukou* population will boost spending by up to an additional 1.5 trillion renminbi in 2025, equal to 2.5 percent of GDP in that year.

Our analysis, based on current trends and on field visits, finds that some cities will face labor shortages while others will experience significant surpluses. And different scenarios yield a variation of results. In both our supercities and townization scenarios, the labor market would more or less balance at the productivity rates we assume within cities. In a distributed growth scenario, there could be an imbalance equivalent to a surplus of 8 million in the urban labor force, implying some downward pressure on wages; in hub and spoke, on the other hand, there could be a deficit of 14 million.

The issue of whether China has sufficient skilled labor to fuel continued development is equally interesting. While the number of Chinese graduates will quadruple by 2025, implying no overall shortage, their distribution will be highly uneven. Large cities will tend, as they already do, to attract more than sufficient graduates, while smaller cities will struggle to attract the talent they need, placing a serious barrier to the development of higher-value-added activities. In the short term, there are many practical steps that cities can take to "pull" in the graduates they need—for instance, through attractive incentive packages, often in conjunction with local businesses.

But quantity is not the only issue. There is increasing public debate in China about the quality of graduates, crucial if the economy is to move up the value chain and boost productivity. Foreign and Chinese companies alike report serious concerns about teamwork, communication skills, and a willingness to take responsibility. Other MGI research has found that multinational companies (MNCs) would consider only 10 percent of qualified Chinese engineers and only 3 percent of generalist graduates to be up to standard.[32] Central government has initiated a new quality drive, but, with funding of only 2.5 billion renminbi or 0.5 percent of the education budget, government could ramp up this program significantly. Some provinces are taking creative steps to improve graduate quality—in some cases with performance monitoring, in others by encouraging investment by private capital.

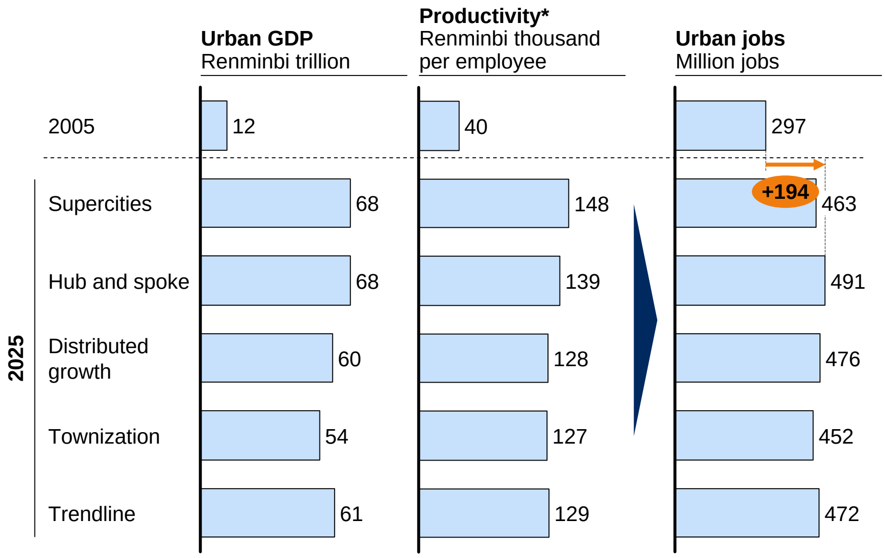
While China has made a start in tackling perceived shortcomings in quality, in the long term the country needs to make some big decisions about how to reform the educational system. A debate is already under way about whether to reform the examination system—a complex and long-term undertaking.

However, there are a number of "no-regrets" options for higher education that could make a difference. The system focuses too little on practical experience, instead emphasizing pure memorizing of facts in an exam-based framework. Cooperation between educational institutions and companies to provide internships, giving students more freedom to choose between practical experience and academic study, and setting financial incentives to encourage students to get a job while they are studying would all help. The system does not engage much in interactive classroom discussion, leaving students lacking in teamwork and communications skills; the introduction of more group-based tutorials and class discussion would be useful. Last but not least, China could upgrade the quality of teaching. The curriculum for student teachers could introduce more courses directly related to teaching—in China these courses account for only 7 percent of the total curriculum for student teachers compared with up to 30 percent in developed countries. Solving these issues implies examining not only the "hardware" of the educational system such as the curriculum and coursework but also its "software"—"how" to teach students, not just "what" to teach.

32 Diana Farrell and Andrew J. Grant, "China's looming talent shortage," *The McKinsey Quarterly*, 2005 No. 4, pp. 70–9 (www.mckinseyquarterly.com).

Exhibit 3.2.1

Job creation will be huge under all scenarios

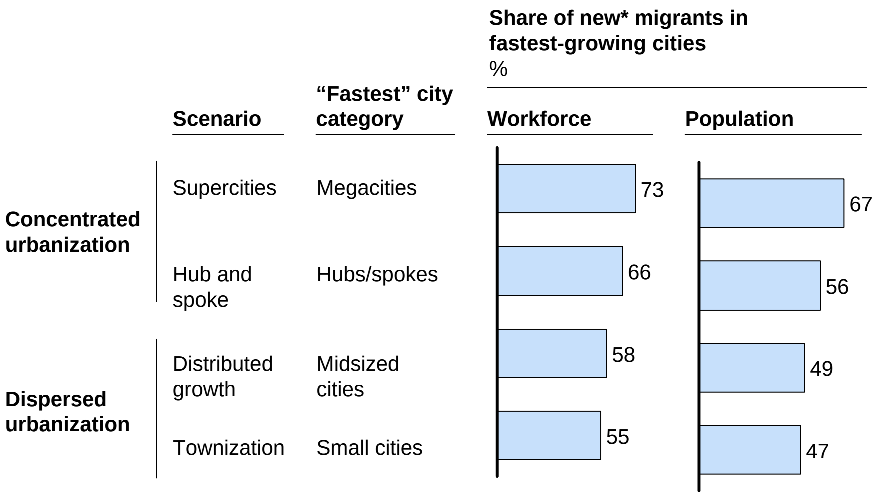


* GDP per employed worker; estimated for 2005 based on demographics and reported labor-force participation.
Source: McKinsey Global Institute analysis

China's urban economy will create a huge number of jobs under all scenarios—albeit with variations among different shapes of urbanization. A hub-and-spoke scenario would see the largest number of total urban jobs—we estimate 491 million by 2025 compared with 472 million in our trendline projection and 297 million jobs in 2005. All scenarios will see upward of 150 million new jobs and, because of a declining "natural workforce" in cities, there will be huge demand for migrants to fill these new jobs. In 2005, cities had 427 million people between the ages of 15 and 64, but by 2025 we expect this to drop due to the fact that the birthrate and number of new entrants to the labor market are not high enough to replace those leaving it. Adding the drop in the resident labor force with the new jobs, we estimate a need for new urban workers of between 170 million and 210 million. The only way for China to fill this gap is through migration.

Exhibit 3.2.2

New migrants will make up the majority of the population of the fastest-growing cities



* Migrants from 2005 to 2025, cumulative.
Source: National Bureau of Statistics; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

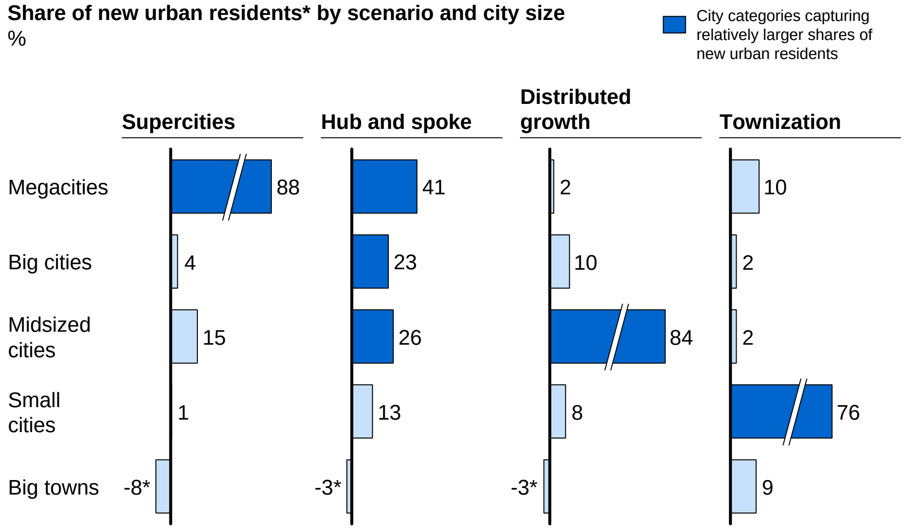
New migrants will account for very large shares of the workforce and population of the fastest-growing cities in all scenarios. A supercities scenario would see the largest numbers with new migrants, constituting 73 percent of the workforce and 67 percent of the population in megacities. Even in townization, the most dispersed urbanization model, new migrants would account for 55 percent of the workforce in small cities (with populations between 500,000 and 1.5 million). This is a radical shift from the recent past, when 25 percent of the population of most of a particular class of cities tended to be made up of migrants. We find that rural areas, with a 2025 working-age population of 370 million, should comfortably be able to supply the migrant workers that cities will need. After accounting for migration, between 140 million and 180 million people would still work in rural areas—a much higher number than the 70 million to 80 million necessary to sustain China's food production under aggressive mechanization (see "Implications for arable land" in this section of volume II). However, there would be significant societal changes, with dependency ratios in rural areas increasing from 1.13 in 2005 to between 1.42 and 1.61—with the top end of this range reached under hub and spoke.[33]

33 We derive our estimate from current migration trends. If China fully enacts the October 2008 land reform, more families will lease their plot and migrate to the cities, drastically changing the profile of migrants.

Exhibit 3.2.3

Depending on where the migrants will flow, the urban shape will be different

Share of new urban residents* by scenario and city size
%



* >0 percent represents an increase of residents, while <0 percent represents a decrease (outward migration toward larger cities).
Source: McKinsey Global Institute analysis

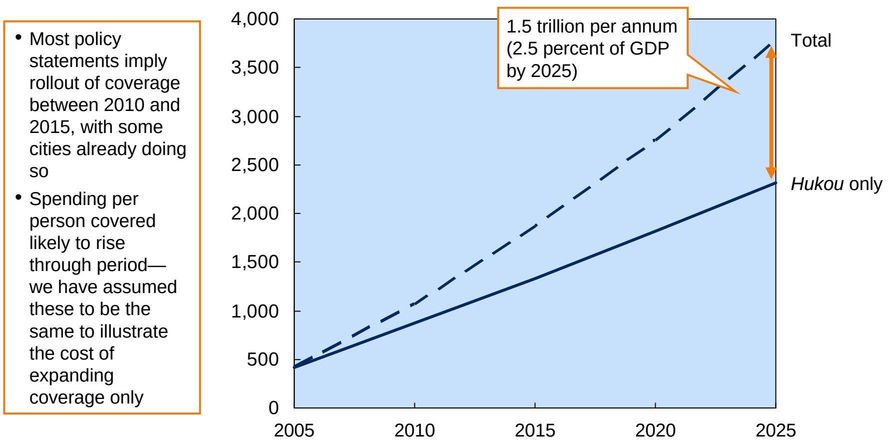
The outcomes of the various urbanization scenarios will greatly depend on which cities capture disproportionate shares of the migrant flows. For instance, in a supercities scenario, megacities would capture 88 percent of all new urban residents. In distributed growth, 84 percent of the total would flow to midsized cities. In townization, small cities would capture 76 percent of new urban residents. Looking at the southwest region as an example, 57 million migrants would come from within the region, and 39 million of those would flow to supercities. At the provincial level, using Hebei as an example, we see that supercities would capture all local migrants in a supercities scenario. Absorbing high levels of new migrants will involve severe social strains. In a supercities scenario, megacities would have average populations of 25 million people, of which only 7 million would constitute the naturally growing *Hukou* resident population and 2 million existing migrants. Some 16 million would be new urban residents.

Exhibit 3.2.4

Extending social provision to migrants would boost required public spending significantly

Spending on urban public services*

Renminbi billion, 2000



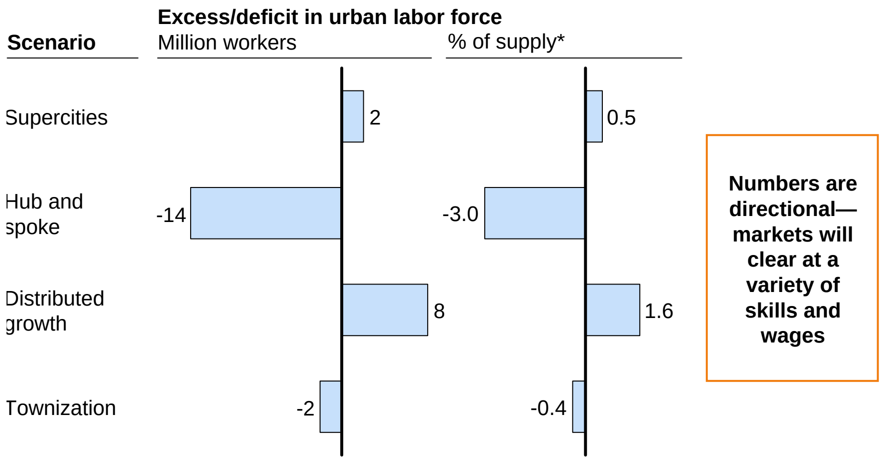
* Education, health care (government spending), maintenance, and sundry services.
Source: Literature search; McKinsey Global Institute analysis

The huge influx of migrants to China's cities will undoubtedly involve strains beyond funding, including tension between migrants and existing populations who will be competing for employment. A solution to this insider/outsider tension would be to extend services to the migrant population while bolstering the security of existing citizens, say through unemployment protection. Such changes would be expensive, and employers would bear part of the cost of social security. Moreover, the administration of city-based social provision would be more complex if it had to track people who were more mobile between cities. The *Hukou* system will also come under strain. MGI believes that China should reexamine the system, but potential reform is beyond the scope of this study. Most policy statements imply that China intends to roll out social-services coverage to migrants between 2010 and 2015, and several cities are already moving in this direction. Providing services to migrants at similar levels to the *Hukou* population will be very costly. MGI estimates that spending will need to rise by 1.5 trillion renminbi a year in 2025[34], equal to 2.5 percent of GDP. To extend basic education to *Hukou* and migrant students, Shenzhen would need a 176 percent increase in spending and Shanghai an increase of 56 percent.

34 This number could rise to 1.8 trillion renminbi if the land reform announced in October 2008 is fully enacted because of higher migrant flows towards urban areas.

Exhibit 3.2.5

Across scenarios, labor market balances will vary widely city by city



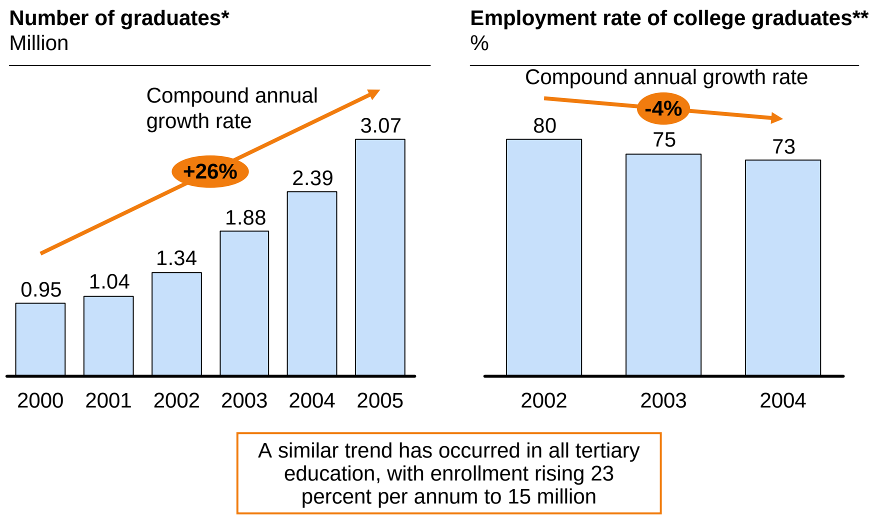
* Assuming city-level proportion of the population above 15 does not change between scenarios, unemployment trend of 4 percent, and city-specific productivity growth at trendline projections.

Source: National Bureau of Statistics; McKinsey Global Institute analysis

Localized pressures will play out among the scenarios. In both supercities and townization scenarios, the labor market would be near to balance at the productivity growth rates we assume within cities. In a distributed growth scenario, there could be a surplus of 8 million in the urban labor force; in hub and spoke, there could be a 14 million deficit. Overall, we note that the labor market would still clear at a variety of skill and price points—any "surplus" or "deficit" is merely an indication of the pressures on those price points. These aggregate findings mask significant local differences. Supercities would experience explosive growth in jobs but an even larger increase in population, leading to marginal downward pressure on wages and employment. "Shortages" would develop in big spokes in which GDP would accelerate slightly beyond a level that trend productivity could sustain. Large towns would develop an excess due to lower GDP growth resulting in low job creation. Midsized cities would have rapid jobs growth at trend productivity, but even faster population growth, resulting in marginal downward pressure on wages and employment.

Exhibit 3.2.6

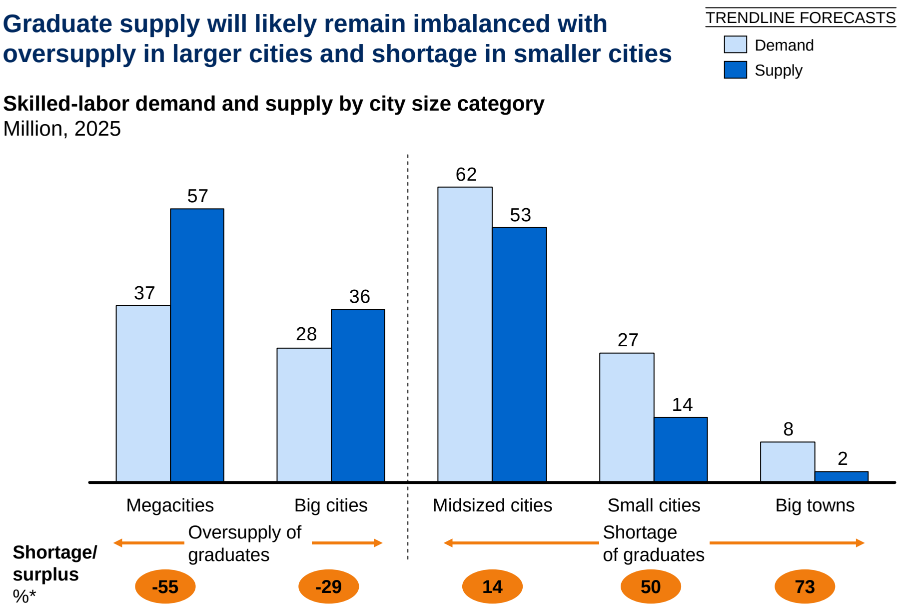
Enrollment and graduates are increasing rapidly



* Postgraduates excluded.
** After six months, including graduates who go on for further study or study for further exams.
Source: China Statistical Yearbook 2006; literature search; McKinsey Global Institute analysis

China has seen massive growth in the number of its graduates over the past five years, propelled by the central government, which has acted to boost enrollment with the aim of supporting social cohesion and producing sufficient talent to support rapid economic growth. In 1999, the government set a target to increase enrollment in universities from 5 percent in that year to the 1997 level in developed countries of just over 60 percent. By 2005, China's rate of enrollment had risen to 19 percent. Between 2000 and 2005, the number of universities rose by 11 percent per annum and the number of graduates by 26 percent a year. However, the supply of graduates now appears to be outstripping demand, evidenced by a recent large drop in employment rates among new graduates. Amid a debate in China whether enrollment should expand at the same pace or slow down, the indication from recent policy pronouncements is that enrollment will continue to grow but at a slower rate. We forecast that China's overall stock of graduates will increasingly exceed requirements over the next decade before shifting to balance by 2025 as the economy catches up with the output of graduates.

Exhibit 3.2.7



* As proportion of demand.

Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

The evolving skilled-labor force has a number of components: the original pool—the percentage of the workforce with a degree; inflows of new migrants, with and without *Hukou* status; and newly graduated local people who may have received their education elsewhere. This total can then decline due to leakage in graduates to other cities and the natural exit of skilled labor from the workforce. Interviews and available data suggest that midsized cities are increasing their stock of graduates much more slowly than megacities—the latter are seeing larger inflows of graduates and losing fewer graduates to other cities and regions. Megacities are posting average annual growth in graduates of some 7 percent compared with 5 percent in midsized cities. By 2025, local graduate markets will demonstrate substantial differences compared with today. Megacities will continue to have a surplus of graduates in 2025, while we expect to see a growing shortage of graduates developing in rapidly growing midsized and smaller cities.

Exhibit 3.2.8

Each scenario will have distinct challenges in guaranteeing appropriate skilled-labor supply

Scenario	Accelerated city size	Education levels in fast-growth cities Average education years	Primary challenges for scenario
Supercities	Megacities	13.5	• Ensuring graduates in supercities meet quality demands of high-value economy
Hub and spoke	Large hubs and midsized spokes	12.5	• Oversupply of graduates in hubs and shortage in key spokes
Distributed growth	Midsized cities	11.5	• Shortage of graduates in midsized cities restricting shift to higher-value industrialization
Townization	Small cities and big towns	10.5	• Shortage of graduates in small cities—where it is most difficult to attract them

Source: McKinsey Global Institute analysis

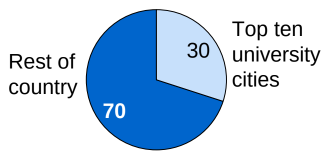
MGI's trendline projections have varying implications for the graduate labor market in those cities that are most prominent in different urbanization scenarios. In a supercities scenario, megacities would not face shortages in graduate labor but instead would need to focus on upgrading the quality of graduates—a nationwide challenge. Under a hub-and-spoke scenario, large hubs and midsized spokes could see serious imbalances arising with an oversupply of graduates in hubs and shortage in key spokes. The task here would be targeted action to attract graduates into fast-growing spokes. In distributed growth, midsized cities would likely see a worsening of the shortage of graduates (and general labor). National and local policies to try to attract graduates to midsized cities would be a key enabler. In townization, it is likely that the shortage of graduates in small cities and big towns would be exacerbated and attracting graduates would not be easy. Again, national and local action aimed at channeling graduates to smaller cities will be crucial.

Exhibit 3.2.9

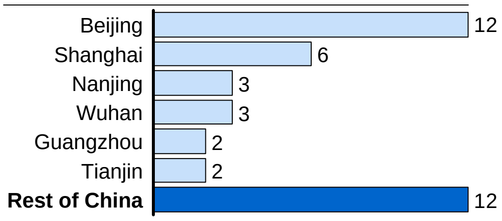
University distribution is imbalanced—richer cities can afford higher-quality universities and secure the best talent

An imbalanced university distribution

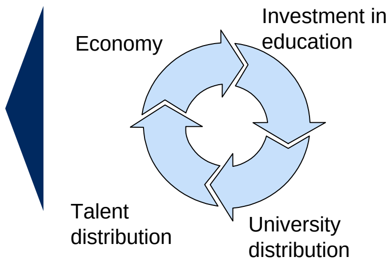
Higher-education distribution
%, 100% = 1,552 universities, 2003



Location of top 40 institutions
Number



A feedback loop drives growing imbalance

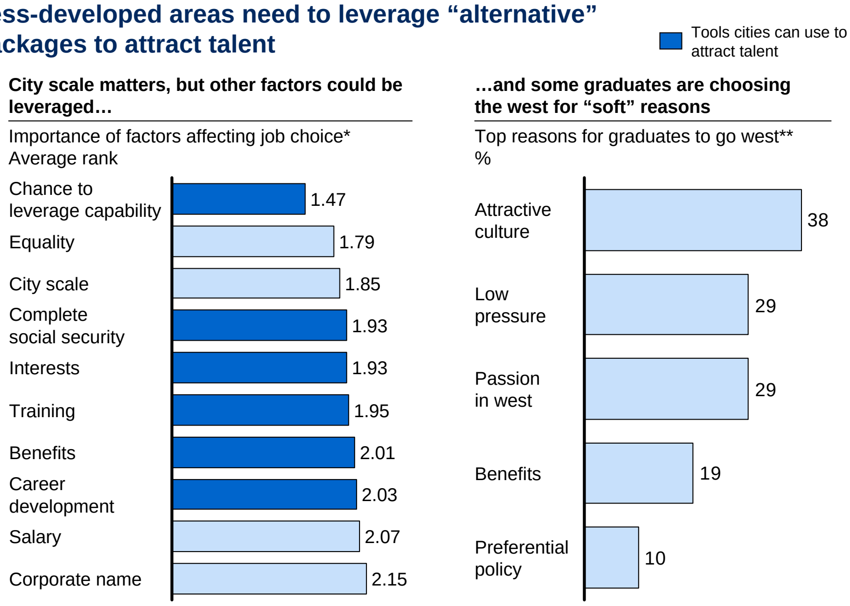


Source: Ministry of Education; McKinsey Global Institute analysis

The distribution of universities in China is imbalanced, reflecting a system in which there is a division of universities into various levels, overseen by different layers of government. Local government finances most education institutions—central government funded only 76 out of a total of 1,792 institutions in 2005, and even these received part of their funding from local government. Nongovernmental funding, such as private donations, is too negligible to provide any material support. Graduate numbers—and the best universities—are largely concentrated in the relatively developed east of China. Because so much of higher education is funded locally, less-developed areas have smaller education budgets, in turn hindering development. In the long term, China may wish to revisit the current structure of educational funding to escape this vicious circle. In the short term, cities can make several "no-regret" policy moves to "pull" in the talent they need for development.

Exhibit 3.2.10

Less-developed areas need to leverage "alternative" packages to attract talent

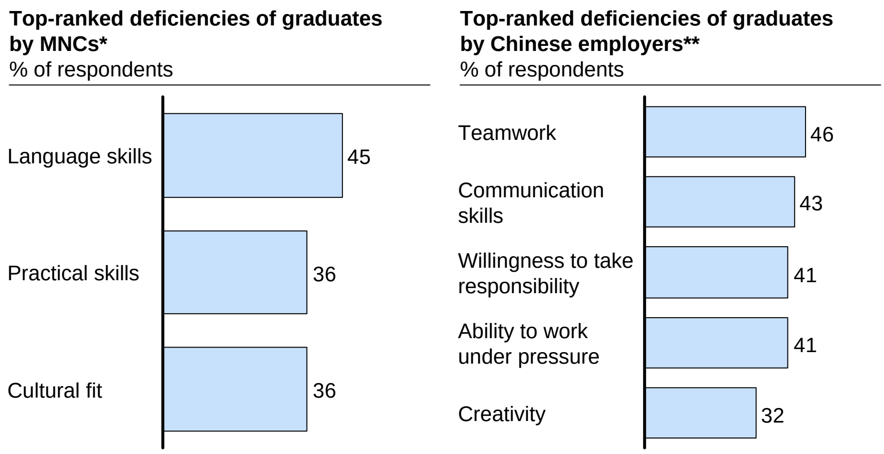


* Based on a 2005 survey conducted by Shanghai Jiaotong University among 3,948 graduates.
** Respondents were able to choose more than one category.
Source: Shanghai Jiaotong University; literature search; McKinsey Global Institute analysis

We find that "pulling" in necessary talent is more feasible than "pushing" talent from oversupplied to undersupplied areas through mandatory instruments such as central postgraduation allocation (e.g., many countries require medical students to serve in remote areas for their first years). Many midsized and small cities—notably in western China—have been effective in pulling skills to their areas through lifestyle and benefit packages to attract the best talent; through offering graduates greater flexibility, for example by allowing them to settle in the city before finding a job; and through investment to raise the quality of local educational institutions (although this is effective only in the long term). Jinan, for instance, has a liberal policy of granting college graduates *Hukou* status. Central government has also begun to take action, for instance offering postgraduate opportunities, stipends, and help to pay off student loans to graduates prepared to work in western regions for a short period. Likely to be more effective is local governments working with businesses on incentive packages. There is evidence that a range of local and central government initiatives are beginning to work—in 2004 and 2005, the total number of graduates in Beijing increased by 20 percent while those going to the west upon graduation increased by 63 percent.

Exhibit 3.2.11

Quality, not quantity, is the real issue for Chinese graduates



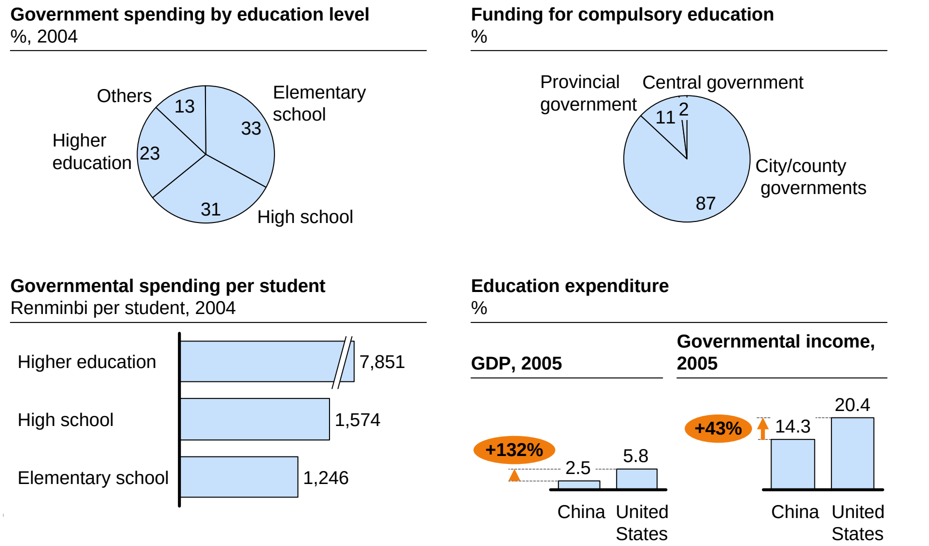
* Based on a survey conducted by McKinsey among German HR managers in multinational corporations (MNCs).
** Based on a survey conducted by Beihang University among 250 interviewees from employers in 2005. Respondents could choose more than one factor.
Source: Diana Farrell and Andrew J. Grant, "China's looming talent shortage," *The McKinsey Quarterly*, 2005 Number 4, pp. 70–9

Although China produces a significant number of graduates, quality—and employability—is an issue. Foreign as well as Chinese companies report serious concerns with teamwork, communication skills, and a willingness to take responsibility. Other MGI research found that MNCs would employ only 10 percent of qualified Chinese engineers and only 3 percent of generalist graduates. A number of specific skill profiles have major gaps. China has dramatically fewer professionals than other countries, and this, unless tackled effectively, could compromise the country's transition to an advanced, modern economy. For example, companies have reported serious shortages of project engineers as industrial expansion plans ramp up across China but new graduates have not had time to gain the necessary experience. Current trends suggest that, in 2025, the big-city talent market will be a recipe for inequality with a large number of underemployed graduates and a small number of high-skilled graduates commanding very high salaries. To preempt this outcome, large cities should shift focus from the quantity of graduates to their quality. This is enormously complex and touches on major debates about long-term policy including whether China should reform its exam system, how to improve teacher training, and how to inject coursework with more creativity rather than today's emphasis on memorizing material. In the meantime, there are several no-regrets moves that China's cities can make in the short term, including forging partnerships between local colleges and companies to boost practical experience, providing internships, and

Exhibit 3.2.12

How to fund education is a hot debate—who should pay, how much, and at which education level are big questions

CURRENT SITUATION



Source: Finance Yearbook of China 2006; literature search; *Economist*; McKinsey Global Institute analysis

China has initiated a deep-rooted debate about the structure of its educational system and whether it needs reform. There are three major issues. First, which level of education should get more resources? Today local government prefers to spend on higher education because this is a direct source of talent—and also serves to attract skills to cities. Although in absolute terms spending on basic education is higher than that on higher education, spending per student is much greater in the latter. The second issue is who should take more responsibility in compulsory education. Today local governments are mainly responsible with provincial and central governments playing a small role. Finally, China is questioning whether total education spending is too low. Between 2001 and 2005, this spending increased by 14 percent a year to total almost 450 billion renminbi in 2005. External observers, including the United Nations, argue that China's spending as percentage of GDP is clearly too low. However, Chinese experts point instead to education spending as a percentage of government income. The gap with other countries such as the United States becomes smaller when comparing this way—but is still marked.

Exhibit 3.2.13

Central government launched a new program to improve quality in the 11th Five-Year Plan

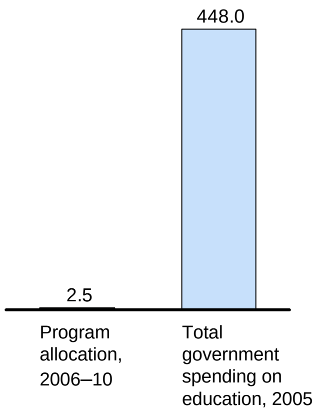
Targets for the program are significant in absolute terms…

Illustrative targets for use of funding

15,000	• Students subsidized for creative experiments
10,000	• High-quality textbooks supported
3,000	• “Excellent courses”
3,000	• Special subject/major departments set up in universities
3,000	• Teachers and professionals subsidized to work in the west
1,000	• Person national-level teaching team
500	• Pilot education centers built
500	• Educational-mode test districts built
500	• Excellent teachers rewarded

…but is funding enough?

Renminbi billion

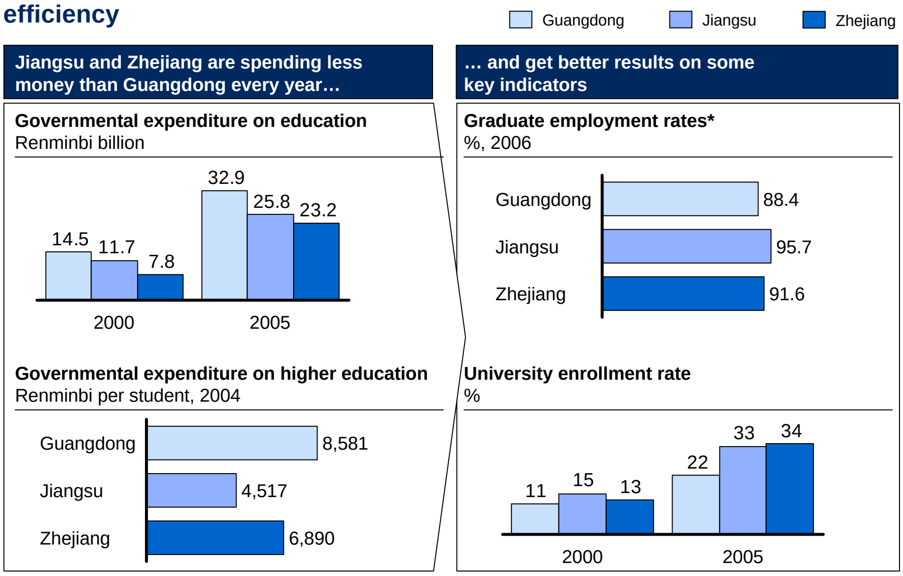


Source: China education press; McKinsey Global Institute analysis

At the start of 2007, central government announced a 2.5 billion renminbi (0.5 percent of the total education budget) special allocation to improve graduate quality from 2006 to 2010 in six ways: making major adjustments to subjects studied, refining the curriculum and sharing resources, introducing an emphasis on practical education and a “creative mode,” improving the quality of teaching, publishing assessments of educational institutions, and supporting higher education in western China. One measurable objective is to solve English listening and speaking issues for at least 60 percent of students within four years. An alternative would be to invest in educational “software” such as teaching methods and curricula, for example in a large-scale project to investigate best-practice teaching methods. The real question is whether funding for improving quality at less than 1 percent of the total education budget will be enough.

Exhibit 3.2.14

Some provinces have begun to improve education funding efficiency



* Only for undergraduates.

Source: Interviews; literature search; local statistical yearbooks; local bureaus of education; McKinsey Global Institute analysis

Action to improve the quality of graduates is starting to ramp up. For instance, a number of local and MNCs have instituted internship and training programs; one major MNC helped fund a vocational college to which the company sends its own workers for training but that is also open to local students. It will be important that students, colleges, and officials see such initiatives as educational, rather than employment, opportunities. At the local level, Jiangsu and Zhejiang are two—quite different—examples of local initiatives. Jiangsu has launched an education-modernization program, including both hardware and software approaches, and has conducted regular performance reviews; productivity has increased. Zhejiang has encouraged private capital to invest in education, which had made funding more efficient, eased strains, and produced an "intensive" improvement in quality. In both cases, these provinces are spending less money with better results than a rich province such as Guangdong in terms of graduate employment rates, for example. There is a substantial opportunity to adapt and replicate successful initiatives more broadly in China—with cities actively helping private companies to engage.

3. Implications for building construction

The boom in housing construction that is under way in China has been one of the most visible and dramatic impacts of urbanization and one that has acted as a major driver of economic growth and job creation. The future of construction will therefore be of critical importance, not only to the Chinese economy but also for commodity prices, given the influence of China's demand for raw materials on the global market.

China's building boom has been driven by increasing wealth (leading to greater living space per person), rapid urban population growth, and relatively high rates of rebuild.[35] The imperative to avoid the creation of slums as city populations expand is another driver. The fact that none of these factors show much sign of abating implies that the building boom is very likely to continue, and MGI projects that construction should continue to grow robustly across urbanization scenarios. Even so, given the low starting point, China will not be able meet the government's target of achieving 35 square meters per person in 2020 under any of the four urbanization scenarios that we have analyzed.

Across scenarios, China will build between 4 million and 5 million new buildings between 2005 and 2025. Under hub and spoke, urban China would build 51,000 buildings of more than 30 floors between 2005 and 2025. Putting this into the context of present-day Chicago, we project that under a hub-and-spoke scenario, urban China could build two and a half Chicagos every year to 2025—and at least one Chicago every year under any scenario.

Considering residential and commercial construction together, MGI finds that a hub-and-spoke scenario would see by far the highest yearly rate of construction in 2025 at a compound annual growth rate of 2.6 percent. By 2025, this scenario would see 3.06 billion square meters of floor space being constructed a year, triple the annual build in 2005 of 1.18 billion square meters. The rate of building would be 30 percent above what we would see under townization in 2025.

Variations in the profile of building construction among scenarios would have a huge impact on raw materials demand. For instance, in 2025 the difference between demand for steel in hub and spoke (very significant because of the impressive number of skyscrapers that would be built) and townization (with far fewer tall buildings) would be equal to 15 percent of global steel demand today.

35 Rebuild refers to floor space destroyed either because it is structurally unsafe or, more common in China, because it must be cleared to allow new construction.

Annual real-estate investment will continue to rise steadily in the period to 2025, reaching between 2 trillion renminbi and 3 trillion renminbi a year depending on the urbanization scenario. However, we expect that even this substantial construction investment will not keep pace with rapidly growing GDP and its share of GDP will drop from more than 10 percent in 2005 to around 5 percent in 2025. We note that these projections relate to underlying demand for real estate based on wealth and density effects. Actual amounts constructed could cycle above and below this underlying trend based on policy shifts that could, for example, lead to unpredictable changes in money supply to developers.

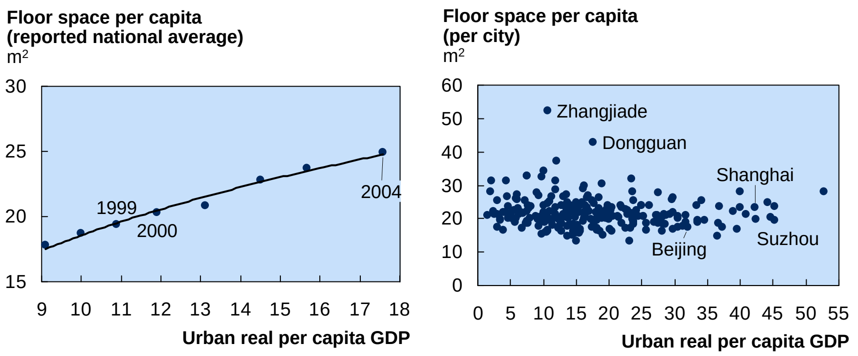
Exhibit 3.3.1

MGI projects urban China's construction rates with a per capita GDP–based approach applied to the city level

Renminbi thousand, 2000

At national level, there is a strong correlation between per capita GDP and housing space over time…

…but each city presents a different behavior



Source: National Bureau of Statistics; Ministry of Construction; McKinsey Global Institute analysis

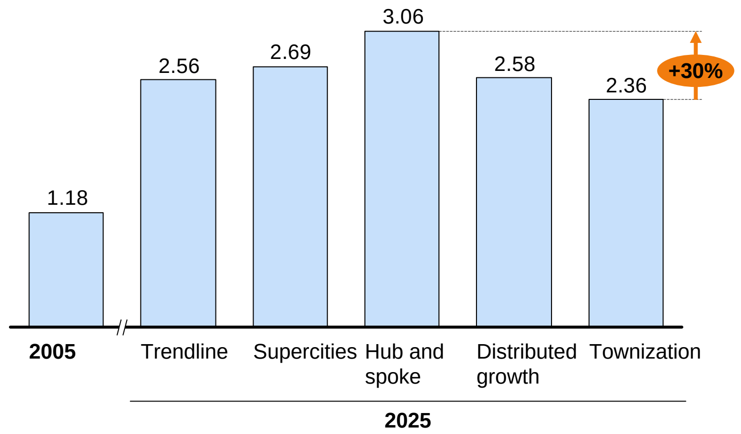
Increasing population and wealth are the twin drivers of construction. The overriding variable influencing housing is "affordability"—or prices relative to incomes. The evidence suggests that prices in turn correlate with both national and local drivers. Among these the most important are interest rates, the yield curve, mortgage markets, real construction costs, inflation, and unemployment. The complex interactions among these still leave a great deal of room for error in projecting construction rates. Even at the same level of per capita GDP, the floor space per person in Chinese cities shows a variability of more than 30 percent. Density accounts for another 10 percent of the variance in space per person. Although there is no direct link between per capita space in an urban center and that city's per capita GDP or size—given that price will intervene—we chose to assume that, over time, increases in per capita urban GDP will feed through to city-level increases in space per person on a similar trend to the national correlation between these two.

Exhibit 3.3.2

A hub-and-spoke scenario would have by far the highest constructed floor space in 2025

Annual build requirement, residential and nonresidential*

Billion m^2



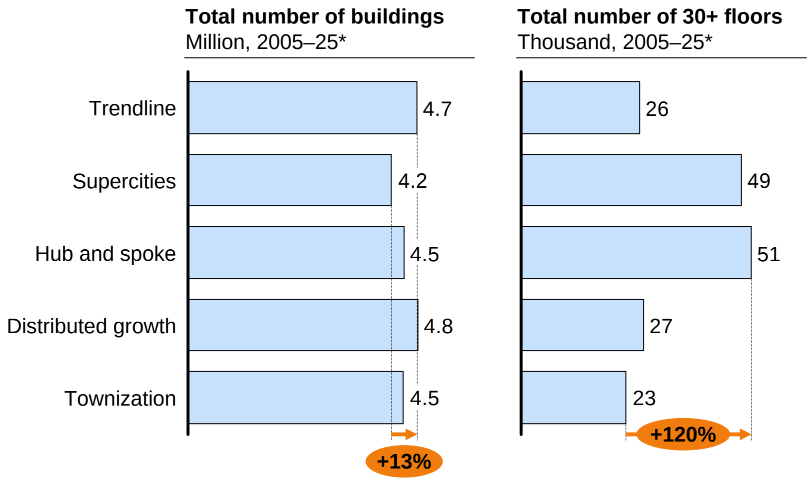
* Including all official, unofficial, and new cities.

Source: National Bureau of Statistics; China City Yearbook 2006; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Taking residential and commercial construction together, MGI finds that a hub-and-spoke scenario would have by far the highest annual rate of construction by 2025, at 3.06 billion square meters of floor space, compared with 1.18 billion in 2005, and 30 percent above the construction rate we would likely see under townization. The robust upward trajectory of construction under hub and spoke would be driven by continued urban population growth concentrated in high-income spoke cities with lower density than the hubs. Both distributed growth and hub and spoke would have the greatest amount of cumulative construction at nearly 40 billion square meters in 2005–2025. A distributed growth scenario would have the highest construction rates to 2015, but then these rates would decelerate significantly as space per capita would plateau in many midsized cities. If we break down residential and nonresidential construction, a supercities scenario would see more nonresidential construction, but the two dispersed urbanization scenarios would construct more residential buildings. An important component of these numbers would be rebuilds. MGI estimates that, with regional variations, some 2.5 percent of China's buildings need replacing each year because they have reached the end of their life spans (compared with 0.3 percent to 0.5 percent in developed countries). Developers indicate that, at least in major coastal cities, the life cycles of recently constructed buildings now average 50 years (the current legal minimum), although evidence suggests that lower-quality buildings inland still have life spans of only between 20 and 40 years.

Exhibit 3.3.3

The number and type of buildings constructed would vary greatly among scenarios

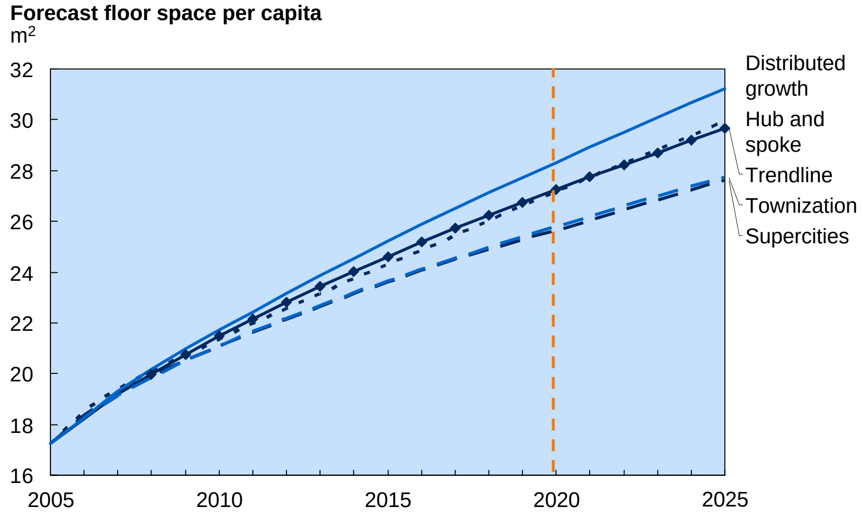


* Cumulative.
Source: National Bureau of Statistics; press; field visits; McKinsey Global Institute analysis

Across scenarios, China will build between 4 million and 5 million new buildings between 2005 and 2025. We believe that this is a relatively conservative estimate because we assume that, even in distributed growth and townization, almost all low-rise buildings would be more than a single story. As a result of the density of China's urban centers, we assume that single-family units will not be a significant part of the mix. To anticipate how the building mix might develop in each scenario, we used firsthand information gleaned during our city visits to estimate building profiles for different city size categories. For instance, we assume that in megacities 70 percent of buildings will have between 10 and 20 floors. In small cities with populations of fewer than 0.5 million people, this share would be only 10 percent. In a hub-and-spoke scenario, urban China would build 51,000 buildings of more than 30 floors between 2005 and 2025, 120 percent more than would be built in a townization scenario. This program of skyscraper construction in hub and spoke would be equivalent to building two and a half Chicagos every year to 2025. In each of the other three scenarios, urban China would build at least one Chicago each year.

Exhibit 3.3.4

Despite continuing growth in urban construction, China will miss its 35 square meter per capita target



Source: National Bureau of Statistics; Ministry of Construction; McKinsey Global Institute analysis

MGI's analysis finds that China's government is not likely to meet its target of achieving 35 square meters per person in 2020 under any of the four urbanization scenarios despite a continued construction boom. Based on available data for city-level space per capita that is almost always lower than the reported national average (30 percent lower on a weighted average), we believe that the starting point for per capita space is significantly lower than indicated by national data.[36] This lower starting point, together with the logarithmic relationship between per capita GDP and space per capita (which leads to a flattening in the growth in the latter over time), leads us to project that the government would miss its target even under distributed growth, which would see the greatest rise in urban floor space per capita.

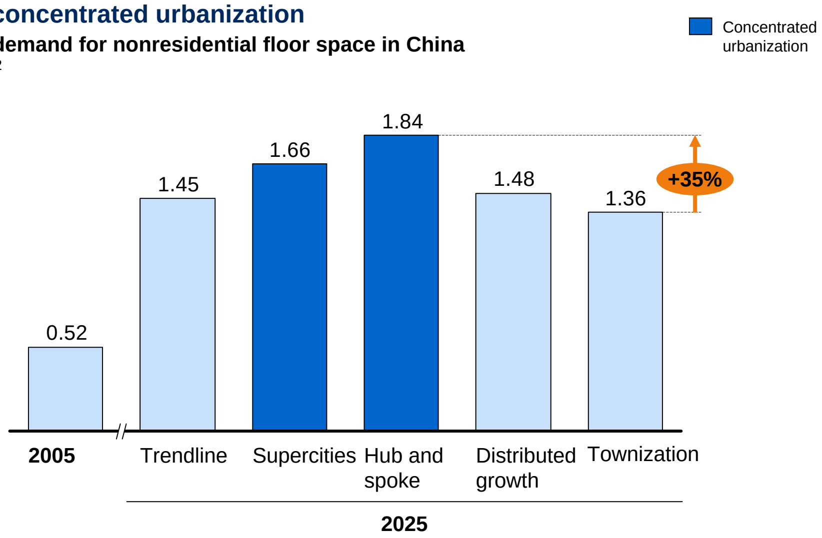
36 We base this on city-level reported per capita floor space, adjusted for the difference in population between *Hukou* and census total data. We also assume that the relationship between wealth and per capita floor space in the smallest prefectural cities is similar to that relationship in cities below prefectural level.

Exhibit 3.3.5

Nonresidential floor space demand would be significantly higher under concentrated urbanization

Annual demand for nonresidential floor space in China

Billion m^2

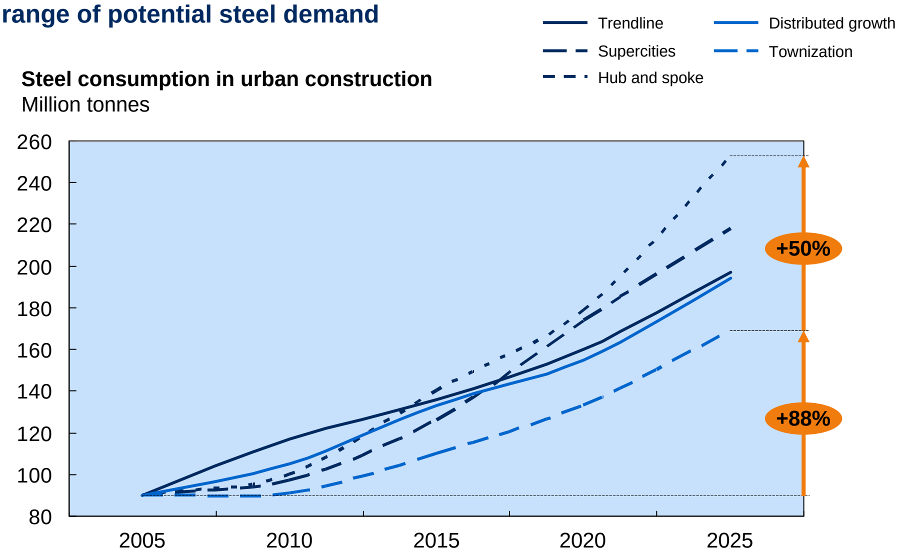


Source: National Bureau of Statistics; China City Yearbook 2006; McKinsey Global Institute China All City model; McKinsey Global Institute analysis

Projecting trends in nonresidential floor space is hampered by the fact that there is no data series long enough to determine trends on the basis of historical experience. However, we know that the total amount of space in offices and factories correlates very closely to GDP. We project that, nationally, GDP per square meter of nonresidential floor space will continue to grow significantly to 2025, decelerating at the end of the period. In all scenarios, demand will rise very strongly, nearly tripling under townization and almost quadrupling under hub and spoke. Given significantly higher GDP growth in concentrated urbanization, overall nonresidential demand would be higher in those scenarios than in dispersed urbanization, reaching 1.84 billion square meters a year under hub and spoke, 35 percent higher than under townization. Supercities and hub-and-spoke scenarios would see the highest GDP per square meter of nonresidential floor space—and supercities would use space most efficiently.

Exhibit 3.3.6

Building profiles in different scenarios would lead to a wide range of potential steel demand



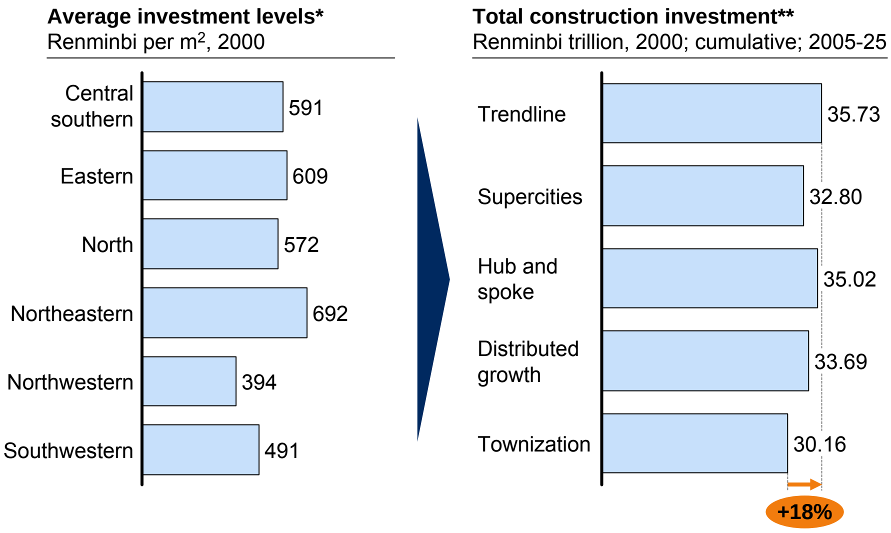
Source: Literature search; Ministry of Construction; interviews; McKinsey Global Institute analysis

Variations in the building profile in different scenarios would produce very substantial differences in demand for various raw materials. Indeed, these building profiles would have more impact on resources demand than floor space itself. Take steel. The height of buildings has a large impact on demand for steel—with skyscrapers needing more. We estimate that a building of between 40 and 50 floors uses 128 kilograms of steel per square meter compared with only 55 kilograms in a building of up to 10 floors.[37] Even under townization, which would see the lowest construction rate of the four scenarios, annual demand for steel would rise by nearly 90 percent in 2025 compared with 2005. Steel demand would be another 50 percent higher still under hub and spoke. To give an idea of the scale of variations among scenarios, the difference in steel demand of 75 million tonnes per annum in 2025 between townization and hub and spoke would be equivalent to 15 percent of global steel demand today.

37 From quotes and articles sourced from Xinhua, interviews with developers, and *steeltoday.com*; Xue Fa, *Long distance telecommunication building should use steel structure*, Beijing Posts and Telecommunications Design Institute of MII, Beijing, 2002.

Exhibit 3.3.7

Investment in construction will be substantial, varying by region and highest in trendline and hub and spoke



* Based on National Bureau of Statistics data for 35 cities.
** Residential and commercial.
Source: National Bureau of Statistics; press; McKinsey Global Institute analysis

MGI projections for investment per square meter vary significantly in different regions due to factors such as local input costs and climatic conditions. For instance, greater insulation in the colder regions of northeastern China drives up costs. Such impacts to an extent dampen the variation that we project in investment in residential and commercial construction in different urbanization scenarios. We find that the cumulative investment required in a townization scenario would be some 18 percent below that under trendline. The highest cumulative investment needs would be in trendline and hub-and-spoke scenarios, the latter having significantly higher annual investment needs in 2025. Annual real-estate investment will continue to rise steadily to 2025 to between 2 trillion renminbi and 3 trillion renminbi a year. We see a somewhat flatter upward trend in the short term before investment accelerates later in the projected period. However, because China's urban GDP will be growing so rapidly, this investment actually drops relative to GDP from more than 10 percent in 2005 to around 5 percent in 2025.

4. Implications for urban infrastructure

China's investment in building its urban infrastructure increased by nearly 20 percent per annum in the period from 2001 to 2005 alone, and spending will grow hugely to between three and five times the 2005 level by 2025 depending on the urbanization scenario. The main areas of spending are mass transit and utilities. The bulk of investment so far has been in urban transit, but, despite these capital outlays, congestion in many Chinese cities has deteriorated rapidly. This implies that infrastructure spending on roads will remain robust.

A distributed form of urbanization would require the most road space, buses, and rail investment with an annualized total investment from 2005 to 2025 of 531 billion renminbi a year. Supercities and hub-and-spoke scenarios of urbanization would come close to distributed growth in terms of demand for roads, buses, and rail. In contrast, townization would involve significantly more modest—although still considerable—demand for the building of public-transit infrastructure.

China's government is pushing for the expansion of urban mass-transit systems and our research shows that in all urbanization scenarios except for townization, more than 100 rail systems—light rail and subway—would have to be built if the government were to meet its long-term targets.

China has thus far financed its urban infrastructure boom from multiple funding sources including bank loans, retained profits, and direct grants with the lion's share coming from retained equity and bank loans. While the funding system has ensured that capital has been available, it has also created inefficiencies. In 2005, the leverage in the funding portfolio of Chinese urban infrastructure was about 35 percent, well below the 60 percent–plus gearing observed internationally for infrastructure projects. This could be improved. Nevertheless, China should have a comfortable enough amount of capital in aggregate to meet the future funding needs of its infrastructure investment given that spending is only a fraction—and potentially a declining fraction—of China's rising capital stock.

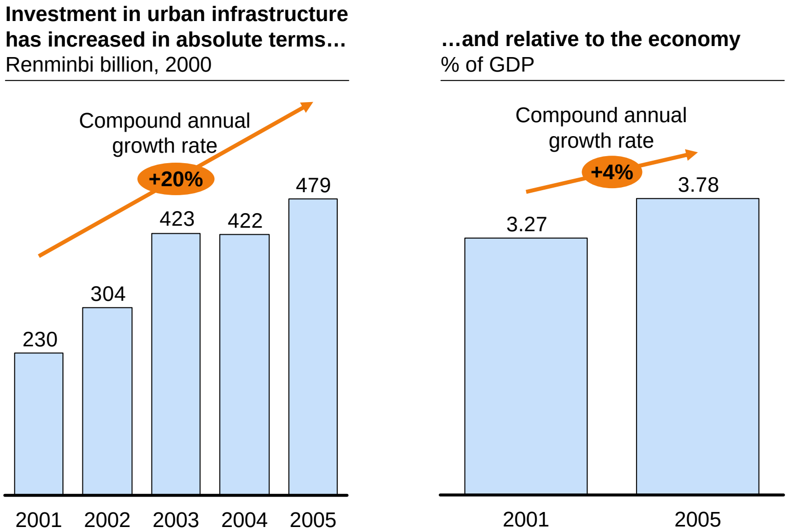
The emerging, and potentially critical, issue lies in the distribution of funding. Smaller and midsized cities may struggle to finance their infrastructure needs, which would grow substantially especially in a dispersed urbanization pattern. These cities receive disproportionately less capital than larger urban centers, and the trend is unlikely to improve without specific action to remove barriers to investment in these cities. Current hurdles include shortcomings in planning and execution skills, risk aversion by local banks, and a lack of budgetary transparency.

To ensure that all China's cities can fund their urban infrastructure construction, a shift in today's financing mix away from equity and toward bonds would lower the cost of capital for high-quality projects and help channel other funding sources to higher-risk projects. Indeed, the pressure for a diversity of funding coming from infrastructure spending could prove to be a strong catalyst to the development of China's debt markets. Bond financing would have the advantage of cutting the cost of capital by between 1 and 2 percent.

In addition, China could embrace a number of managerial reforms to further alleviate the urban infrastructure financing pressure. For example, it could support local planning bureaus capable of developing integrated plans that would avoid repeated construction or market failures. In less developed areas of the country, the government could promote more local autonomy in the operation of infrastructure, use flexible pricing schemes, and allow more foreign equity investment. Although these reforms are subject to public and political debate, they could yield significant long-term benefits in facilitating the financing of infrastructure building and freeing up capital for other needs such as the provision of social services to expanding city populations.

Exhibit 3.4.1

China has been investing heavily in urban infrastructure



Source: Chinainfobank; Ministry of Construction; McKinsey Global Institute analysis

China's spending on urban infrastructure rose by 20 percent per annum from 2001 to 2005. Spending has risen as a share of China's total GDP but still accounts for only a fraction of total output. Moreover, with China's very high savings rate, investment in urban infrastructure has represented only around 10 percent of gross capital formation, below the comparable ratio in other developing Asian countries.

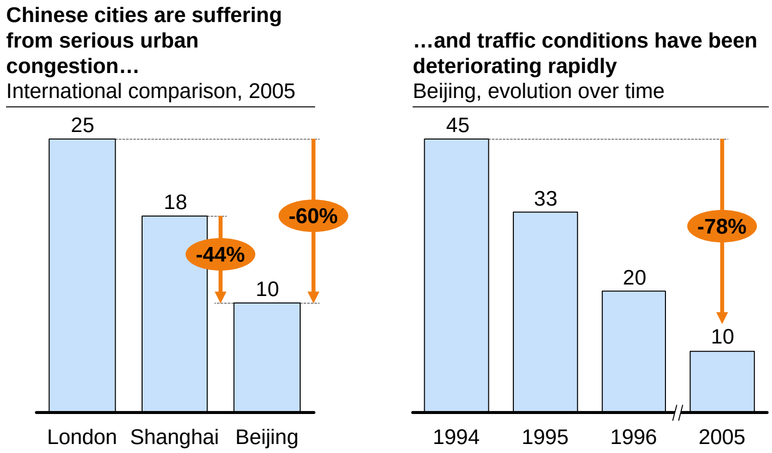
This suggests that China can continue to afford making these capital outlays. China's infrastructure spending has been diverse, embracing the building and extension of subways, light-rail systems, and expanding bus fleets. However, the bulk of capital outlays have so far been on building roads. In 2005, 51 percent of total spending was on roads, bridges, and mass transit, with the remainder on public utilities (e.g., sewers, flood control). Outlays are also overwhelmingly concentrated in the east, which accounts for 69 percent of spending or just over 300 billion renminbi.

Exhibit 3.4.2

Congestion has increased rapidly, and investment in urban transit is likely to continue

EXAMPLE

Average speed for cars and public transport during peak hours, km/h

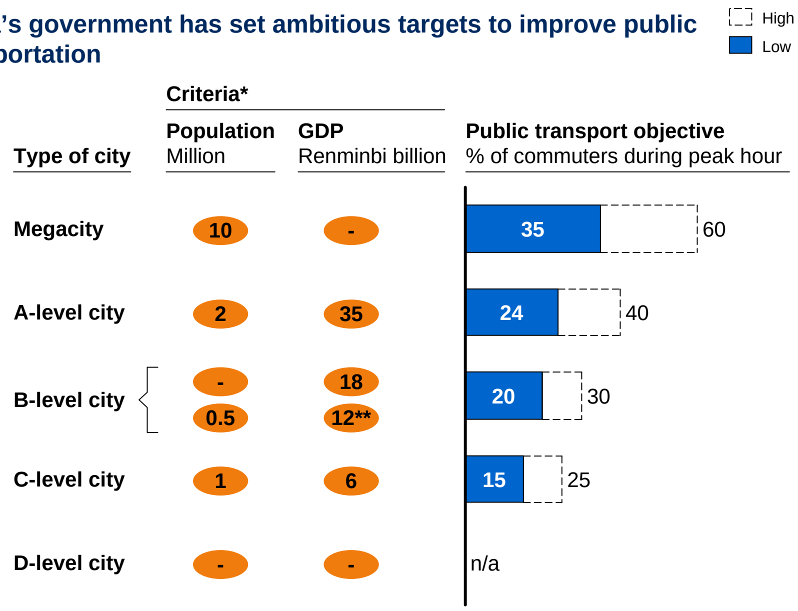


Source: *The 3rd comprehensive transport survey of Shanghai*, 2005; literature search; McKinsey Global Institute analysis

Despite huge public investment in city road infrastructure, many Chinese cities face increasing congestion, suggesting that investment in urban transit is likely to continue. Clear evidence of the deterioration in traffic conditions comes from data on the average speed of cars in some cities. In Beijing, for instance, traffic speed has decreased sharply and is now less than half that of London. This trend is unsurprising given that private-car ownership in China has soared by 31 percent a year between 1990 and 2005 but urban road space has expanded by only 10 percent per annum. Among transportation means, cars need vastly greater urban road space per user at 40 square meters. Motorcycles come next at 18 square meters needed per user, followed by buses with 8 square meters and bicycles with 5 square meters. Given that even public transport (except rail) requires road space, China's cities will need to undertake investment and planning in a holistic way.

Exhibit 3.4.3

China's government has set ambitious targets to improve public transportation

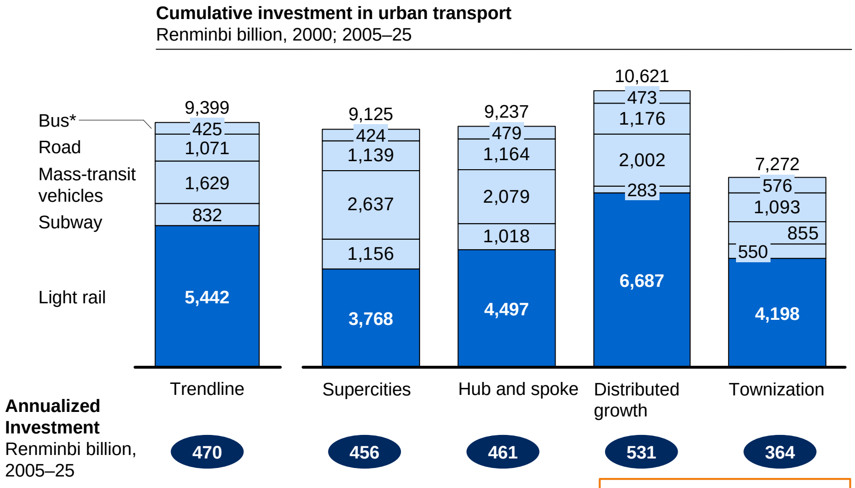


* Either/or, i.e., GDP >6 billion renminbi or population >1 million for C-level cities.
** For B-level city, GDP >18 billion renminbi or >6 billion renminbi but with population >1 million.
Source: Urban public transport evaluation criteria, Ministry of Construction; McKinsey Global Institute analysis

China's government has set targets for public-transport use for cities based on their populations and their GDP, splitting them into five categories. In the short term, these categories act as criteria for the approval of investments, while in the long term they represent targets. If China meets these targets, its cities would come into line with international standards of public transport as a percentage of overall travel. We used a combination of patterns of current use—in China and in international comparison cities—and China's public-transport policy aims to calculate the potential future breakdown of different modes of urban transport in the nation's cities. We know that shares of different kinds of transport correlate closely with the density of cities everywhere in the world—high-density urban structures limit the space for cars, so that public transport serves mobility needs more effectively. We expect all Chinese cities to show the same correlations we see internationally between density and the use of public transport once they cross a per capita GDP threshold of 50,000 renminbi. We can then calculate the breakdown of transport modes for different categories of city by size and arrive at an estimate of the split in 2025. For instance, in megacities we project that, by 2025, 22 percent of peak-hour travelers will use rail, 8 percent bus, and 24 percent car.

Exhibit 3.4.4

Investment in urban transport will more than double



Urban transport investment in 2005 totaled 250 billion renminbi

Note: Numbers may not sum due to rounding.
* Current estimate based on net addition to fleet; could increase due to fleet replacement.
Source: Urban Statistical Yearbook 2006; McKinsey Global Institute analysis

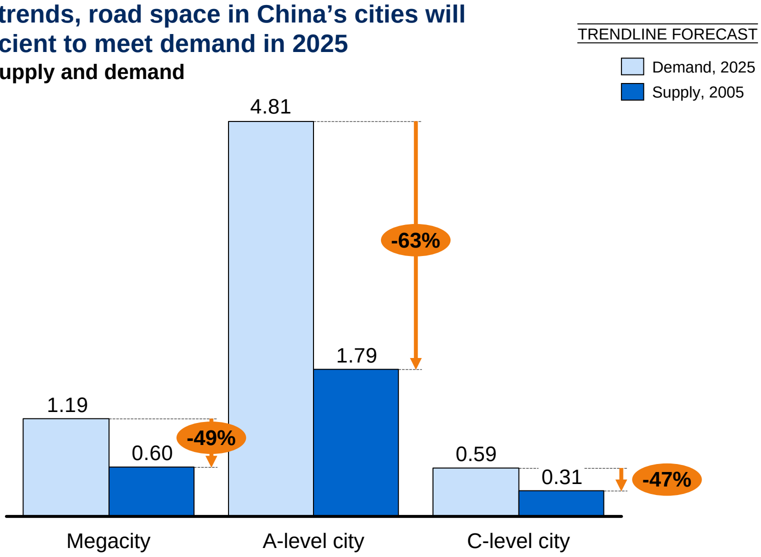
In all urbanization scenarios, we will see a massive increase in spending on urban transit by 2025 compared with 250 billion renminbi in 2005. The largest annualized investment from 2005 to 2025 would be in a distributed growth urbanization scenario at 531 billion renminbi a year. This scenario would require the most road space, buses, and rail transportation, as a very large number of midsized cities require relatively less-efficient transit systems. Supercities and hub-and-spoke shapes of urbanization would come close, while townization would involve significantly more modest—although still considerable—demand for the building of public-transit infrastructure. Nevertheless, in townization the relatively lower demand for infrastructure would coincide with difficulties in financing its supply, leaving the scale of the challenge in building this infrastructure similar to, if not greater than, in other urbanization scenarios.

Exhibit 3.4.5

On current trends, road space in China's cities will not be sufficient to meet demand in 2025

Road space supply and demand

Billion m^2



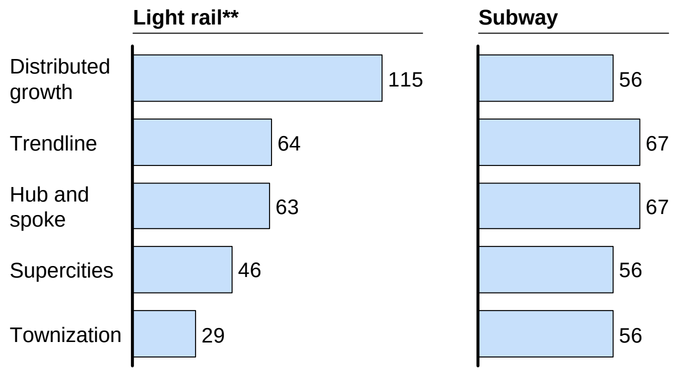
Source: Urban Statistical Yearbook 2006; McKinsey Global Institute analysis

Our trendline projections show that China's current urban road space will fall far short of demand by 2025 and that road construction will likely need to continue—unless Chinese cities decide to push forward a set of policies to decrease car ownership and to increase public-transport usage. Megacities and A-level cities will be short by almost 3 billion square meters—reflecting the pressure of density in big cities. However, even D-level cities face a shortage on our trendline projections of almost 300 million square meters. The most significant road building would have to occur in a distributed growth scenario with 4.99 billion square meters of urban roads needing to be constructed. To put this in perspective, this is the equivalent of paving and tarring an area the size of metropolitan Paris, or about twice the 47,000-mile US interstate highway system. Road building in a hub-and-spoke scenario would have to be almost as extensive, followed by a supercities model of urbanization. Road construction in a townization scenario would be somewhat less at 4.65 billion square meters but still on a massive scale.

Exhibit 3.4.6

Government targets imply building more than 100 light-rail and subway systems

Qualified cities by 2025*



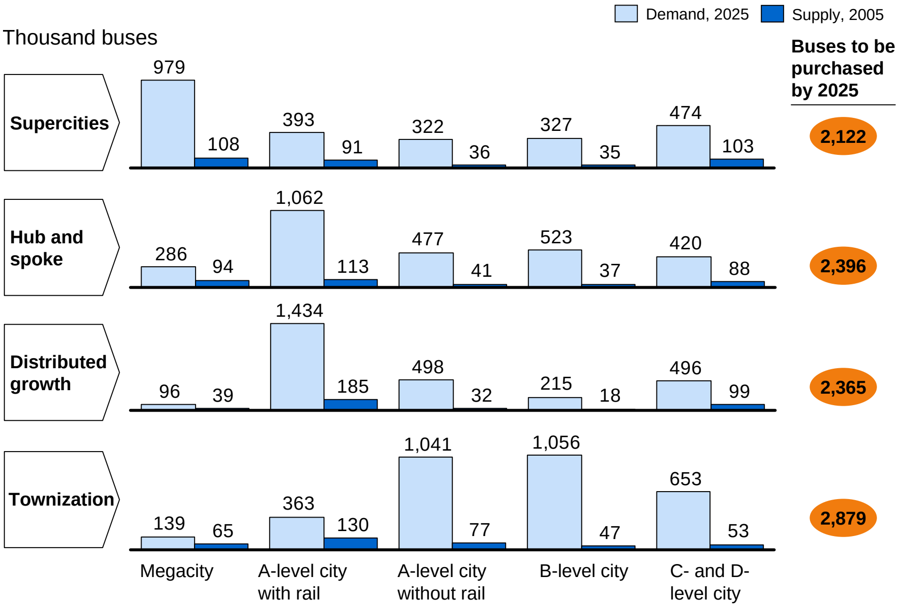
Criteria	• City population >1.5 million • City GDP >60 billion renminbi	• City population >3 million • City GDP >100 billion renminbi

* Some cities qualify between 2020 and 2025, so will not have the lead time to initiate construction.
** Including cities qualifying for subway in later years (even if they qualify before 2020).
Source: China Urban Statistical Yearbook 2006; criteria of subway/light-rail development issued by Ministry of Construction

Urban infrastructure is not just about roads. The construction of light-rail and subway systems will be massive, driven by China's policy of expanding mass transit. A distributed growth scenario would see 171 cities qualifying under the government's criteria as needing to build light-rail or subway systems. In this scenario, China's light-rail system would need to expand by almost 300 times to meet demand. This means building 31,000 kilometers of new light-rail track by 2025, implying an annualized investment of some 330 billion renminbi. A hub-and-spoke model would require 21,500 kilometers of light-rail track with annualized investments of some 220 billion renminbi. Light-rail construction would be somewhat less extensive under townization and supercities scenarios at 18,600 (210 billion renminbi annualized investment need) and 17,100 kilometers (190 billion renminbi), respectively. Pressure to build new subway capacity would be far higher in supercities and hub-and-spoke scenarios than in dispersed urbanization models. In both concentrated urbanization scenarios, subway capacity would need to expand nine times by 2025 to meet demand.

Exhibit 3.4.7

Cities would need to buy more than 2 million buses in any scenario



Source: McKinsey Global Institute analysis

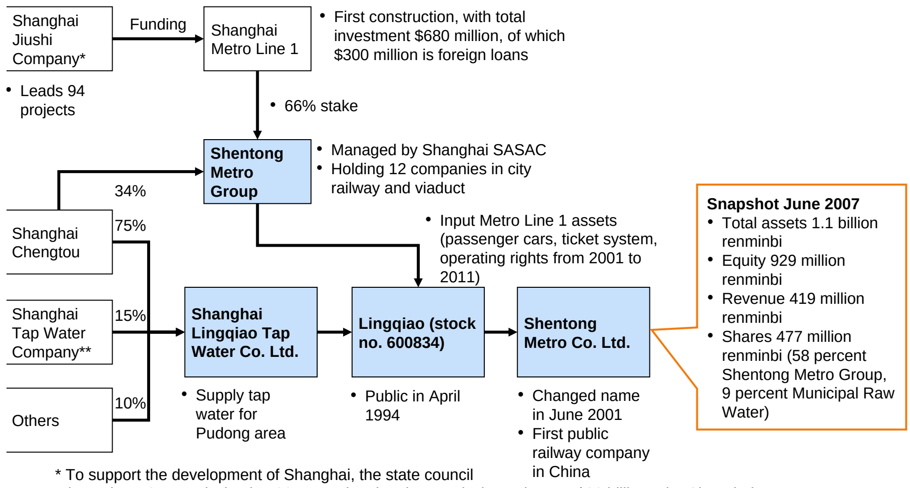
While pressure to build rail systems is markedly lower in townization than in other scenarios, this most dispersed model of urbanization would still require the purchase of almost 3 million buses by 2025 to meet transportation demand. A-level cities without rail systems and B-level cities would need to buy more than 1 million buses each—a hefty investment that some of these cities will struggle to finance. This is not to say that the other scenarios would not require sizable bus-purchasing programs. However, which cities will be buying will shift dramatically in different urbanization scenarios with clear strategic implications for suppliers. For example, under supercities, 15 cities would together purchase more than a million buses—or almost 70,000 each—whereas under townization the same number of buses would be spread among 210 cities.

Exhibit 3.4.8

China has funded urban infrastructure through a complex web of financial and institutional arrangements

ILLUSTRATIVE

Ownership and funding evolution for Shanghai Metro Line 1



* To support the development of Shanghai, the state council issued No. 94 permission in 1987, granting the city permission to borrow $32 billion. The Shanghai government established Jiushi Company to manage the projects utilizing the debt.

** Established in 1985, turned into stock company, and changed name to Shanghai Municipal Raw Water Co. Ltd. in July 1992.

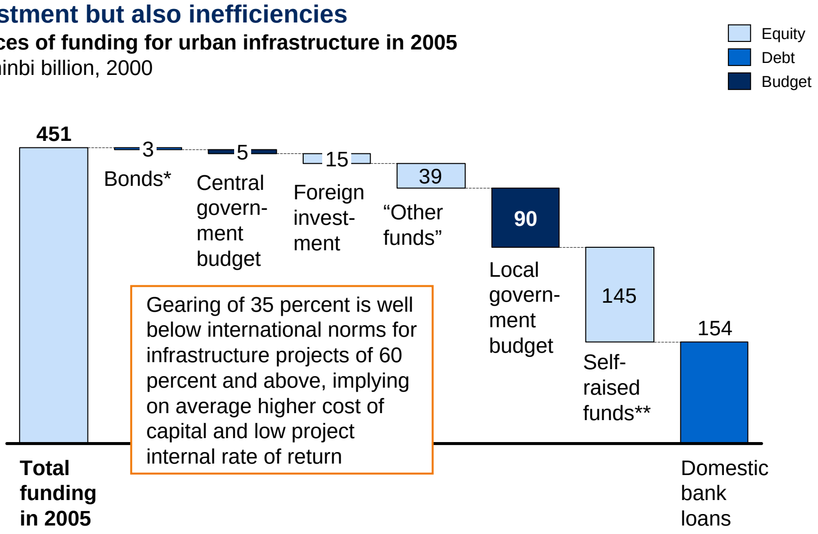
Source: Shanghai Metro Co. Ltd., http://www.jrj.com.cn/; Justice Department; McKinsey Global Institute analysis

A complex web of actors is involved in funding urban infrastructure. Central government funds and controls major national infrastructure projects such as national railways and also partly finances large local projects. Local government funded between 100 billion renminbi and 200 billion renminbi on infrastructure projects in 2005 but cannot take on debt as state-owned infrastructure companies do (150 billion renminbi in 2005). China has recently allowed the private sector to participate in financing urban infrastructure projects, mainly in joint ventures with local government and publicly owned companies, and it seems likely that this trend will continue. For instance, the complex funding arrangements for the building of Line 1 of Shanghai Metro has involved at least nine companies and institutions, with at least three asset transfers. As a result, the listed company, Shanghai Shentong Metro Co. Ltd., claims returns on equity that are deceptively high, because large parts of the subway line's funding sit in separate financial vehicles.

Exhibit 3.4.9

China's multifaceted funding system has resulted in unprecedented investment but also inefficiencies

Sources of funding for urban infrastructure in 2005
Renminbi billion, 2000

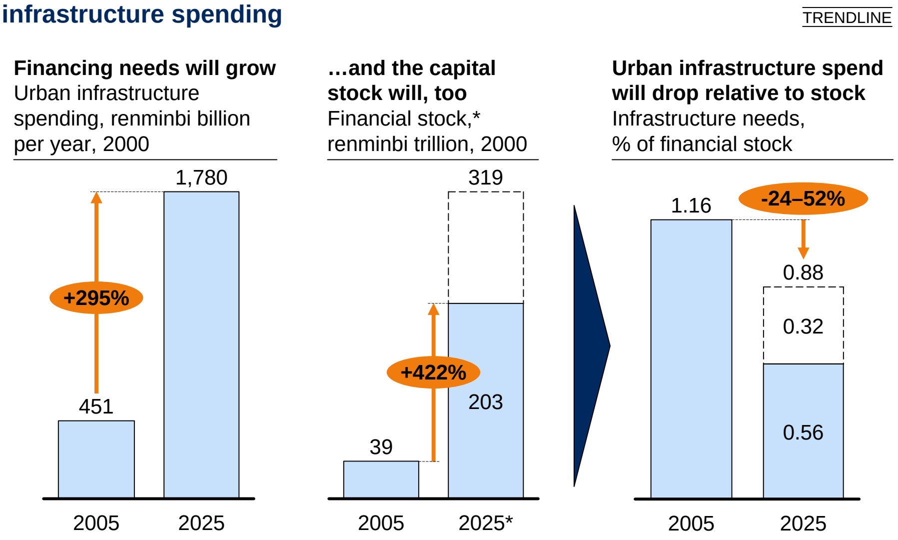


* 4 billion renminbi of bonds issued in 2005 were reallocated from "self-raised funds."
** Off-budget revenue deployed as funding, reinvested profits, and local equity.
Source: China Finance Yearbook 2006; China Urban Construction Statistical Yearbook 2006; China Government Securities (www.chinabond.com.cn); McKinsey Global Institute analysis

A range of sources provide funding for China's burgeoning urban road infrastructure. "Self-raised funds"—off-budget revenues deployed as funding that include reinvested profits and local equity—and bank loans are the largest sources of finance. These together triple the size of funding from local government budgets. Bonds barely figure as a source of finance, and foreign investment is still small at 15 billion renminbi out of total spending of 451 billion renminbi in 2005. Cities often use many sources of funding to finance a single road-building project. For instance, Sichuan Province has used ten separate sources of funds to build roads over the past eight years. This multifaceted funding system has undoubtedly enabled the vast investment of the past few years—spending grew at a compound annual rate of 18 percent in real terms between 1985 and 2005. However, the system has also produced inefficiencies. A suboptimal capital structure drives up the cost of capital, even more so because that capital has been relatively easy to obtain, resulting in relatively loose discipline on designing and evaluating projects.

Exhibit 3.4.10

China will have sufficient capital overall to fund urban infrastructure spending



* Lower bound at 2006 financial depth (defined as total financial assets/GDP) of 3.1, upper bound at continuation of 2000–05 growth in financial depth of 4.8.

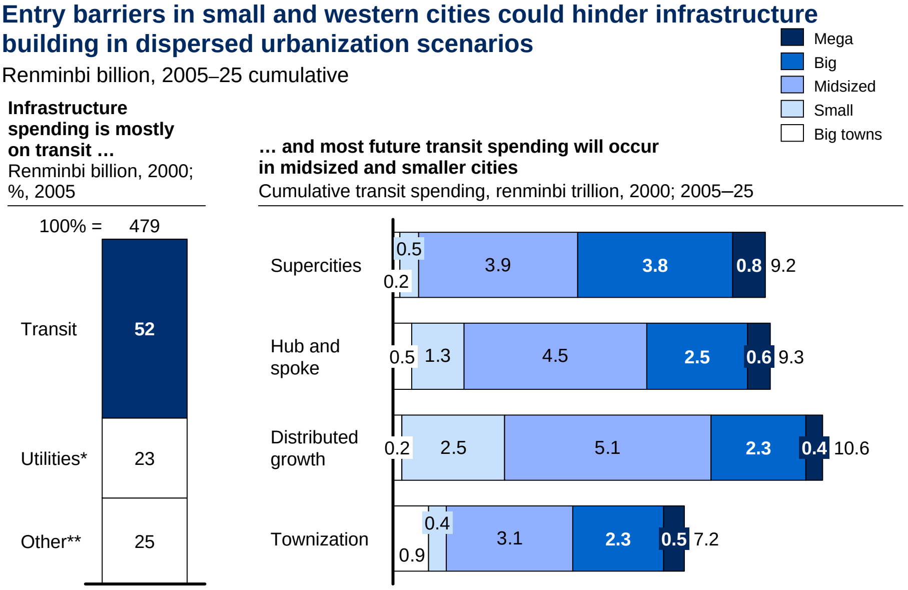
Source: China Construction Yearbook 2006; McKinsey Global Institute All China City model; McKinsey Global Institute Capital Markets Database; McKinsey Global Institute analysis

The investment needed to fund rising spending on urban infrastructure will be affordable. Spending is set to nearly triple between 2005 and 2025, but, even using conservative assumptions about a prospective increase in China's financial depth—the ratio of a country's financial assets to its GDP—the country's capital stock will more than quadruple. Indeed, urban infrastructure spending as a percentage of China's capital stock could drop, suggesting that China as a whole could finance its massive program of building with relatively less difficulty than other countries.

Exhibit 3.4.11

Entry barriers in small and western cities could hinder infrastructure building in dispersed urbanization scenarios

Renminbi billion, 2005–25 cumulative

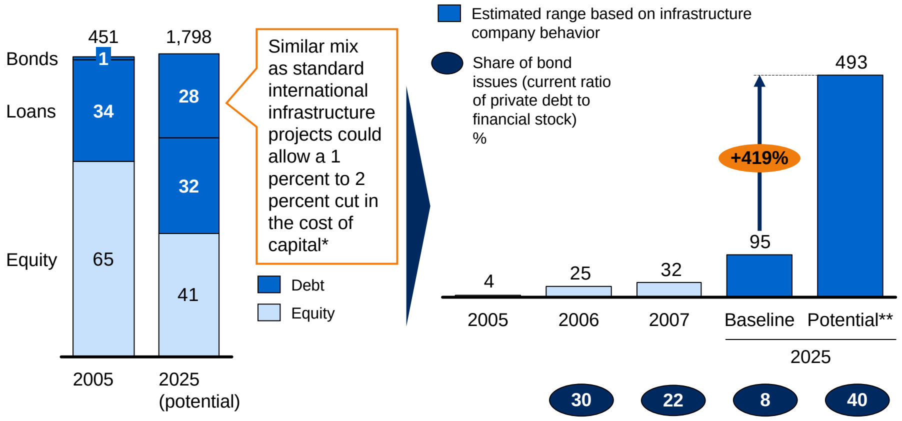


Note: Numbers may not sum due to rounding.
* Water, sanitation, central heating, etc.
** Landscaping, "unclassified," etc.
Source: McKinsey Global Institute analysis

While in aggregate terms, China will have more than sufficient capital to finance the construction of its urban infrastructure, there will be financing pressures in smaller and midsized cities—particularly in western China and in dispersed urbanization scenarios. These cities have substantial investment needs, and yet today they receive a disproportionately small amount of capital. It is notable that midsized and smaller cities today account for 77 percent of China's urban population and 64 percent of its GDP but only 54 percent of urban infrastructure investment. Central loan commitments for the west are only 3 percent of total infrastructure spending. Small and midsized cities suffer from four interlocking barriers to capital: inadequate local funds because many small cities in western and central China transfer most of their tax revenues upward, poor planning and execution skills, risk aversion among local banks, and the blurred role of infrastructure providers. On the last of these four barriers, 70 percent of water supply companies in the west are losing money because they are required to subsidize consumers, whereas a foreign water plant entrant would want to make returns of up to 9 percent.

Exhibit 3.4.12

Shifting the funding mix could cut the long-term cost of capital and help develop China's debt markets



Note: Numbers may not sum due to rounding.
* Given 2-2.5 percent discount from bonds on bank loans, a cost of equity in China of 9 percent, and interest rate derived from the McKinsey Global Institute China All City model.
** Assuming a funding mix with 28 percent from bonds; i.e., a similar mix as in standard international infrastructure projects.
Source: China Government Securities (www.chinabond.com.cn); McKinsey Global Institute analysis

Equity dominates China's urban infrastructure spending today, accounting for two-thirds of funding, with loans making up the other one-third. Bonds barely make a contribution. However, it would potentially be feasible to change this mix to a more or less even split between equity, loans, and bonds—and thereby cut the cost of capital by between 1 and 2 percent. To achieve this shift, China could embrace higher gearing in high-quality projects, particularly in the east; encourage the development of securitization products for projects of comparatively low risk; and give even greater support to the west to help small and midsized cities overcome the gaps they otherwise face in funding the development of their urban infrastructure. The pace and extent to which infrastructure companies turn to debt financing will be a key driver of the development of China's bond markets and of the ability of China to finance its infrastructure. To avoid "crowding out," China's debt market would have to reach the global average share of financial stock. China could make a number of practical moves in the medium term to encourage the development of this market including enlarging the base of bond issuers, allowing the market to set interest rates, allowing a role for riskier bonds, and attracting more institutional investors. China could also speed up the approvals process, develop an effective system to evaluate and rate credit, clarify today's fragmented regulatory structure, and establish a clearer legal framework.

5. Implications for intercity transport

Freight volumes in urban China will more than quadruple from 20 billion tonnes a year in 2005 to between 80 billion and 90 billion tonnes per annum in 2025. In the four different urbanization scenarios, distributed growth would result in the highest freight volumes at 89 billion tonnes, some 14 percent higher than under townization at 79 billion tonnes.

The volume of freight correlates closely with GDP growth. While we expect urban GDP to increase at a rate of between 8 and 10 percent a year, we project that freight volumes will expand by between 7 and 8 percent per annum. Aggregate forecasts of GDP and freight volumes in the different scenarios mask substantial structural differences between cities in different geographies and with varied economic profiles. These variations to some extent determine the precise relationship between freight volumes and GDP.

We classify China's cities into five major categories: eastern/southern seaports, northern seaports, eastern nonseaports, inland heavy industry, and western inland. Shifts in volumes among these five different types of cities in the various urbanization scenarios could produce dramatically different prospects for the logistics industry. For instance, the difference in 2025 freight volumes in eastern seaports between a townization and supercities scenario would be some 10 billion tonnes a year—half of total freight volumes of 20 billion tonnes in 2005 or five times the total cargo carried by all of China's trains in the same year.

If we assume that, for each city category, the current split between different modes of transport remains the same, the differences in freight volumes in the four urbanization scenarios could, in turn, lead to large variations in the absolute amount of freight within modes of transportation at the national level. For instance, we could see waterborne traffic hit volumes of 10.5 billion tonnes in a supercities scenario, some 2.5 billion tonnes or nearly one-third more than under townization.

The number of cities that will need to build connections to China's national highway network will also vary in different scenarios. Based on current planning definitions, for instance, townization could mean that an additional 170 to 190 cities will need to build 6,000 kilometers of extra road connections among them.

The amount of investment needed to support expanding freight volumes will also differ among scenarios. We looked extensively at the Yangtze River Delta (we cannot apply our findings across China because the data is not available). We found that this cluster of cities alone would need investment in waterborne transport, road, and rail of some 4 trillion renminbi under a supercities scenario, more than 50 percent more than they would require under townization.

Exhibit 3.5.1

We divide China's cities into five categories in terms of their generation of freight

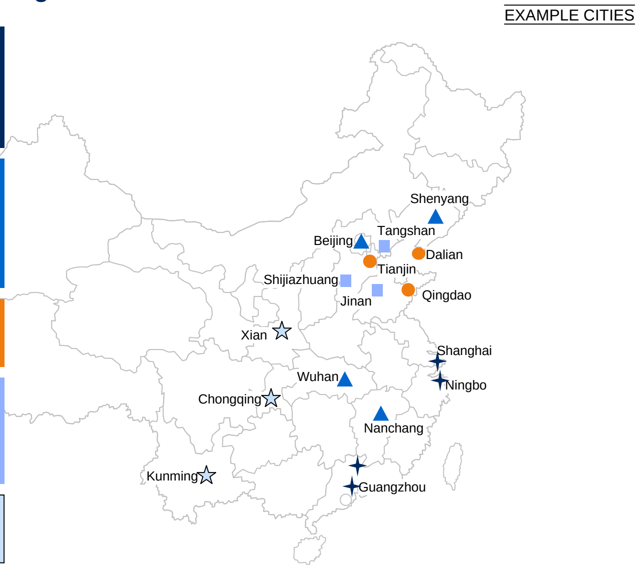
Eastern/southern seaports
Cities with—or very close to—seaports in eastern, southern, and southern central regions

Eastern nonseaports
Cities in provinces with a coastline but without a seaport, or situated one or two provinces back from the coast

Northern seaports
Seaport cities in the northern region

Inland heavy industry
Inland cities with a significant part of output in heavy goods or commodities

Western inland
Cities in provinces further inland

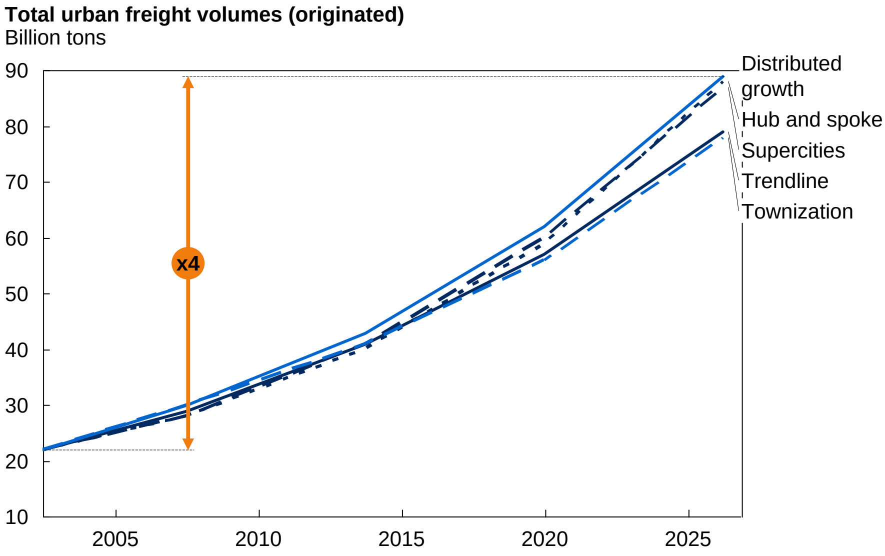


Source: National Bureau of Statistics; city yearbooks; McKinsey Global Institute analysis

In comparing patterns of freight generation among China's cities, it becomes clear there are five distinct categories of urban centers. These are primarily geographical, but they also split across functional lines—for instance, the presence or absence of a port or type of industry. Each category displays a very strong correlation between GDP and tonnes of freight originated, and we have used this relationship to compile our projections of future freight patterns. It is interesting to observe that the relationship between freight and total GDP is stronger than that between freight and industrial GDP in all five categories. This indicates that cargo volumes are not tied exclusively to local manufacturing industry but relate more strongly to the total local economy.

Exhibit 3.5.2

MGI expects freight volumes to rise between three and four times in different scenarios



Source: McKinsey Global Institute analysis

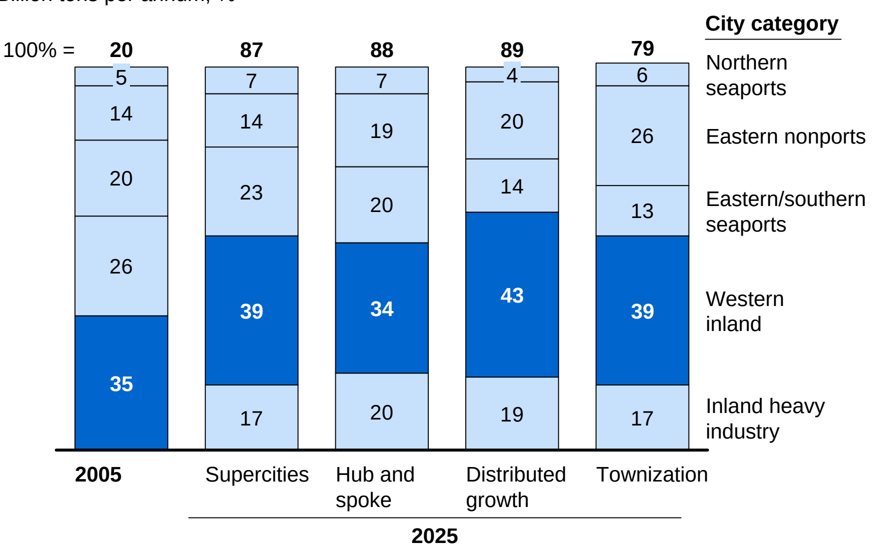
By 2025, total cargo volumes in China will have increased by between three and four times their level in 2005 with annual growth in volumes of between 7 and 8 percent. This will boost volumes from 22 billion tonnes in 2005 to between 79 billion tonnes and 89 billion tonnes in 2025.[38] Dramatic GDP growth in cities in all urbanization scenarios will drive cargo volumes, but there will be variations in pattern in different urbanization shapes. In a supercities scenario, eastern and southern seaports would see GDP grow nine times to 23 trillion renminbi compared with a quadrupling of GDP in these cities under a townization scenario. Nonport eastern cities in a townization scenario would see GDP increase six times between 2005 and 2025. Overall, cargo volumes could be highest in a distributed growth scenario, driven by relatively high shares of GDP in manufacturing-intensive western cities.

38 This calculation aggregates city-level data and estimates those cities that are missing data.

Exhibit 3.5.3

The increase in freight volumes will reflect a strong shift westward

Freight volumes and composition by originating city
Billion tons per annum, %

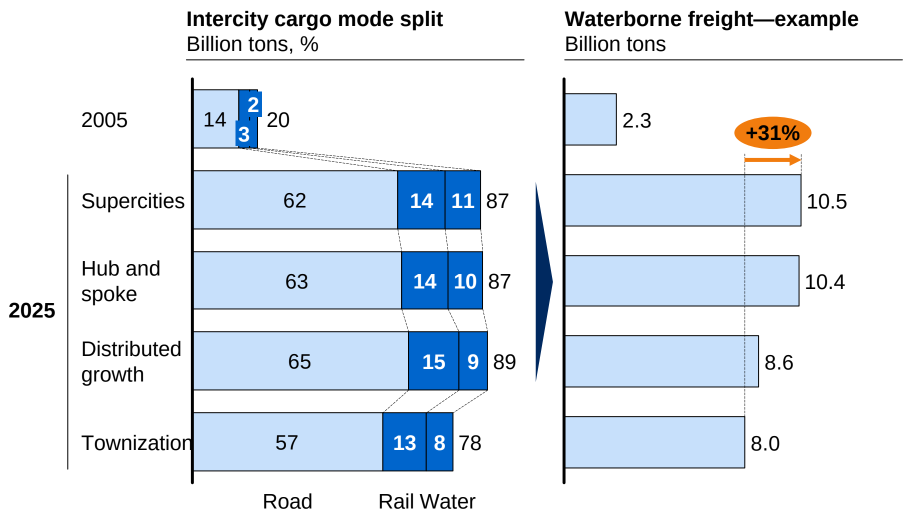


Note: Numbers may not sum due to rounding.
Source: National Bureau of Statistics; McKinsey Global Institute analysis

Freight volumes will expand robustly throughout China, but western inland cities will come to dominate freight generation in all urbanization scenarios. For other groups of cities, freight volume patterns will vary across scenarios. For instance, eastern and southern seaports would see double the throughput of freight in a supercities scenario than under townization. This is largely due to the fact that this group would include supercity ports such as Shanghai and Shenzhen or cities such as Guangzhou and Nanjing that are close enough to ports to count as such. In townization, many new cities would emerge in inland eastern areas (where counties are today more developed), generating significant growth in freight volume. Under all scenarios a clutch of “logistic megahubs” (to be distinguished from ordinary cluster “hubs”) will develop and originate more than one billion tonnes of freight per annum. There are no such megahubs today, but there could be six such hubs by 2025 under townization and up to 22 in a hub-and-spoke scenario.

Exhibit 3.5.4

Townization would result in the least freight, but differences in specific modes could be highly pronounced



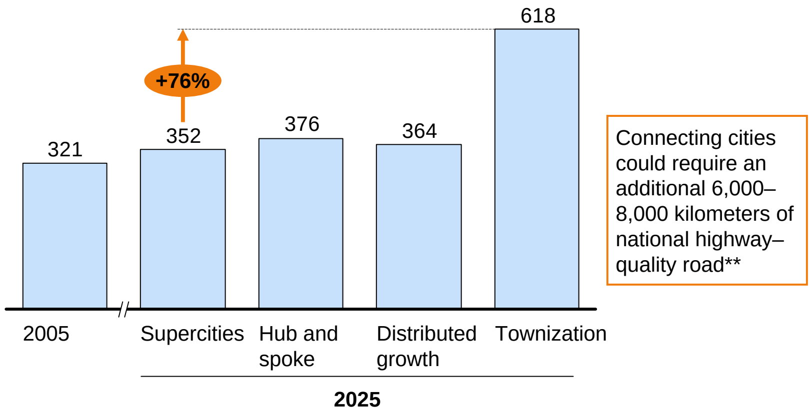
Note: Numbers may not sum due to rounding.
Source: National Bureau of Statistics; McKinsey Global Institute analysis

Structural shifts between different categories of cities could imply shifts between modes of freight transportation of several billion tonnes, and the various urbanization scenarios could mean large variations in water freight. We did not examine the drivers of modal shares at the city level but analyzed future trends under different urbanization scenarios assuming these shares remained the same. At the national level, variations in these shares will not be overwhelming, but differences in volumes under the four urbanization scenarios (and in various categories of cities within each scenario) could be dramatic. For example, waterborne freight would be 31 percent higher under a supercities scenario than under townization—a difference equivalent to 2.5 billion tonnes a year.

Exhibit 3.5.5

More than 600 cities could need highway access in a townization scenario

Number of cities that need connection to the highway network in 2025, by scenario*



* Based on projected urban population in 2025.
** Assuming an average of 69 kilometers per city connected (average of planned highway network to be built from 2005 to 2010).
Source: National Bureau of Statistics; McKinsey Global Institute analysis

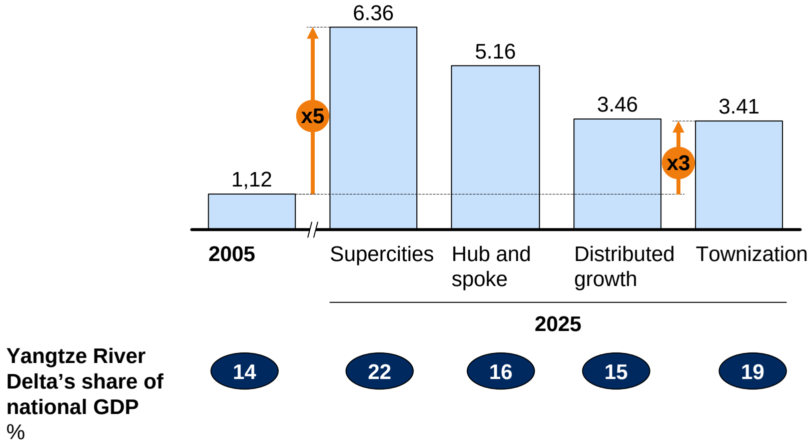
In a townization scenario, many more cities would meet central government's planning criteria to be linked to the national highway network. The criteria are based on politics (e.g., provincial capitals, cities within 800 kilometers of Beijing, famous tourist cities), logistical networks (whether or not cities have been designated as "junctions"), and size (all cities above 500,000 people and 75 percent of those above 200,000 will be connected).The number of qualifying cities would nearly double from 352 in a supercities scenario to 618 in townization. We estimate that nearly all of these new cities would be within 50 kilometers of established cities and the majority within 25 kilometers of existing urban centers. Our conservative estimate is that, in a townization scenario, cities would need to build an additional 6,000 to 8,000 kilometers of national highway–quality road by 2025. There would likely be significant additional infrastructure for other transportation modes as well.

Exhibit 3.5.6

Cargo originated from the Yangtze River Delta will at least triple

Yangtze River Delta's generated cargo in 2025
Billion tons

EXAMPLE



Source: McKinsey Global Institute analysis

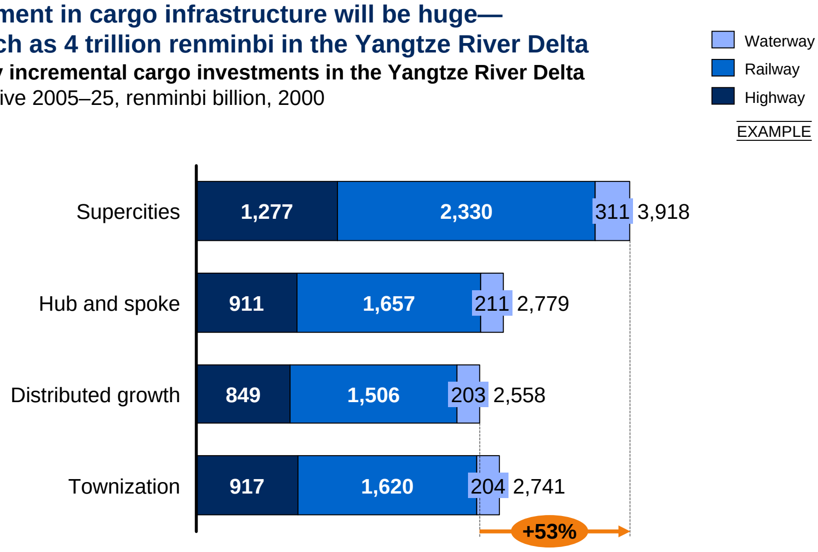
National origin-destination statistics are not publicly available in China. We therefore opted to conduct an illustrative analysis of the Yangtze River Delta (YRD) region for which we do have significant data. This region comprising Shanghai, Jiangsu, and Zhejiang is already a major source of China's GDP, and this will continue under all scenarios. Under supercities, YRD's GDP would rise seven times between 2005 and 2025 and its share of China's urban GDP would jump from 14 to 22 percent, driven by the location in the delta of three supercities. Robust GDP growth would, in turn, increase traffic flowing through the YRD from just over 1 billion tonnes per annum today to between 5 billion tonnes and 6 billion tonnes in concentrated growth scenarios and some 3.5 billion in distributed growth scenarios.

Exhibit 3.5.7

Investment in cargo infrastructure will be huge—as much as 4 trillion renminbi in the Yangtze River Delta

Intercity incremental cargo investments in the Yangtze River Delta

Cumulative 2005–25, renminbi billion, 2000



Source: National Bureau of Statistics; China City Statistical Yearbook 2006; McKinsey Global Institute analysis

Dramatic growth in freight volumes passing through the cities of the YRD (and other fast-developing areas) will require substantial investment in railways and roads to channel in traffic from outside, distribute within the delta region, and then ship outward. We estimate that capital outlays in the YRD will range from 2.5 trillion renminbi to 4 trillion renminbi, with by far the largest amount required in a supercities scenario. This reflects not only the fact that GDP in a supercities pattern of urbanization would be higher but also the fact that two of the supercities would be slightly inland. In comparison, the delta's investment needs in a townization scenario would be half of those under supercities. Because the YRD is in some ways an archetypal city cluster, and will display strong cluster characteristics under all scenarios, the high share of rail investment needed can be taken as an indication that the hub-and-spoke scenario in general would give rise to unprecedented logistic, and in particular rail, investment across China.

6. Implications for arable land

China is one of the largest countries in the world by land mass, but its endowment of arable land ranks near the bottom of the global league in per capita terms, and available arable land is shrinking as cities grow. Since 1979, rapid urbanization has eaten away 10 percent of China's arable land, and the total remaining area is getting very close to the government-mandated minimum of total arable land for 2010, effectively leaving only 0.1 hectares available to each person.

China's rapidly growing cities will continue to erode the amount of arable land available to the country over the next 20 years. If historical trends were to continue, some 15 percent, or almost 20 million hectares, of the land currently available for arable use would be lost.

However, we should put the scale of the reduction of available arable land into context. Similar rates of loss occurred in other industrializing countries in Asia during comparable periods of urban development. For example, when South Korea moved from an urbanization rate of 35 to 57 percent between 1965 and 1980, the country lost 17 percent of its land, and this trajectory has continued with little deceleration in the subsequent decades.

Our research finds that the shape of China's urbanization could be critical in determining how much arable land is lost. A model of urbanization concentrated in larger cities could reduce land loss to only between 7 and 8 percent of the current total, whereas a more dispersed pattern of urbanization would result in losses of more than 20 percent.

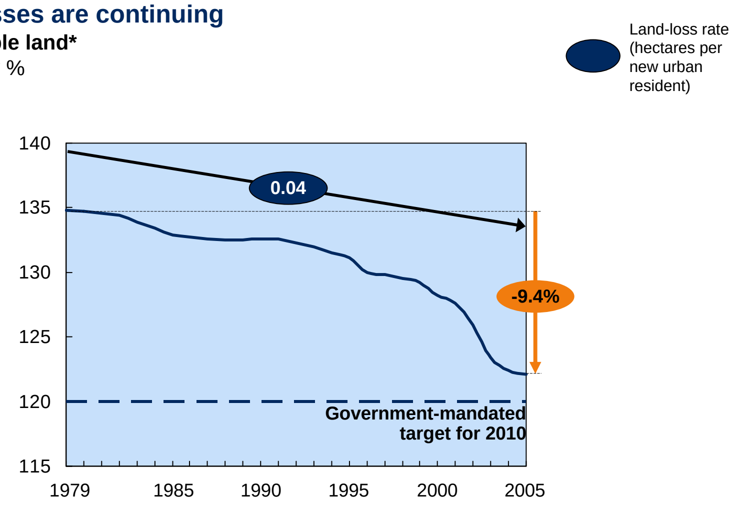
In the context of concerns in China about food self-sufficiency, gains in yields should stabilize production whichever urbanization model plays out, although it remains the case that concentrated urbanization would be less sensitive to climatic and land-quality changes. Our research finds that China could substantially mitigate the impact on food production of arable land attrition through even a moderate increase in yields to a level commensurate with peer countries and, indeed, its own history. In the process, China could ensure a stable food supply in future years, assuming stable climatic conditions and steady land quality. Mechanization is potentially a key lever to support continued increases in yields, but China would have to strike a balance between the likely negative impact of this on rural employment (over and above the effects of migration) and food security.

All the findings presented in this chapter could substantially change if the land reform announced in October 2008 is fully enacted (as of February 2009, China had not unveiled detailed plans for implementation). With this reform, China will grant farmers official land-use right certificates for the first time and the right to lease their contracted farmland to other parties, incentivizing in turn plot consolidation, mechanization and accelerated migration to urban areas. This has the potential to create a completely new landscape for rural China. In particular, the average farm size (hitherto proportionally small) could more than double in the next two decades. Larger, consolidated farms would allow increased mechanization, and encourage farmers to shift to higher-value crops. Higher productivity would boost rural incomes and contribute to China's ability to achieve food self-sufficiency.

Exhibit 3.6.1

China has sustained heavy arable land losses since 1979—and these losses are continuing

China total arable land*
Million hectare,** %



* 1996 saw the first systematic survey of arable land in China.
** 1 hectare = 10,000 m^2 = 0.01 km^2.
Source: China Land and Resources Almanac; Global Insight; McKinsey Global Institute analysis

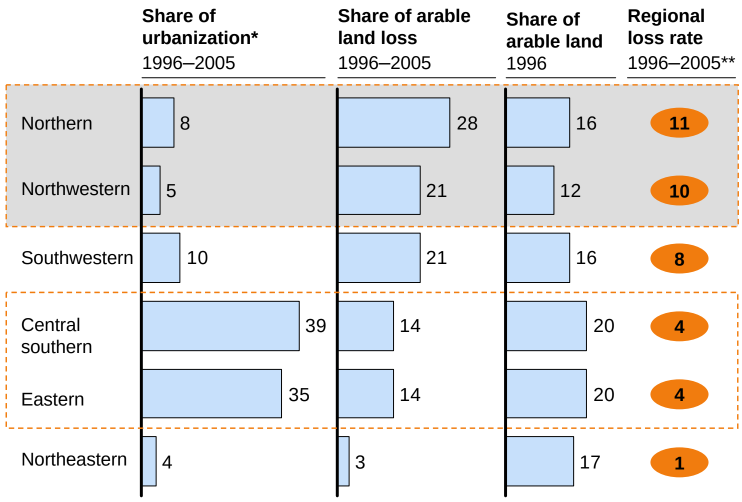
While China ranks 11th in the world in terms of its total arable land—land cultivated for crops such as wheat, maize, corn, and rice—it ranks close to the bottom of the world's rankings in per capita terms, in 175th position. As China has urbanized, the country has been losing land at a remarkably steady rate of some 0.04 hectares per new urban resident. China's arable land per capita peaked in 1965 at 0.19 hectare, but this had fallen to 0.1 hectare by 2003. Since 1979, China has lost more than 9 percent of its available arable land mostly due to urbanization and is now very close to the government-mandated national minimum for 2010. There is now widespread public concern both about the displacement of farmers as cities grow and about whether rapid urbanization will severely compromise China's self-sufficiency in food in future years. It is important to note that the trend that we observe in China of losing a substantial amount of arable land due to urbanization is not unique. South Korea had a similar experience, which the country tackled by increasing yields, shifting out of cereals, and opening up to trade.

Exhibit 3.6.2

Each province has experienced different rates of arable land loss with the highest attrition in the North

Regional share of arable land and arable land loss

%



* Total urban residents in region as a proportion of total urban residents in China.

** National land-loss rate from 1996 to 2005 was 6.1 percent.

Source: Ministry of Land and Resources; National Bureau of Statistics; McKinsey Global Institute analysis

The rate at which the country is losing arable land varies between regions—for reasons that appear to be intrinsic to those different areas. China's northern and northwestern regions have sustained a large share of arable land loss despite a lower level of urbanization. These regions accounted for 49 percent of the land lost (partly exacerbated by loss through desertification) from 1996 to 2005 but had just 28 percent of total arable land at the start of that period and an urbanization rate of only 13 percent. By contrast, China's eastern and central southern regions appear to have urbanized efficiently with respect to arable land (partly explained by higher city population densities in these areas). The causes of this regional variation are not immediately obvious, but it is likely the greater concentration of cities in southern regions was an important factor. These regions have lost less arable land over the same period, despite having started with a higher share of China's total arable land and having experienced a higher rate of urbanization.

Exhibit 3.6.3

Government action to stem arable land loss has had some success, but its long-term impact is not guaranteed

	Primary causes of arable land loss	Government actions to limit land loss	Outcome
1983–86	• Industrialization of towns and villages • Sharp increase in housing development on farmland	• China State Council announced executive order to "strengthen land management" • Passed "PRC National Land Resource Management Law" in 1986	• Paused rapid arable land loss in 1986 • Loss resumed 10 years later as development continued
1999–2003	• Rapid establishment of development zones across the country	• China State Council announced emergency decree to "tighten land management and land development" – Elevated land-development approval from local to provincial level – Established land-development quota	• Significantly slowed land loss • Local governments and businesses had difficulty in obtaining land allocation for development • Pressures beginning to show—some local governments rely on land sales for income

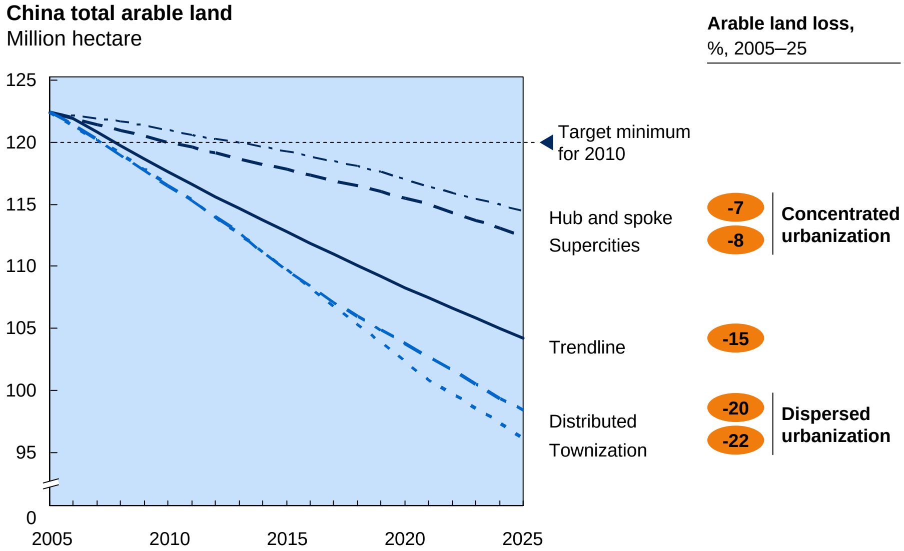
Source: Literature search; McKinsey Global Institute analysis

China's central government has enacted legislation to counter the loss of arable land since 1983 when the first towns and villages began industrializing. This action managed to halt land attrition in 1986—but only temporarily. China's regulatory approach then stepped up a gear between 1999 and 2003 when the government was rapidly establishing new development zones. Again, this succeeded in slowing the erosion of arable land significantly—but cities' hunger for land has appeared to continue. Recently, the government's main tool to limit the loss of arable land to urbanization has been through restrictions on cities' conversion of land for development. Some city governments have been relying on land sales to finance urbanization, and new restrictions may intensify budgetary pressures in such cities. The central government has clearly attempted to address this issue head-on also in October 2008 with the new land-use reform policy: this reform will likely stem the acquisition of arable land, since official "land certificates" granted to farmers will make it more difficult for city governments to take their land. But it remains to be seen whether central government will be able to enforce new limits on land acquisition, given the importance to cities of this lever of urbanization, and whether, in the long term, action to protect arable land will prove sustainable given the strong momentum of urbanization.

Exhibit 3.6.4

Concentrated urbanization would contain the loss of arable land more effectively

China total arable land
Million hectare



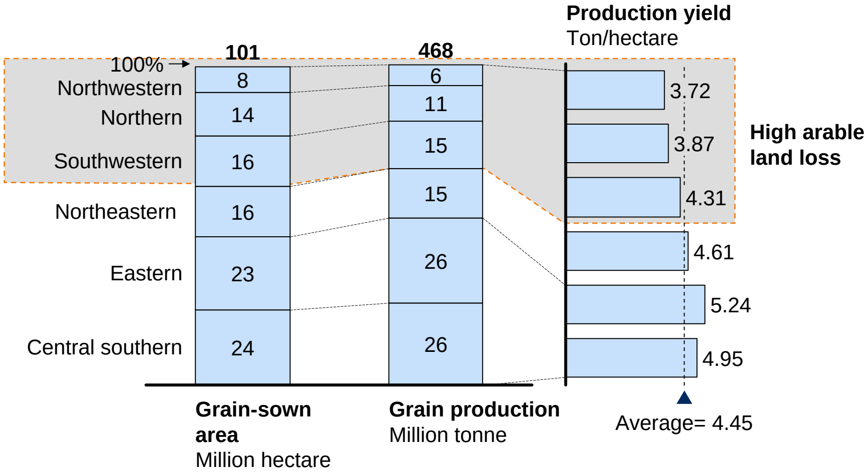
Source: China Agricultural Yearbook 2006; China State Council; McKinsey Global Institute analysis

Different urbanization scenarios matter for how much arable land China loses. The largest loss of arable land would be most likely to occur in MGI's dispersed urbanization scenarios—distributed growth and townization—at 20 and 22 percent, respectively, by 2025 compared with 2005 levels. A loss of arable land to this degree would likely have a serious impact on food production, and China would cross the government's arable land red line well before 2010. In contrast, in concentrated urbanization scenarios—hub and spoke and supercities—attrition rates would likely be more modest at about 7 and 8 percent, respectively. Under concentrated urbanization, China would cross its red line later and would contain overall land loss to more manageable levels

Exhibit 3.6.5

Arable land will be lost mainly in regions that account for limited food production

2005

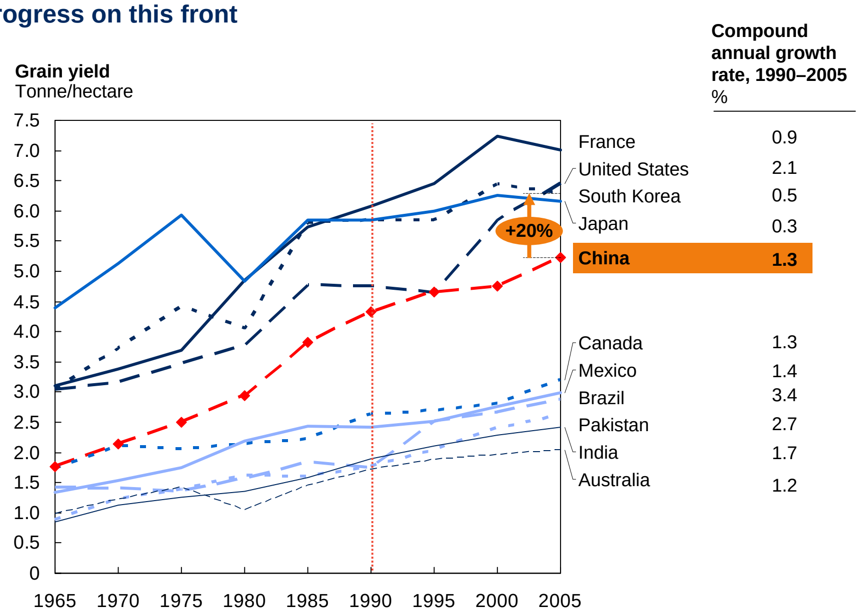


Note: Numbers may not sum due to rounding.
Source: National Bureau of Statistics; McKinsey Global Institute analysis

The good news for China's long-term food security is that those regions that will see the least erosion of arable land—eastern and central southern—are also the most productive, accounting for more than 50 percent of China's total production of grains. The exception to this relatively benign pattern is China's northern region, which will account for a very high 28 percent of China's total arable land loss to 2025. The greatest loss of available land will tend to occur in less densely populated regions, which expand horizontally rather than vertically. Fortunately, these regions happen to be the least productive. For instance, western China (northwestern and southwestern) accounts for 28 percent of the country's arable land but only 24 percent of grain-sown land and just 21 percent of its agricultural production.

Exhibit 3.6.6

Yields have improved, but there is an opportunity to make even further progress on this front



Source: Food and Agriculture Organization Statistics Division; McKinsey Global Institute analysis

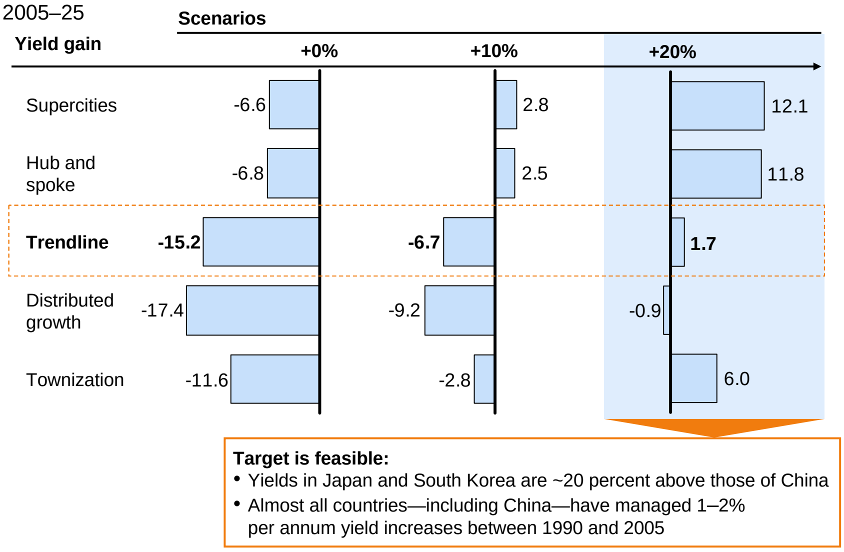
Grain production, which has far lower yields than fruit and vegetable production, dominates China's total sown area. Since 1970, grain yields have approximately doubled.[39] Between 1990 and 2005, yields increased at a compound annual rate of 1.3 percent a year, far outstripping the 0.5 and 0.3 percent growth rates of South Korea and Japan, respectively, over the same period. However, because yields in these two countries were higher at an earlier stage, China still has some way to go before its yields catch up. For example, there was still a 20 percent gap in the yield rates between China and South Korea in 2005. China has a number of levers at its disposal to continue increasing grain yields. For instance, there is significant potential from boosting crop resistance to disease through selective breeding and/or genetic modification (while preserving nutritional value). Given the high existing use of fertilizer and pesticides, there is limited scope to push yields through increasing their utilization. The land reform announced in October 2008 would likely provide a major boost to yields increase: increased plot sizes would provide farmers with incentives to invest in machinery and irrigation, and also shift to higher-value crops such as vegetables, maize, and fruit. As a result of larger farms, we estimate that China's cereal yields could rise by as much 40 percent by 2025.

39 Our definition of grains includes the entire food group—e.g., rice, wheat, corn.

Exhibit 3.6.7

Gains in yield could compensate for the gap in food supply resulting from arable land loss

Change in grain production
%, 2005–25



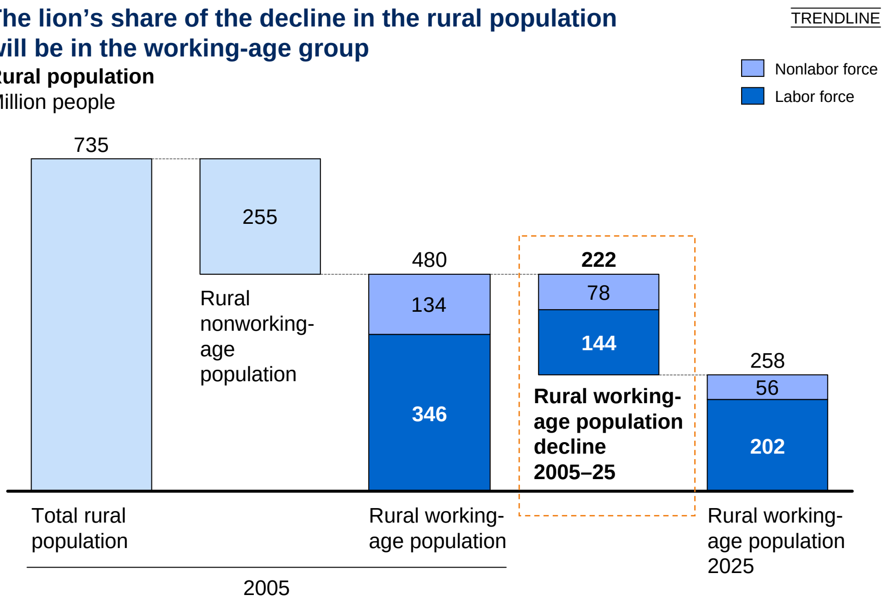
Source: Food and Agriculture Organization; McKinsey Global Institute analysis

Although a significant amount of arable land will be lost to urbanization, China should be able to maintain grain production at 2005 levels – and beyond, if the new land reform will be fully implemented. This is partly because the greatest attrition will be in less productive regions and, more important, because yields should continue to rise at the current pace. Of course, different urbanization scenarios have extremely varied implications for grain production. For instance, in supercities and hub-and-spoke patterns, a modest gain in yields of 10 percent over the next 20 years would result in a 3 to 4 percent increase in overall production compared with today's levels. However, yield increases of 10 percent would not be sufficient to counteract the loss of arable land projected in distributed growth and townization scenarios, implying a potential net loss in overall grain production. A cumulative 20 percent increase in yields over the next two decades—which is well below historical rates of improvement and consistent with China's potential—would more than offset the loss of arable land in all scenarios. In supercities and hub-and-spoke scenarios, the net gain in grain production would be more than 10 percent.

Exhibit 3.6.8

The lion's share of the decline in the rural population will be in the working-age group

Rural population
Million people

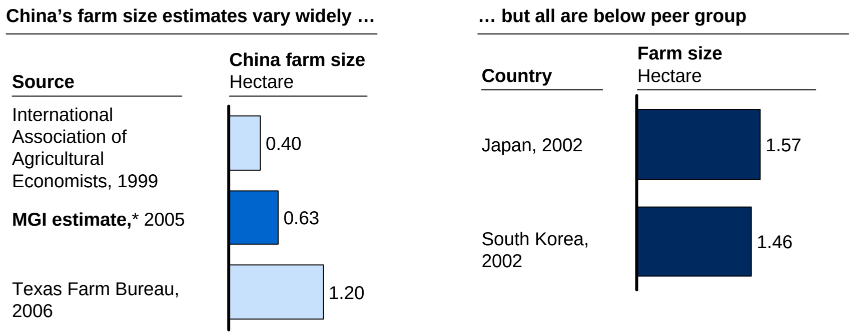


Source: Global Insight; UN Population Division; China Statistical Yearbook 2006; McKinsey Global Institute analysis

China's rural population is likely to fall steeply over the next 20 years, whichever form of urbanization plays out. The largest decline would come in a distributed growth scenario with a drop of 240 million from 735 million today to 495 million in 2025. Supercities would produce the lowest—although still substantial—decline in rural population of 210 million, to 525 million. In all scenarios, the lion's share of the fall will come from among the working-age population, which we expect in our trendline forecasts to decline from 480 million in 2005 to 258 million in 2025. The rural labor force will decline even more steeply to 202 million by 2025, increasing the dependency ratio in rural areas—already high at 1.13 dependent to every worker—to 1.42–1.61. Counteracting this, rural workers will be left with more land with which to support dependents. Nationwide arable land per capita will drop at an annual rate of some 1.2 percent, but the arable land available per rural worker should rise by an average of almost 2 percent per annum.

Exhibit 3.6.9

China's farm sizes would need to grow substantially to enable mechanization and further yield gains

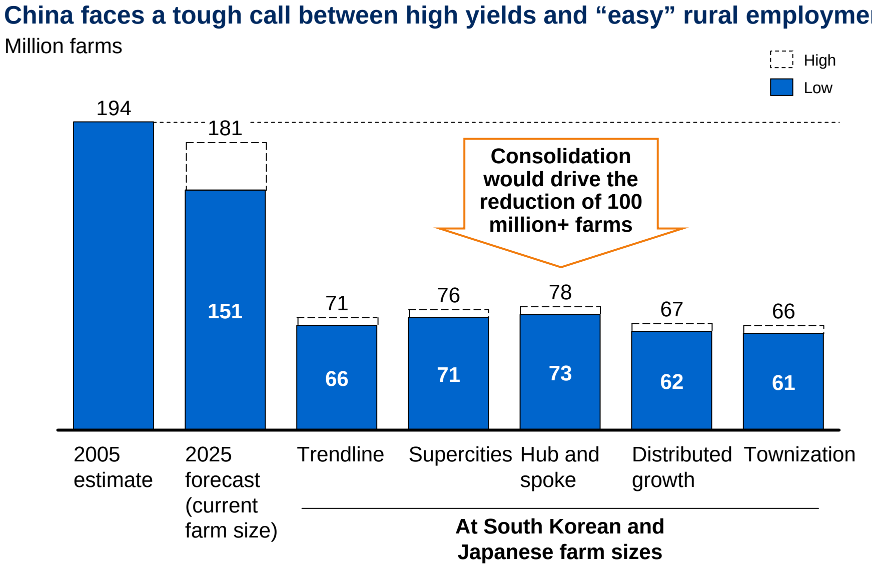


* 1.3 billion x 56 percent agricultural population ÷ 4 people per agricultural household = 199 million agricultural households; 122 million hectares ÷ 199 million households = 0.63 hectares.
Source: International Association of Agricultural Economists; IndiaStat; Food and Agriculture Organization supplement to the World Census of Agriculture; Korean Ministry of Agriculture and Forestry; expert interviews; literature search; McKinsey Global Institute analysis

Prospects for increasing agricultural yields would change a great deal if rural China were to embrace mechanization. Estimates of the average size of Chinese farms vary widely from 0.40 hectare to 1.20 hectare. Our estimate lies in between at some 0.63 hectare. This is much smaller than the average in any other large country. By 2025, available land per worker is forecast to rise by almost 50 percent, but increases in farm size should be far more limited. In line with the current trends, we expect mainly working-age members of rural households to migrate toward the cities, leaving the rest of the family taking care of the rural plot.[40] The average farm in Japan and in South Korea is between two and three times the current Chinese size, at 1.57 hectares and 1.46 hectares, respectively. In order to reach the average size of farms in South Korea, China would have to reduce the number of its farms from our projection of between 150 million and 180 million farms to only 65 million to 80 million. If China achieved this consolidation over the next 20 years, the scale would be unprecedented and could pave the way to substantial yield gains generated by mechanization.

40 This trend is bound to change if the October 2008 land reform is fully enacted, leading to more families leasing their plots and migrating to cities.

Exhibit 3.6.10

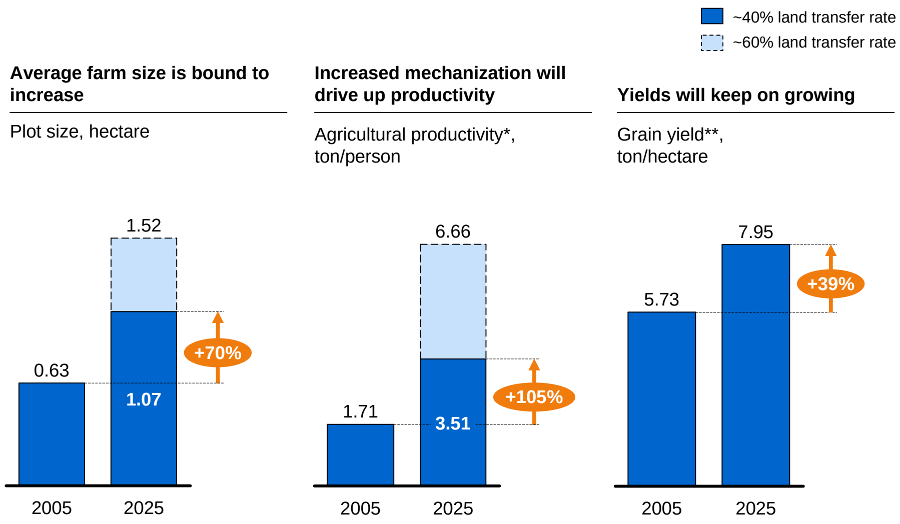


Source: International Association of Agricultural Economists; IndiaStat; Food and Agriculture Organization supplement to the World Census of Agriculture; Korean Ministry of Agriculture and Forestry; expert interviews; literature search; McKinsey Global Institute analysis

If China were to cut the equivalent of 100 million farms in the next 20 years, there would be a significant impact on rural employment (above and beyond our projection of a decline in the rural labor force due to mass migration as China urbanizes). The number of workers per average farm would increase from only 2.2 today to between 3.2 and 4.6. The implication is that each remaining farm would have to absorb an additional one to two workers compared with 2005. Yet it is hard to envisage farms being able to support extra laborers given that mechanization should make farms less labor-intensive. China clearly faces a difficult trade-off between increasing yields—and thereby stabilizing supply—and the likelihood of a significant increase in unemployment and social instability in the countryside. China could manage such a trade-off by finding alternative sources of rural employment, but such an effort will present a severe challenge. In the period to 2025 and probably beyond, the net effect will be a continued strong flow of displaced migrants from the countryside to China's growing cities, creating additional strains for the urban areas.

Exhibit 3.6.11

The new Land reform will generate higher productivity and yields



* Includes farmers and their dependents, not solely the agricultural workforce
** Ton/ hectare per year, including rice, wheat, corn, sorghum, millet, bean, potato
Source: McKinsey Global Institute analysis

On October 12, 2008, in an effort to accelerate economic development in China's rural areas, the government enacted a landmark rural land-use reform policy that, for the first time, grants farmers official land-use rights certificates and the right to lease their contracted farmland to other parties without approval from the village collectives. Previously, land was collectively owned, and farmers only held usage rights to the plots they cultivated for the limited period of 30 years. Under the new policy, land-use rights could extend to 70 years or more.

Details concerning the pace and geographic location of the reform's roll-out, and whether or not the government will impose quotas on the issuance of land ownership certificates, are still unknown at this time. However, if the implementation of this reform is managed well, it could have a significant positive economic impact on the countryside, as well as on China's economy as a whole. The policy could help the Chinese government achieve its two main objectives of rural reform: revitalizing the rural economy and guaranteeing food self-sufficiency for the nation. With formal legal titles to their land and the right to consolidate their plots, farmers will be more likely to make long-term investments in their land in order to maximize food production and boost their incomes. Farmers who decide to lease out their land could receive a steady cash income that could enable them to move to the city and join the urban workforce. Those who decide to remain on their land will have the opportunity to boost their income by increasing productivity and crop yields.

The new land reform will likely slow the acquisition of arable land, since official "land certificates" granted to farmers will make it more difficult for city governments to appropriate their land. While the implementation of this reform will help to stem the loss of arable land, however, substantial land resources will still be required for the infrastructure projects the government is planning as part of its recently announced 4 trillion renminbi economic stimulus package. As a result, we believe that by 2025, the amount of arable land will in any case drop below the government's 120 million-hectare threshold for food self-sufficiency, although this reform will help to offset reductions in food production through higher productivity from the consolidation of plots and the mechanization of agricultural production.

Larger average farm size: This new land-use reform will likely encourage the consolidation of farms into bigger plots. Depending on how aggressively the government implements this reform, the land transfer rate could be between 40 and 60 percent by 2025[41], resulting in average plot sizes that are between 70 and 140 percent larger than current ones.

Enhanced productivity: Data from Taiwan and Korea confirm a positive correlation between plot size and productivity: larger plot sizes require fewer workers per hectare, and thus produce more output per worker. Due to larger average farm sizes and greater mechanization, agricultural productivity in China could expand by between one to three times that of today's levels by 2025.

Increased yields: Some experts in China believe that the potential increase in grain output per hectare will be marginal, since China's small-scale farms already boast relatively high yields. In 2005, China's total cereal yield was 5.23 tonnes per hectare—a modest amount, but comparable to other developing countries. However, increased plot sizes would provide farmers with incentives to invest in machinery and irrigation, and encourage them to shift to higher-value crops such as vegetables, maize, and fruit. For several years preceding the enactment of this reform, several villages in China have tested the effects of such investments. Villages in Anhui province and in the areas surrounding the city of Chengdu in Sichuan province saw an immediate jump in cereal yields

41 We assumed that average transfer rates could range from as high as 60 percent, such as in the pilot village of Xiaogang in Anhui province, to as low as 40 percent, such as in the Wenjiang area of Chengdu city.

of 15 to 20 percent due to increased investment in machinery and irrigation, as well as a shift to higher-value crops such as maize.

As a result of larger farms, we estimate that China's cereal yields will rise by almost 40 percent by 2025. As technology further improves yields, we believe that China can assure enough food production for its population. Increased plot sizes would also make controls on food quality and security more cost efficient.

7. Implications for urban energy demand

China's urban energy demand will more than double in all four urbanization scenarios between 2005 and 2025, increasing from 60 quadrillion British thermal units (QBTUs) to about 140 QBTUs. This large increase in energy demand comes as a fivefold increase in urban GDP more than compensates for a fall in urban China's energy intensity across residential, services, industrial, and agricultural end-use sectors.[42] Our analysis finds that energy intensity will decline by between 50 percent and 60 percent to 2025. A supercities urbanization scenario would have the highest energy efficiency, and distributed growth the lowest.

In terms of urban China's fuel mix, there will be a substantial national shift toward renewables in the power sector, as targeted in the 11th Five-Year Plan[43] and reinforced by the China Energy Bureau in 2008 announcements. Nonrenewables used for power generation, mainly coal, will significantly drop compared with today's figures in all scenarios, with the largest decline in coal use seen in a supercities scenario. In transport, on the other hand, urban China's demand for oil will increase from 6.9 million barrels per day in 2005 to 13.6 million barrels per day in 2025, accounting for up to one-quarter of additional global oil demand in this period. Oil demand variation between different urbanization scenarios (11 percent), represents a difference between scenarios that equates to more than total demand for oil in the United Kingdom today.

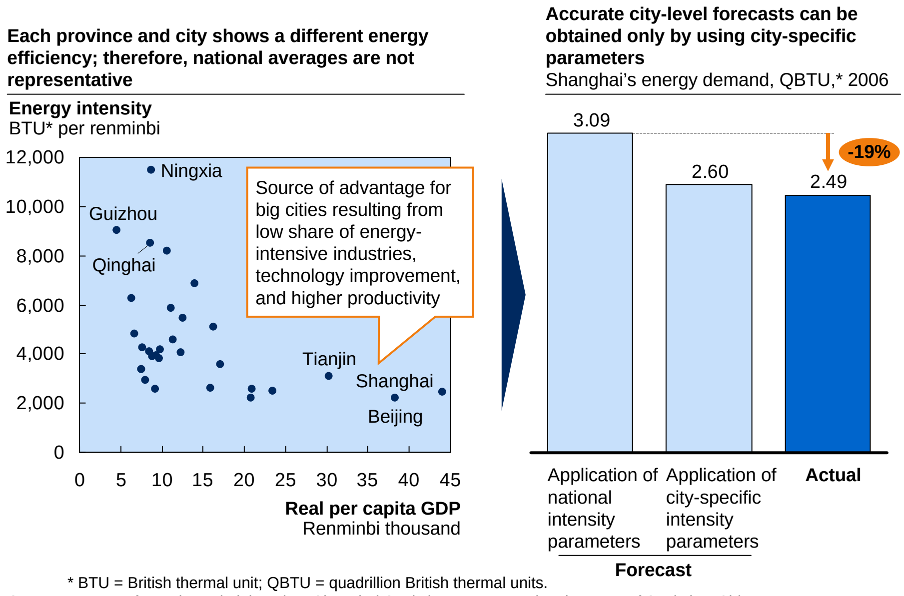
A drive to raise energy productivity (the level of benefits we achieve from the energy we consume), combined with smart urban planning, could cut urban energy demand in 2025 by more than 20 percent compared to forecasts in trendline and in all scenarios. For instance, the enforcement and wider deployment of building standards could save three QBTUs of 2025 energy demand; accelerating the adoption of compact fluorescent lighting (CFL) or other energy-saving lighting devices could produce further savings of more than three QBTUs; promoting increased urban density could deliver a cut of up to four QBTUs in transport energy demand; and an even more aggressive build-out of efficient power capacity could save another two QBTUs.

42 For a full analysis of China's future energy demand growth, please see Leapfrogging to higher energy productivity, McKinsey Global Institute, July 2007 (www.mckinsey.com/mgi).

43 The National Development and Reform Commission put further detail on these targets. See Mid- and long-term development plan for renewable and nuclear energy, National Development and Reform Commission, September 2007.

Exhibit 3.7.1

City-specific efficiencies drive energy demand at the city level



* BTU = British thermal unit; QBTU = quadrillion British thermal units.

Source: Energy Information Administration; Shanghai Statistics Bureau; National Bureau of Statistics; China Energy Statistical Yearbook; McKinsey Global Institute analysis

We based our projections of energy demand growth in urban China on MGI's Global Energy Demand Model, principally using energy-intensity data and forecasts, and extending MGI's demand projections beyond 2020 to 2025 using International Energy Agency (IEA) figures.[44] We matched national- and sector-level energy intensities to city-level drivers such as GDP growth and floor space, and we adjusted national intensities to take account of higher efficiencies in more developed cities. We found that energy intensity will fall in cities of varying sizes and that the absolute gap between the levels of intensity in different-sized cities will narrow. We then projected overall energy-intensity improvements onto fuel intensities and aggregated the results to evaluate the dynamic for urban China as a whole, under each scenario.

We estimated future fuel mix from current patterns of urban fuel intensity and adjusted these over time to account for national improvements in energy efficiency, in such a way that energy fuel mix will change according to GDP growth and GDP structure changes. We also considered a very large increase in

44 World energy outlook 2006, International Energy Agency.

renewable energy sources—as per current policy targets[45]—with conventional energy fuel share derived from total demand forecast less renewables.[46]

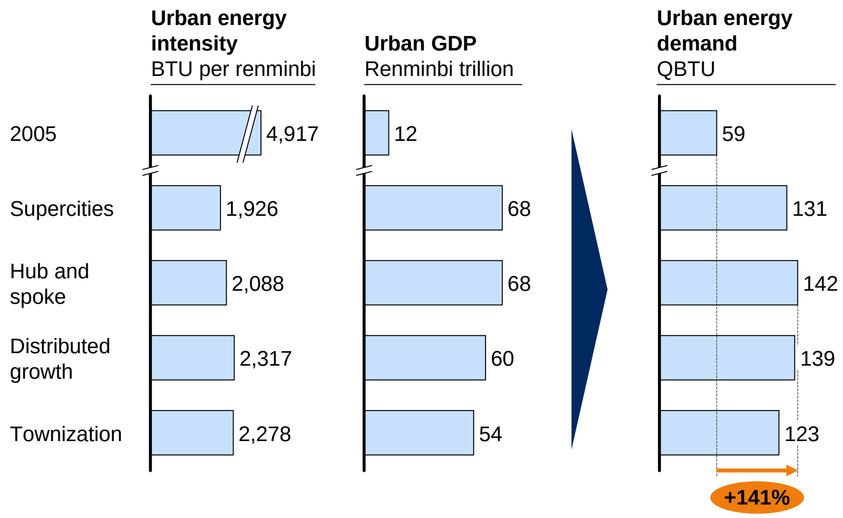
Our fuel mix forecast therefore reflects regional characteristics of fuel use, intensity trends at the national level, and the latest official government targets on renewables.

45 Based on the general target expressed in the 11th Five-Year Plan; *Mid- and long-term development plan for renewable and nuclear energy*, National Development and Reform Commission, September 2007; and specific targets on nuclear and wind generation expressed by the China Energy Bureau in March 2008.

46 Specifically, we first split China's national renewable target across the different cities proportionally to their GDPs, and we used a renewable intensity number such that, under the trendline, the government target is met uniformly for every city. We then considered the 2005 sectoral nonrenewable fuel mix intensities (e.g., coal per industrial GDP) for each city and then adjusted them downward in each succeeding year using the energy-efficiency trends. We multiplied that by the city's sectoral GDPs in each year, obtaining the energy-use split for nonrenewables.

Exhibit 3.7.2

China's energy demand will more than double in all scenarios by 2025



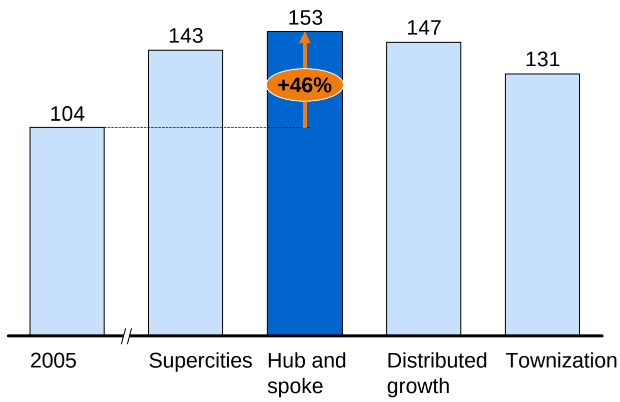
Source: McKinsey Global Institute analysis

China's energy demand will more than double in all four urbanization scenarios by 2025 (at an annual growth rate of between 3.7 and 4.4 percent) as a quintupling in urban GDP will more than compensate for a fall in urban China's energy intensity across residential, services, industrial, and agricultural end-use sectors. We see energy intensity declining by between 50 and 60 percent to 2025 as the economy shifts away from heavy industry toward higher value and the industry that remains becomes more efficient. A supercities scenario would have the highest energy efficiency as growth concentrates in more efficient megacities; distributed growth would have the lowest energy efficiency, driven by a concentration in less dense, manufacturing-intensive midsized cities. Meanwhile, national energy intensity will be lower than that of urban areas due to the much lower energy intensity of rural areas. Urban energy use will grow steadily during the period to 2025 by as much as 2.4 times in a hub-and-spoke scenario that would see demand growth accelerating toward the end of the period due to strong urban GDP and population growth, particularly in the spokes. Energy demand in hub and spoke would be 15 percent higher than under townization. In 2025, we project that urban energy demand would account for more than 85 percent of national energy demand in a townization scenario and more than 90 percent in the other scenarios.

Exhibit 3.7.3

Hub and spoke will have the highest per capita energy demand

Urban residents' energy demand per capita
MBTU* per capita, 2025

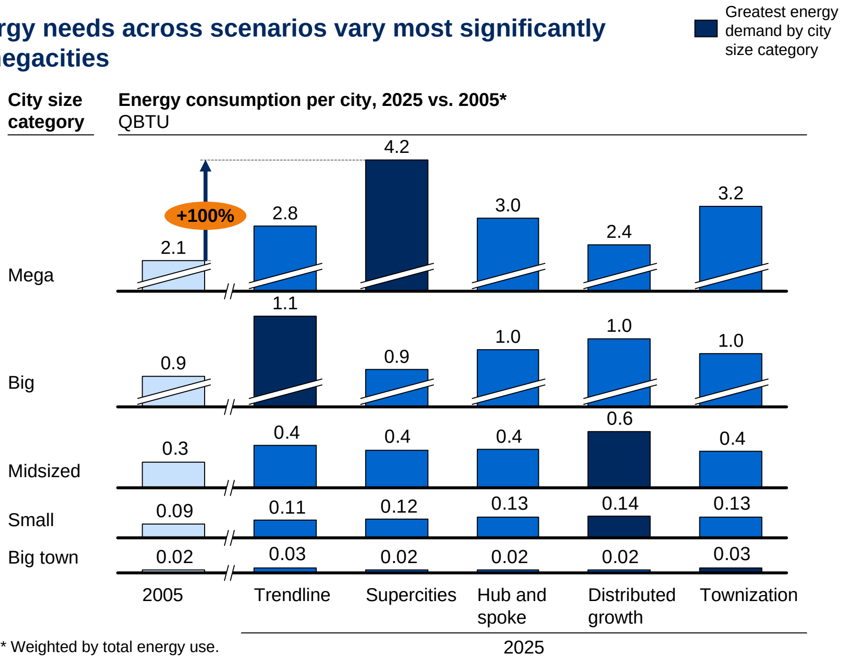


* MBTU = million British thermal units.
Source: McKinsey Global Institute analysis

In per capita terms, energy demand will increase by between 40 and 50 percent across urban China, significantly less than growth in absolute demand (between 100 and 140 percent). A hub-and-spoke scenario, which would produce almost as high a level of GDP as under supercities, would see per capita energy use being the highest of all scenarios—and up to 46 percent higher than today's level—because energy efficiency would be lower in less dense but more industrial spoke cities. A hub-and-spoke scenario would involve greater per capita space, transport usage, and other such inefficiencies compared with these metrics in a supercities scenario. Even in a hub-and-spoke scenario, however, per capita energy demand would still be 55 percent lower than in the United States and roughly equivalent to that of Europe in 2025.

Exhibit 3.7.4

Energy needs across scenarios vary most significantly in megacities



* Weighted by total energy use.
Source: McKinsey Global Institute analysis

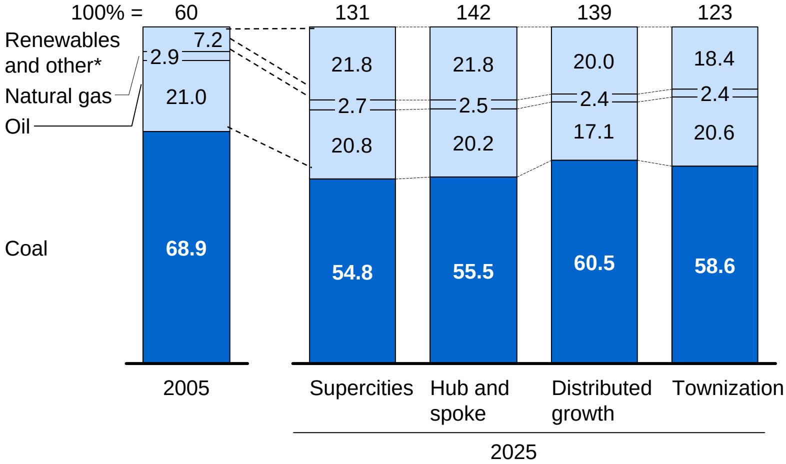
Energy demand growth would vary across scenarios, most significantly for the megacity category. These variations reflect the differences in cities' GDP and population growth under different urban shapes. In a supercities scenario, for illustration, megacities with populations of more than ten million would see energy demand double from 2.1 QBTUs in 2005 to 4.2 QBTUs in 2025, with significantly more robust growth than in other scenarios. This result is unsurprising given that this concentrated urbanization shape would favor the growth of very large cities. For midsized cities with populations of between 1.5 million and 5 million, energy demand growth would be markedly stronger in distributed growth, which would favor the expansion of cities of this size compared with other scenarios.

Exhibit 3.7.5

Under current conditions, coal would remain the dominant fuel source in China

Energy consumption by fuel type in urban China

QBTU, %



Note: Numbers may not sum due to rounding.

* Includes solar power, wind power, hydro power, biomass, and nuclear power.

Source: National Bureau of Statistics; China Energy Statistical Yearbook; China Energy Bureau; literature search; McKinsey Global Institute analysis

Coal will remain dominant in urban China's fuel mix, but its share will drop from almost 70 percent today to less than 60 percent in 2025, with the largest decline in its use seen in a supercities scenario.[47] China has abundant coal reserves and relies heavily on this energy source, but, for environmental reasons, the national government aims to reduce coal's share through aggressively expanding nuclear power, promoting renewables, building higher-efficiency coal-powered plants, and implementing "green" energy subsidies.[48] An even more aggressive rollout of renewables, already technically possible, is not to be excluded and would push the coal share in the fuel mix to even lower levels.

The national fuel mix masks significant variations. Provinces in northern China use a large amount of coal because of significant deposits in the region, while the more developed eastern seaboard provinces use a greater share of oil—although coal remains dominant. Beijing fulfils 52 percent of its energy needs from coal and 46 percent from oil (the other 2 percent coming from renewables); Taiyuan's figures are 98 percent and 2 percent (and no renewables),

47 Our analysis of fuel use assumes that the relationship between fuel-use intensities (i.e., the ratio between demand for a specific fuel and sectoral output) will not be subject to huge shifts; we have not considered major technological changes such as solar-thermal.

48 *The 11th Five-Year Plan (2006–2010)*, National Congress of People's Republic of China, October 2005.

respectively.[49] The fuel mix varies among scenarios, too. Annual per capita coal use under distributed growth would be 16 percent higher than in townization due to midsized cities' greater relative use of coal; annual per capita oil use would be 23 percent higher under hub and spoke than under distributed growth because of higher oil consumption related to the greater use of cars in wealthy spoke cities.

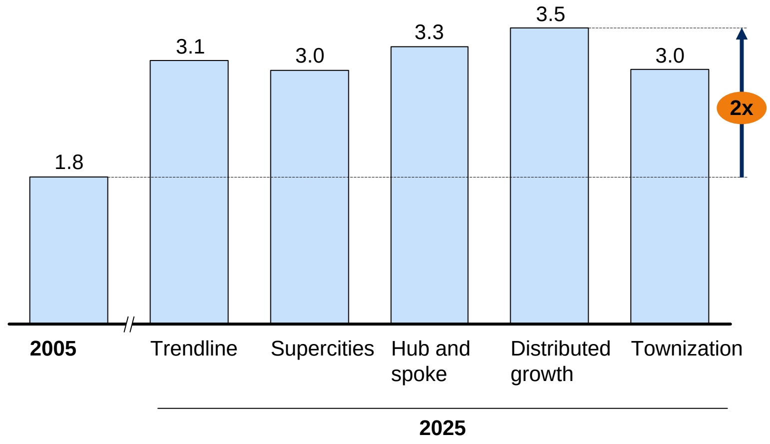
49 NBS provides data on provincial-level fuel mixes, from which we derived city-level data by adjusting for city size and industry mix.

Exhibit 3.7.6

Although reliance on coal will decline, urban China could double its coal demand to 2025

Coal requirements in urban China

Billion SCE* tonne per annum



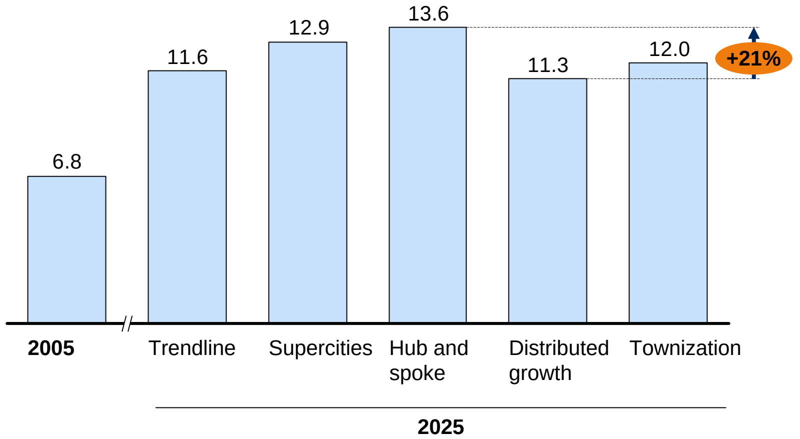
* Standard coal equivalent.
Source: McKinsey Global Institute Global Energy Demand Model; McKinsey Global Institute analysis

Urban China overall could see a near doubling in its coal demand to 2025 from 1.8 billion standard coal equivalent (SCE) tonnes in 2005 to 3.1 billion SCE tonnes in 2025 under trendline forecasts. This would account for almost half of worldwide growth in coal consumption during this period. China will use its coal to feed electricity generation. We project continuing construction of electrical power capacity on a massive scale, with the addition of between 700 Gigawatts and 900 Gigawatts between 2005 and 2025. The least capacity would be necessary in a townization scenario, and the most in distributed growth. MGI analysis shows a 20 percent variation in demand for coal among urbanization scenarios. The highest demand would be in distributed growth and the lowest under townization. The scale of variations is huge—for instance, between supercities and hub and spoke, there would be a difference of 500 million SCE tonnes a year—almost five times Germany's total coal consumption today. Higher use of gas and renewable energy as well as increased energy efficiency in megacities means that a supercities scenario would have the lowest demand for coal despite the highest GDP. We project that in this scenario only seven provinces would require more than 100 million tonnes of coal a year compared with 12 provinces under hub and spoke.

Exhibit 3.7.7

Oil demand will also grow, especially in concentrated urbanization scenarios

Oil requirements in urban China
Million barrels per day

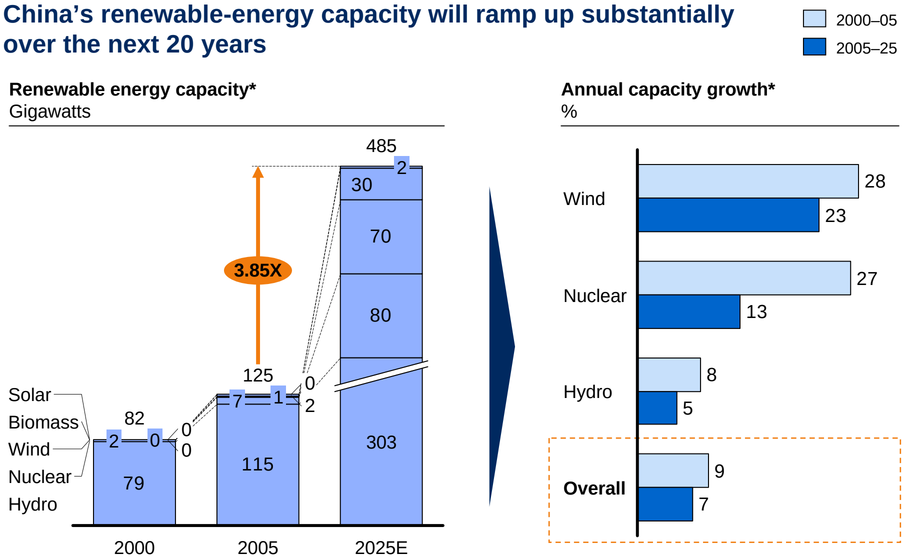


Source: McKinsey Global Institute Global Energy Demand Model; McKinsey Global Institute analysis

MGI's trendline projections show that urban China's demand for oil will increase from 6.8 million barrels per day in 2005 to up to 13.6 million barrels per day in 2025, accounting for up to one-quarter of additional global oil demand in this period. Again, oil demand varies among different urbanization scenarios by 21 percent. This is less than the variation that we would see in the case of coal—but still equivalent to substantially more than total demand for oil in the United Kingdom today. We see the highest oil requirements in a hub-and-spoke scenario, which would combine midrange energy efficiency, higher oil use, and high output, of almost 2.5 million barrels per day higher than under townization (equivalent to a supertanker per day) in 2025. In general, concentrated urbanization would have higher oil needs than dispersed growth, driven by higher wealth and therefore greater transport needs—even if density were to drive car ownership lower than would be the case at similar wealth levels in dispersed growth. In addition, the cities that would grow most strongly under these scenarios would tend to use more heating and fuel oil than cities further inland that tend to be more reliant on coal.

Exhibit 3.7.8

China's renewable-energy capacity will ramp up substantially over the next 20 years



Note: Numbers may not sum due to rounding.
* Solar and biomass not shown, because zero base in 2000 prevents comparisons.
Source: China Electric Power Yearbook; CEC; China Energy Bureau; literature search; McKinsey Global Institute analysis

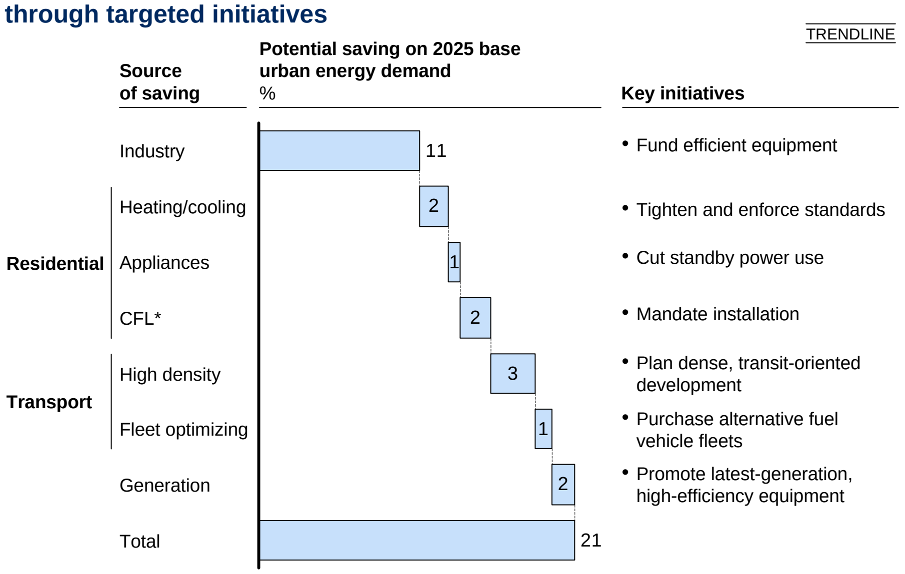
MGI expects China to continue to expand its renewable-energy capacity over the next 20 years but at a slower rate than the aggressive expansion we have seen during the past five years as future growth in line with aggressive central government targets builds on an increasingly large base. China has already demonstrated its capacity to meet challenging renewable-energy targets; therefore, in our 2025 numbers we assume that government's targets in this area will be largely met, with substantial upside potential in particular for wind and solar. In fact, according to the National Development and Reform Commission (NDRC), by the end of 2008, wind power capacity is supposed to reach 10 Gigawatts, the level that was supposed to be reached in 2015 in the original plan.

With surging oil and coal prices, renewable energy has become more price-competitive, and, with growing local know-how in renewable technology, particularly in hydro- and nuclear power, costs will likely drop further. China is already a major player in the largest categories of renewable energy, providing financial incentives for renewables plant and equipment manufacturing and prioritizing renewables in electricity purchase. The country has the highest hydropower capacity in the world, 16 percent above today's hydropower capacity in the United States.[50] China is targeting a robust building program of nuclear power capacity in partnership with leading global players including Westinghouse and Areva. Of the 35 Gigawatts of additional nuclear power capacity that China is expected to add between now and 2025, more than half (six plants with some 16 Gigawatts of capacity) is already under construction. Supercities and hub and spoke—and megacities in particular—would have the greatest share in renewables, reflecting today's situation, because the significant capital spending required (particularly for nuclear) would be more affordable, while the concentration of demand would allow for the situation of such plants closer to cities rather than relying on the grid.

50 *Key world energy statistics 2006*, International Energy Agency.

Exhibit 3.7.9

China has scope to abate urban energy demand by more than 20 percent through targeted initiatives



Note: Numbers may not sum due to rounding.
* Compact fluorescent light.
Source: *Leapfrogging to higher energy productivity in China*, McKinsey Global Institute, July 2007

Urban China has a huge opportunity to abate its energy-demand growth by boosting energy productivity—the level of output the urban economy can achieve from the energy it consumes—through aggressive "smart-growth" initiatives at the local level. MGI estimates that if urban China were to capture the full opportunity that is available—using available technologies with an internal rate of return of 10 percent or more—this would reduce urban energy demand growth from between 3.8 and 4.4 percent to between 2.4 and 3.1 percent.[51] This abatement opportunity could total around 20 percent of projected total demand in 2025 and varies modestly among scenarios. The largest source of energy productivity comes in the industrial sector, with an opportunity to cut 2025 overall energy demand by 11 percent. In power generation, urban China could cut 2025 energy demand by 2 percent by mandating the highest-efficiency plants. In the residential sector, another 5 percent could be shaved off from 2025 demand through tightening efficiency standards in heating and cooling, improving the efficiency of appliances, and reducing the intensity of lighting.

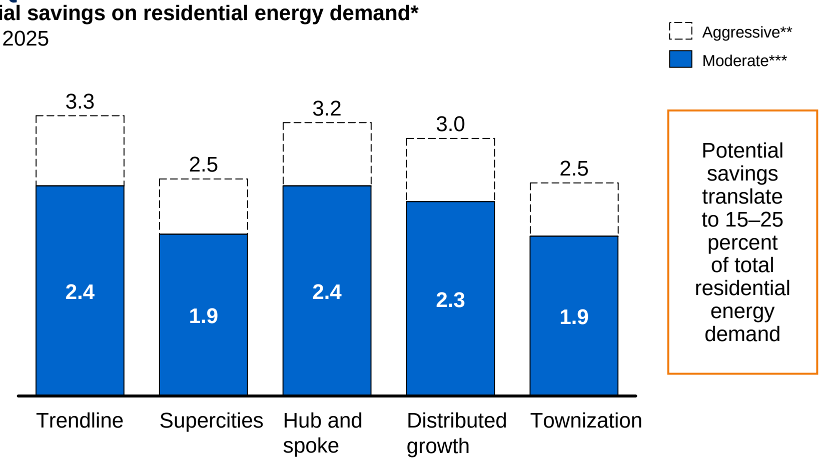
51 For a full analysis of the abatement opportunity in China nationally, please see Leapfrogging to higher energy productivity in China, McKinsey Global Institute, July 2007 (www.mckinsey.com/mgi).

Exhibit 3.7.10

Enforcement and wider deployment of building standards could save three QBTUs

Potential savings on residential energy demand*

QBTU, 2025



* Assuming universal implementation in new stock built from 2010 to 2025.

** Assuming on average 70 percent of households are converted (based on current building-shell standards).

*** Assuming on average 50 percent of households are converted from lower to higher efficiency.

Source: Yu Joe Huang, Siwei Lang, John Hogan, and Haiyan Lin, *An energy standard for residential buildings in south China*, Lawrence Berkeley National Laboratory; press search; McKinsey Global Institute analysis

China has already been defining and tightening its building standards. However, these standards lag some way behind international benchmarks, and their implementation has not been universal. China has both a regulatory and enforcement issue. Today national standards are often guidelines rather than rules.[52] Several cities have scope to further tighten their local rules on standards, and others could adopt rigorous rules in the future. Given the amount of construction that will take place in China over the next 20 years, this action is vital. MGI finds that consistent enforcement of building standards and their wider deployment could abate three QBTUs of energy demand in 2025.[53] We assume universal implementation of standards in new stock built from 2010 to 2025, an average of 70 percent of existing households convert to comply with current building-shell standards, and an average of 50 percent of households convert from lower to higher efficiency. China will need to overcome several barriers to the adoption of building standards including insufficient skilled labor, undersupply of the necessary technology, a lack of energy-efficiency awareness among consumers that leads to inertia about implementing higher efficiency, and a lack of financial incentives.

52 Joe Huang Yu, Siwei Lang, John Hogan, and Haiyan Lin, *An energy standard for residential buildings in south China*, Lawrence Berkeley National Laboratory, July 1, 2003.

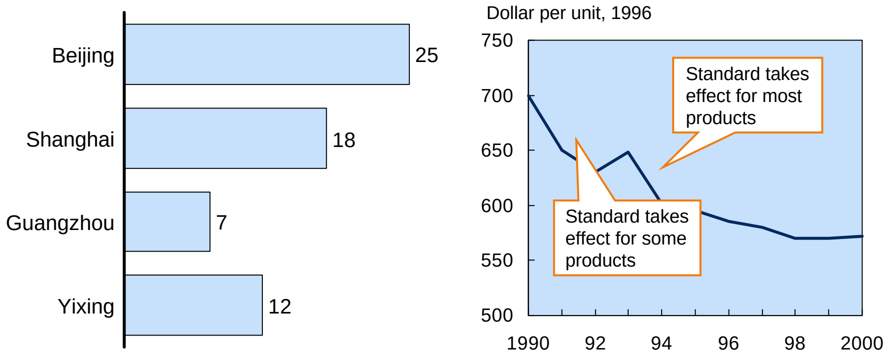
53 We take the key figures from Debbie Brockett, David Fridley, Jieming Lin, and Jiang Lin, *A tale of five cities: The China residential energy consumption survey*, proceedings of the 2002 Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Washington, DC, August 2002.

Exhibit 3.7.11

Regulatory intervention will likely be needed to achieve higher energy efficiency in every household

Because of low energy prices and high purchasing costs, energy-efficient appliances do not pay back across China …
Payback for high-efficiency air conditioning, years

… but achieving scale (for example, through regulation) can close this gap rapidly*
Effect of standards on air conditioner costs in the United States



* This reduces demand for existing, non-energy-efficient products, shifting it to energy-efficient ones. Over time, the prices of energy-efficient products fall, alongside increased scale.
Source: *Leapfrogging to higher energy productivity in China*, McKinsey Global Institute, July 2007; press search; McKinsey Global Institute analysis

Urban China could abate an additional one QBTU of energy a year with the aggressive adoption of more energy-efficient appliances, including air conditioners and refrigerators that use less power per degree cooled and the reduction of the standby power requirements of many small appliances.[54] Both through national frameworks and local regulations, China could target annual efficiency increases of close to the 4.7 percent achieved by Japan's "top-runner" program.[55] Regulatory intervention will be necessary because investment in higher efficiency in the case of many appliances has very long payback times, mainly because of the limited degree to which these appliances are used and low prevailing electricity tariffs. Evidence from other countries—notably the United States in the case of refrigerators—shows that the adoption of higher-efficiency technology, accompanied by economies of scale, quickly reduce the prices of these goods to a point at which they become an economic proposition.

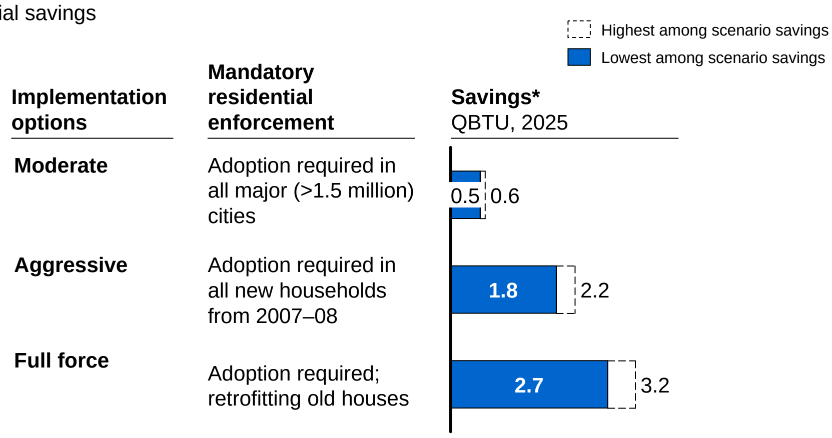
54 See, among others, Jiang Lin, *Made for China: Energy efficiency standards and labels for household appliances*, Environmental Energy Technology Division, Lawrence Berkeley National Laboratory, November 2002.

55 Takahiro Tsurusaki, Yumiko Iwafune, Yoshiaki Shibata, Chiharu Murakoshi, and Hidetoshi Nakagami, *Actual energy consumption of top-runner refrigerators in Japan*, Jyukankyo Research Institute, Inc., 2006.

Exhibit 3.7.12

Accelerating the adoption of efficient lighting devices could produce energy savings of more than three QBTUs

Potential savings



* Based on range of scenario savings.
Source: Literature search; McKinsey Global Institute analysis

China has already instituted an aggressive drive to convert to CFL that involves the setting of business standards—although these remain voluntary in residential buildings—as well as a certification system for high-quality CFL bulbs and financial support for conversion including bulk purchasing.[56] The economic case for CFL is established—these bulbs' life cycles are up to ten times those of incandescent lights, offer average electricity savings of up to 70 percent, and quickly pay back their ten times price differential. China today produces 1.7 billion CFL bulbs a year. The program has been broadly successful, but there is scope for even more aggressive measures, particularly in making residential codes mandatory. Given the high numbers of new buildings that China is constructing, such action has the potential to deliver large energy savings. MGI analysis finds that urban China could reduce its energy use by up to three QBTUs. Further, urban China could use its huge scale to accelerate the development of even higher-efficiency and safer (given concerns about mercury in CFL) light-emitting diode (LED) lighting.

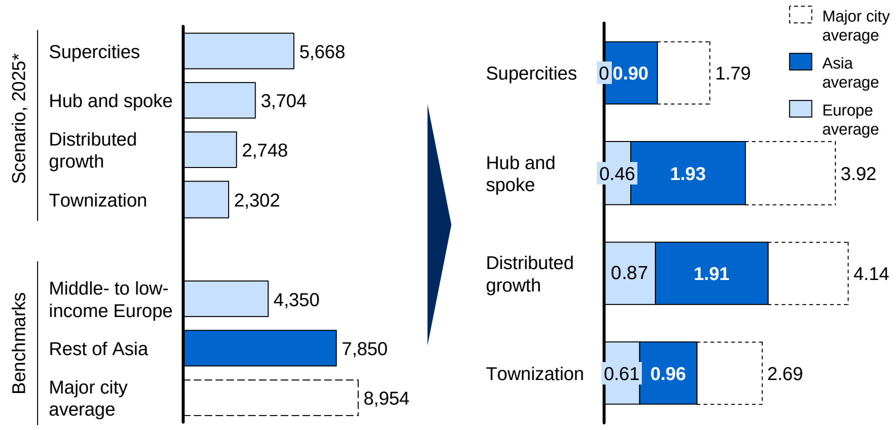
56 Nicolas Lefèvre, Philippine de T'Serclaes, and Paul Waide, *Barriers to technology diffusion: The case of compact fluorescent lamps*, Organisation for Economic Co-operation and Development and International Energy Agency, October 2006.

Exhibit 3.7.13

Dense cities could generate savings on transport energy demand of up to four QBTUs

Chinese cities have significant potential to raise density
Average density, inhabitants/km²

Potential energy savings from increased density* to benchmark levels
QBTU, 2025



* Of cities eligible for mass-transit construction (i.e., such that vehicle alternatives exist), net of increased energy demand due to rising steel production for denser construction.
Source: Literature search; McKinsey Global Institute Global Energy Demand Model; McKinsey Global Institute analysis

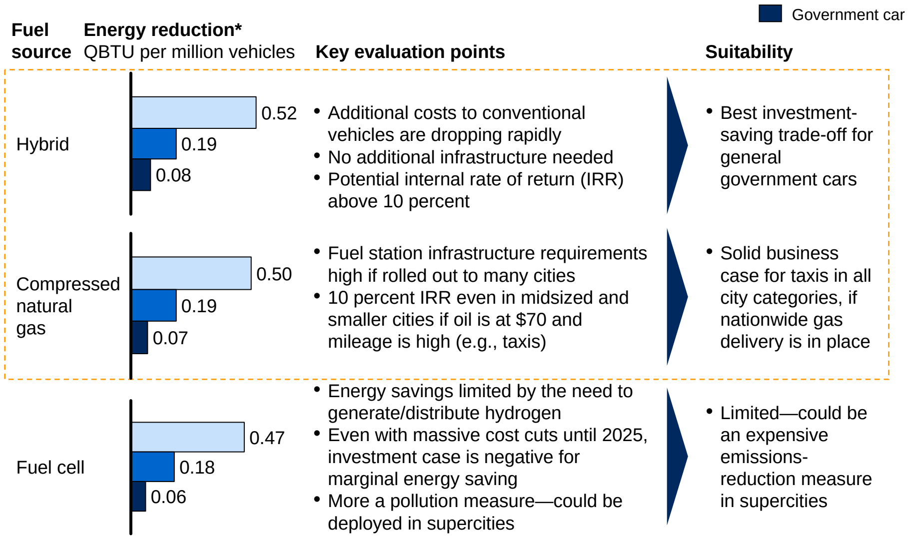
If urban China were to promote denser and transit-oriented development, it could cut four QBTUs of energy demand in the transportation end-use sector. Multiple international studies have found that petrol use varies as a function of density and that driving declines by between 20 and 30 percent for every doubling of residential density.[57] The key variables in these studies—residential density, nearby commercial areas, and good transit options, for instance—are typically highly interrelated, suggesting that density alone is not enough to deliver substantial savings but must be part of mixed-use development. In China, we find that across urbanization scenarios, the average density of the largest cities will be below other large Asian cities, and even further below the average of major global cities. There is therefore significant potential for more density delivering energy savings. The potential would be lowest in the supercities

57 See, among others, John Holtzclaw, Robert Clear, Hank Dittmar, David Goldstein, and Peter Haas, "Location efficiency: Neighborhood and socio-economic characteristics determine auto ownership and use—studies in Chicago, Los Angeles and San Francisco," *Transportation Planning and Technology*, 2002, Volume 25, No. 1, pp. 1–27; Mary Jean Bürer, David B. Goldstein, and John Holtzclaw, *Location efficiency as the missing piece of the energy puzzle: How smart growth can unlock trillion dollar consumer cost savings*, Proceedings of the 2004 Summer Study on Energy Efficiency in Buildings, American Council for an Energy Efficient Economy, Washington DC, August 2004; Robert Cervero, "Efficient urbanisation: Economic performance and the shape of the metropolis," *Urban Studies*, September 2001, Volume 38, No. 10; Amy Liu, *The benefits and realities of high density development*, Presentation at the Urban Land Institute, The Brookings Institution, Washington, DC, October 2003.

scenario, as baseline density would already be high. It is important to note that density together with smart planning would reduce vehicle ownership in China by between 10 million and 30 million cars (although the number of cars in affected cities would still grow to around 90 million even in the most aggressive case), impacting on one of China's pillar industries.

Exhibit 3.7.14

Hybrid and compressed natural gas vehicles would deliver large energy-demand reductions with solid economics



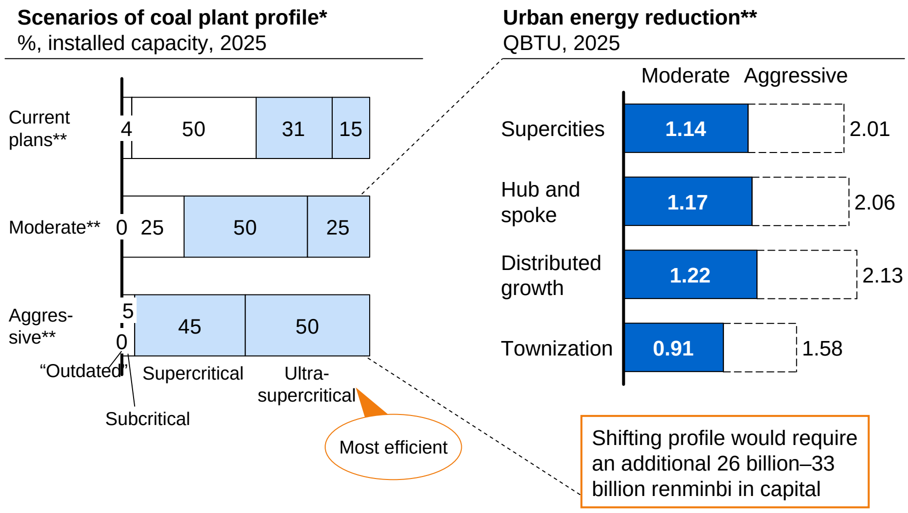
* Total energy reduction per annum in 2025, including distribution, storage, etc.
Source: *DRIVE—the future of automotive power*, McKinsey & Company, February 2006; McKinsey Global Institute analysis

City governments have the opportunity to abate energy demand through the use of alternative fuels in public fleets of buses, taxis, and official cars—as New York has done.[58] In China, MGI finds that fuel cells do not offer a solid business case in contrast to compressed natural gas (CNG). With oil at $70 a barrel (which appears to be a conservative estimate given average oil prices in the first half of 2008), hybrids pay back in less than four years, and we assume 100 percent conversion of official city fleets, whose huge expected expansion offers a substantial opportunity to abate energy demand through clean technology. An aggressive replacement program—taxis running half and half on CNG and hybrid, official fleets being converted in full to hybrid, and buses running on a mixture of fuels—would reduce urban transportation energy demand by some 1.4 QBTUs to 1.6 QBTUs by 2025, reducing peak air pollution at the same time. Some Chinese cities are already leading the way—Chengdu, for instance, is aggressively converting its fleets to CNG. These measures should be easier to implement in megacities because of their greater availability of capital and their higher operating efficiency and expertise.

58 New York has replaced city bus fleets with clean-fuel and hybrid models and has a program facilitating the finance and fueling logistics of replacement taxis running on compressed natural gas (CNG); 6,000 alternative-fuel vehicles would reduce fuel use by some 300,000 liters per annum. See C40cities.org (www.c40cities.org/bestpractices).

Exhibit 3.7.15

A more aggressive build-out of energy-efficient power plants could cut urban energy demand by more than two QBTUs*



* Based on announced plans until 2020, carried forward to 2025 at steady rates of change in capacity shares.
** Assuming targeted reductions in generation and transmission losses take place.
Source: Commission for Environmental Cooperation; literature search; McKinsey Global Institute analysis

China will construct new coal-fired electricity-generation capacity on a huge scale over the next 20 years—locally owned (or influenced) generating companies will construct a large proportion of these plants to meet cities' demand. Building plants with the latest ultra-supercritical technology (with thermal efficiencies of 50 percent compared with 36 percent in standard subcritical plants) is a large opportunity with the potential to cut urban energy demand by two QBTUs or more. However, meeting such an aggressive target would more than exhaust today's global supply of the necessary equipment—some suppliers already have 29-month backlogs—and China would need to work with suppliers to ramp up capacity. Although a conversion to the new ultra-supercritical technology has its risks—the technology is proven but it has still not been widely installed globally—MGI believes that its use still provide a significant opportunity for China to use its scale to "leapfrog" older technologies, in the process not only abating energy demand but providing the demand that would potentially allow the Chinese power-equipment industry to take a leading position in this cutting-edge technology.

8. Implications for urban water

China is a water-poor country, a situation that is exacerbated by the country's water resources being unevenly distributed. Although China's available water resources are on a par with those of the United States, in per capita terms China has access to only one-quarter of the resources available to the United States. Nationally, this is not as serious a problem as commonly believed, because China's per capita use is low and growing slowly at only 3 percent a year. However, a shortage of available water resources is a severe localized problem that is set to intensify, especially in northern China.

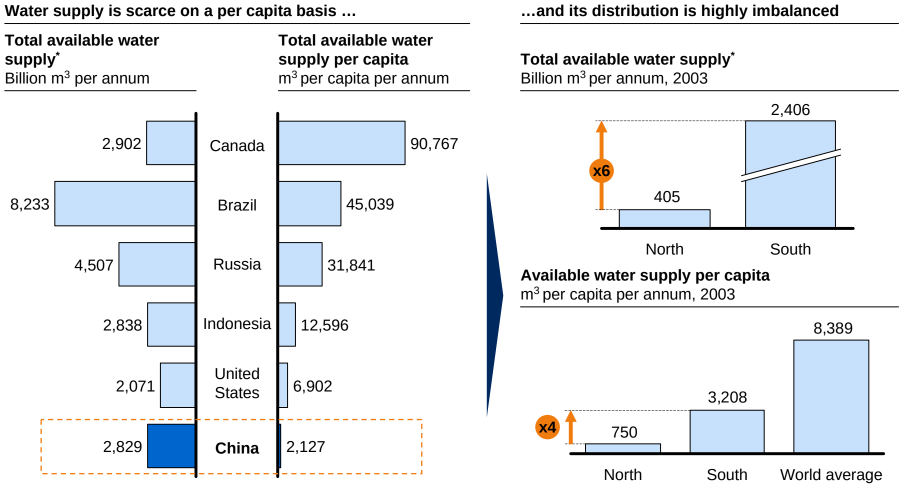
MGI's research finds that urban demand for water will increase by between 65 and 100 percent over the next 20 years as the economy grows and as urbanization continues at a rapid rate. The principal driver for this increase will be a tripling in residential water use. The shape of China's urbanization will also have a significant impact on water demand and the investment needed to satisfy this demand. In a supercities scenario, urban water demand would double by 2025 and China would have to invest an estimated 1.1 trillion renminbi in its water-supply infrastructure. In a townization scenario, urban water demand would increase by 70 percent from 2005, significantly less than under supercities. The amount China would need to spend on its urban water supply infrastructure would vary even more significantly—by 40 percent—between supercities and townization.

However, under all scenarios, China's urban water use would not amount to more than 4.1 percent of total available water resources and 21 percent of overall water usage, which would continue to be driven mainly by agriculture and increasing pressure to boost agricultural yields. The pressure point will not be matching supply and demand overall; it will be China's imbalanced geographic distribution of water resources. The challenge will be getting water to those areas that are already in water stress and where rising demand will exacerbate current scarcity. In particular, northern areas will face severe shortages despite national water-supply projects that will alleviate some of the pressure.

As a result, urban China urgently needs to become more productive in its use of water, particularly where water is relatively scarce. Regardless of the shape of urbanization, China could achieve savings of up to 40 percent of urban water demand if the country adopted targeted water-saving initiatives such as tackling today's substantial leakage in the distribution system.

Exhibit 3.8.1

China has scarce water resources that are unevenly distributed



* Available water supply is defined as renewable water, water resources that can be extracted without endangering long-term supply. Total water available is the sum of surface water and aquifer water, which exceeds the amount that can be harnessed for human use in a cost-efficient way. Based on 2003–07 average.

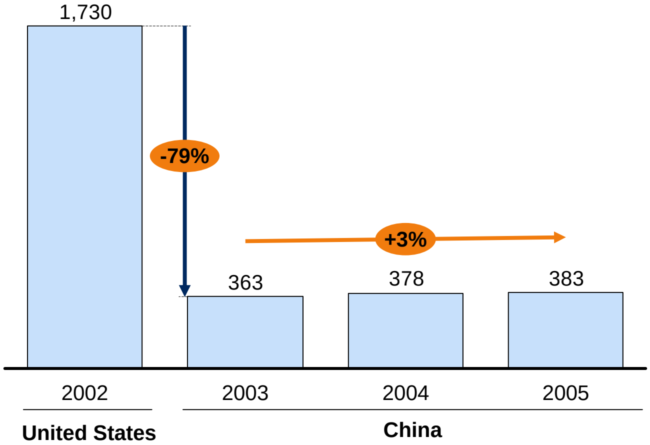
Source: Food and Agriculture Organization Aquastat; "Addressing China's growing water shortages," World Bank, 2006; McKinsey Global Institute analysis

China does not have abundant water supplies, and what resources the country has are unevenly distributed. In absolute terms, the country's annual available water supply—that is, renewable water that China can extract without compromising long-term supply—is comparable with that of the United States. However, on a per capita basis, China's available water supply is less than one-third of that in the United States. In terms of distribution, southern China has six times more available water resources than northern China. In per capita terms, the South has four times more water than the North. As a result, large parts of the North are at, or close to, the sustainable water-use level of 40 percent of available resources. With rising water demand expected to materialize as China urbanizes, we expect water stress in the North to rise. We should note that MGI's data and projections do not take into account climate change as a factor in water stress.

Exhibit 3.8.2

China's per capita water use is low and is not increasing very fast

Overall per capita water use
m^3 per capita per annum

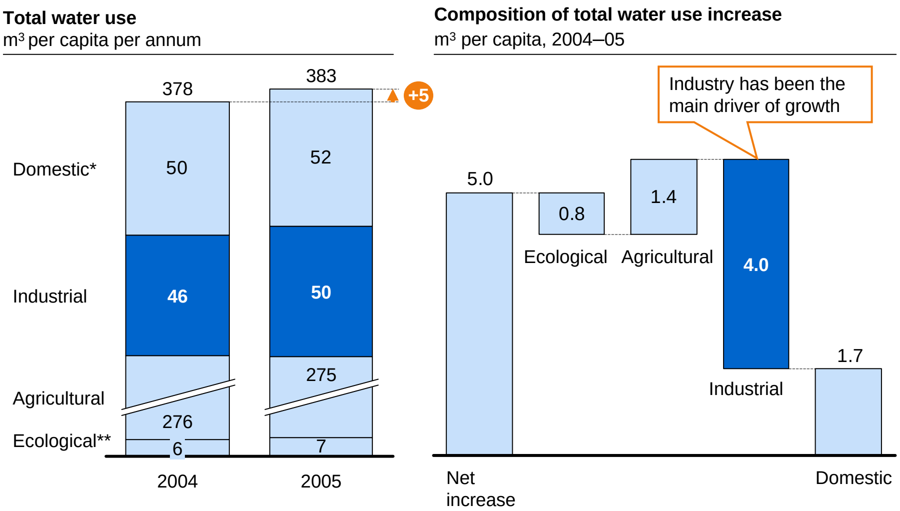


Source: OECD Factbook 2005; China Water Resources Bulletin; McKinsey Global Institute analysis

Although migration from rural areas to cities is leading to significant increases in urban residential water use, overall use is almost stable and still very low compared with other countries. For instance, between 2003 and 2005, China used an average of 375 cubic meters of water per capita per year compared with 1,730 cubic meters used in the United States in 2002. China tends not to use a great deal of water outdoors, for example to water lawns. Per capita usage has been growing slowly by only some 3 percent a year since 2003 despite urbanization and the fact that urban residents use three times more water per person per day for domestic purposes (e.g., washing) than do rural citizens. In 2005, each urban resident used 211 liters per day compared with only 68 liters a day used by each resident of rural areas. The reason why urbanization has not thus far produced accelerating national water usage is that urban water usage still accounts for a very small share of overall consumption, which remains currently dominated by agriculture. However, with continued urbanization, cities' water use will grow and cities could become the primary source of pressure on water resources at the local level.

Exhibit 3.8.3

Agriculture is the overwhelming source of water use, but industry has been driving recent growth



Note: Numbers may not sum due to rounding.
* Domestic water use equals residential water use plus service water use.
** Used in green spaces, forests, etc.
Source: China Water Resources Bulletin; McKinsey Global Institute analysis

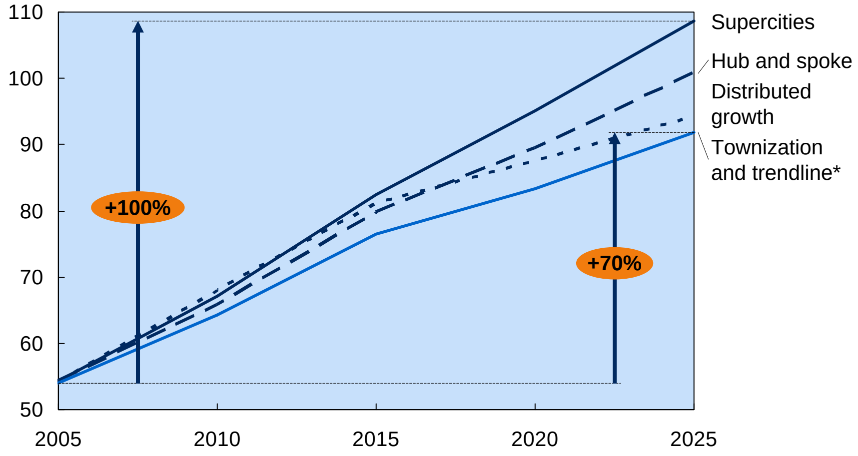
In 2005, agriculture accounted for more than 70 percent of total demand for water, while industry and residential consumers each accounted for 13 percent. However, as China continues to industrialize and urbanize, industrial and residential usage is rising. Industry, in particular, has been driving growth in water demand, accounting for two-thirds of the rise in demand in recent years. In urban areas, industrial and residential users account for 76 percent of all water usage with services accounting for 14 percent. This breakdown clearly points to demand for water rising substantially as China's cities continue on their rapid growth trajectory—although the precise rate at which demand expands will also depend on how efficiently China uses its water resources.

Exhibit 3.8.4

Urban water demand will soar under all scenarios, doubling in the case of supercities

Total urban water demand under different scenarios

Billion m^3



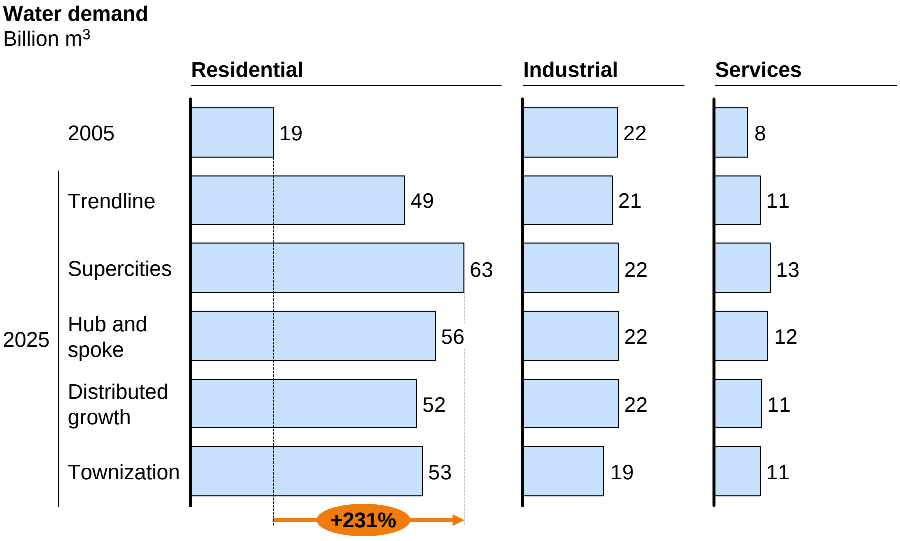
* Trendline roughly matches the townization scenario; the small difference in water demand is accounted for by the slightly lower urban population under the trendline scenario.

Source: China Water Resources Bulletin; China Urban Construction Statistical Yearbook; McKinsey Global Institute analysis

Our research estimates that overall urban water demand will increase very substantially in all urbanization scenarios by 2025 in both absolute and per capita terms—by 70 percent in a townization scenario and 100 percent in a supercities model. Demand would rise strongly in a supercities scenario, driven principally by much higher residential consumption. Given the higher wealth we project in a supercities scenario as well the concentration of large populations in cities in more water-intensive areas, residential consumption would be more than 25 percent higher under supercities than under trendline. Higher services and industrial GDP in the supercities case would also drive up water use by these sectors. Total urban water use would rise to 109 billion cubic meters and to 119 cubic meters per capita. In a hub-and-spoke scenario, urban water use would rise to 101 billion cubic meters and to 108 cubic meters per capita. In a distributed growth pattern, the equivalent figures would be 94 billion cubic meters and 100 cubic meters. Townization would produce the lowest demand growth with total urban water use rising to 92 billion cubic meters and 98 cubic meters in per capita terms—some 16 and 17 percent lower, respectively, than in a supercities scenario. Urban water use per capita in 2005 was 88 cubic meters.¬

Exhibit 3.8.5

Residential consumption will be the main driver of growth in urban water demand in all scenarios

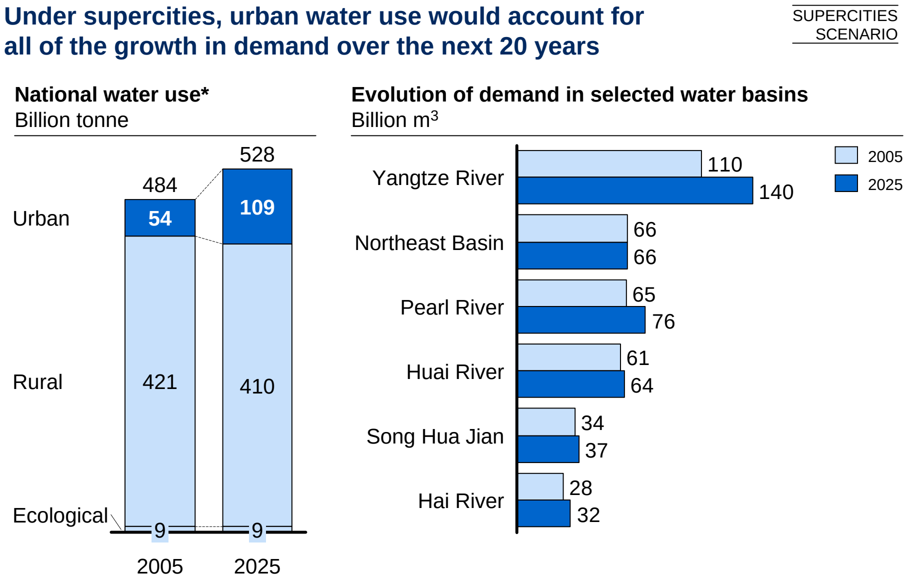


Source: China Water Resources Bulletin; China Urban Construction Statistical Yearbook; McKinsey Global Institute analysis

Residential water demand could increase by between 1.6 and 2.3 times over the next 20 years to well above 50 percent of total urban water demand. While the increase in residential demand would be strongest in the supercities scenario, demand from industry would remain broadly stable over the next 20 years. Assuming that water tariffs remain constant in real terms, improving efficiency in the use of water should offset rising industrial demand as the economy grows. From 2000 to 2005, industrial water intensity has declined at 15 percent per annum. We have therefore assumed that China will meet the government target of a 7 percent per annum improvement over the next 20 years. This would still leave China with an industrial water intensity that is more than three times higher than US intensity in 2000. If the service sector were to hit the same intensity target (lower than the 9 percent per annum being achieved today), this would leave intensity in this sector at levels comparable with South Korea in 2005 and the United States in 2000. In the case of supercities, this assumption would result in demand increasing by 67 percent from 2005 levels, whereas the townization model of urbanization would see demand rising by a more moderate 37 percent—a variation due largely to different levels of services GDP.

Exhibit 3.8.6

Under supercities, urban water use would account for all of the growth in demand over the next 20 years

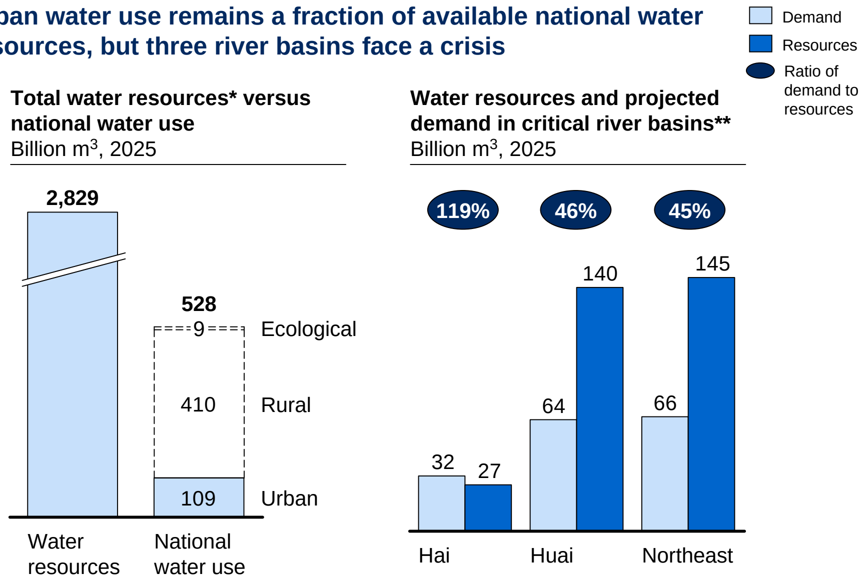


* Data are adjusted to reflect double counting of water use for power generation.
Source: China Water Resources Bulletin; McKinsey Global Institute analysis

While agriculture will remain by far the largest consumer of China's water resources, cities will dominate growth in the demand for water to 2025, accounting for all the growth in demand over the next 20 years in a supercities scenario. In this pattern of urbanization, rural consumption would fall marginally, while urban demand would grow from 11 percent of national water use to just over 20 percent. National water consumption will grow by 0.4 percent per annum from 2005 to 2025. However, there will be significant variations in regional patterns. For example, urban water use could be close to 40 percent of total use in the North under a supercities scenario. The largest overall increase in water demand would come in the urban centers along the Yangtze River.

Exhibit 3.8.7

Urban water use remains a fraction of available national water resources, but three river basins face a crisis



* Total water available is the sum of surface water and aquifer water, which exceeds the amount that can be harnessed for human use in a cost-efficient way. Based on 2003–07 average.

** Before incorporating supply from water-transfer projects.

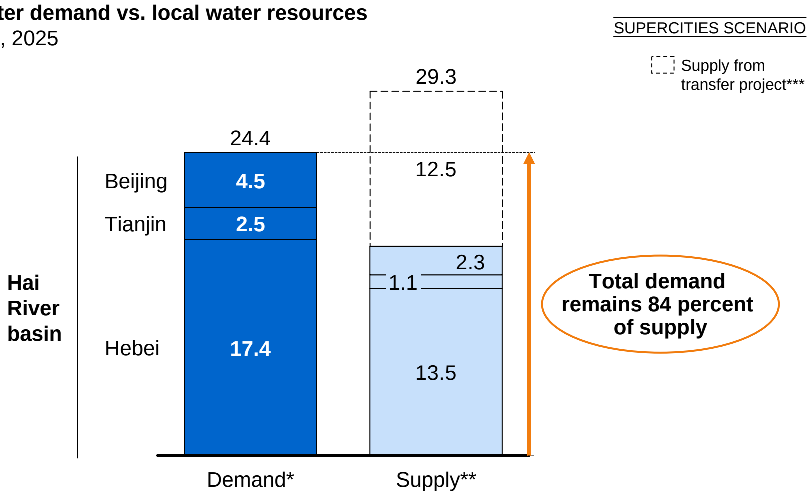
Source: China Water Resources Bulletin; McKinsey Global Institute analysis

Even in the most extreme case of supercities in which urban demand for water would double, urban demand would still represent only 4.1 percent of total national renewable supplies with agriculture remaining the dominant consumer of this resource. Nationally, water usage will not come anywhere close to matching the resources that China has available. This is not to say that some regions of China will not experience water stress. We project that three out of ten river basins in the country—the Hai, Huai, and Northeast basins—will face severe water shortages with total demand exceeding the sustainable threshold of 40 percent of available supply. The Hai River basin is critical. Even with current water-transfer projects that are boosting supply, this river basin will not keep pace with demand in any scenario.

Exhibit 3.8.8

Transfer projects will ease northern water shortage, but total demand will remain unsustainable

Total water demand vs. local water resources
Billion m^3, 2025



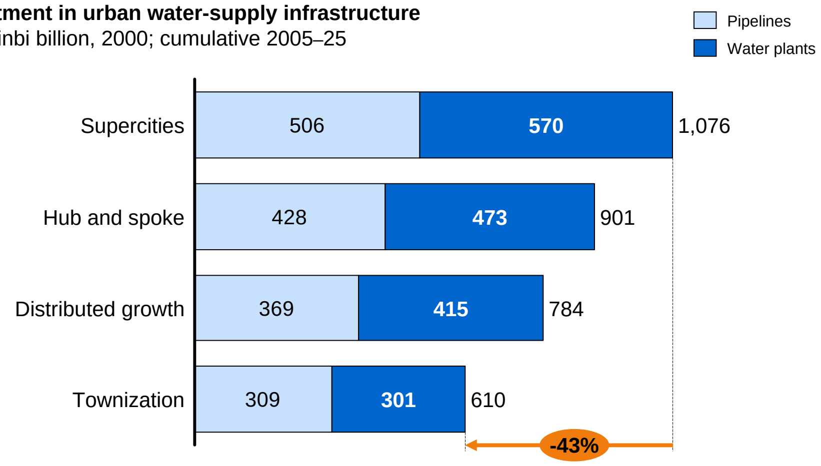
Note: Numbers may not sum due to rounding.
* Water demand is estimated using the sum of agricultural water use and urban water use.
** We use 2005 data for local water resources.
*** Assumes that the east and middle route of the transfer project will be completed by 2025.
Source: China Water Resources Bulletin; McKinsey Global Institute analysis

The challenge as China urbanizes will be about not whether the country can meet rising demand but how to ensure that water can be "brought" to those areas where it is naturally scarce. For these regions, rising demand from growing urban centers will heighten their water stress. There is international consensus that limiting water usage to between 20 and 40 percent of available water resources is sustainable. However, in some northern regions of China, this ratio of usage to available resources already stands at some 80 percent. In Beijing, Tianjin, and Hebei, we project that demand will outstrip local sustainable supply of water resources in 2025, even if we assume that China will have completed its South-North Water Transfer (SNWT) Project at that point and will, as planned, be moving 44 billion cubic meters of water a year to northern China.

Exhibit 3.8.9

Cumulative investment in new urban water-supply infrastructure could top 1 trillion renminbi

Investment in urban water-supply infrastructure
Renminbi billion, 2000; cumulative 2005–25



Source: McKinsey Global Institute analysis

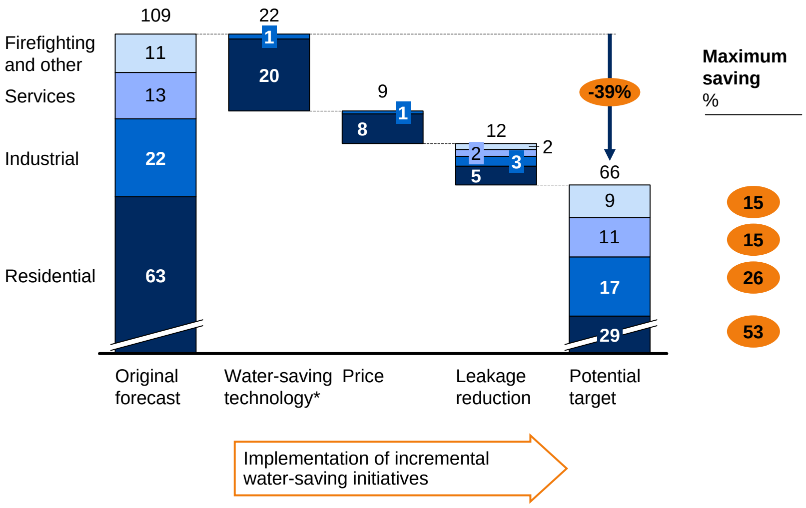
China is already investing heavily in its water-distribution system (the nation is investing up to 700 billion renminbi in the SNWT Project). Projections of how large investment in urban water supply will have to be in future years vary according to the urbanization scenario. The most substantial investment would arise in the supercities scenario. Very large and rapidly growing urban centers would have to build extremely big and expensive water plants using complex processing equipment, longer pipeline connections to the original source of water, and more extensive areas of land. There are unfortunately limited economies of scale in these types of investments. The investment need would be 43 percent lower in a townization scenario compared with a supercities model at some 610 billion renminbi. This gap between townization and supercities is larger than the 19 percent urban-water-demand difference between these two scenarios. This is because many small cities already have sufficient infrastructure in place to meet projected demand and require only cheap, small-scale plants.

Exhibit 3.8.10

China could abate urban water demand by ~40 percent

Composition of urban water demand under different water-saving scenarios

Billion m^3, 2025



Note: Numbers may not sum due to rounding.

* For example, toilet retrofitting for residential; increase of water-reuse ratio in industry.

Source: McKinsey Global Institute analysis

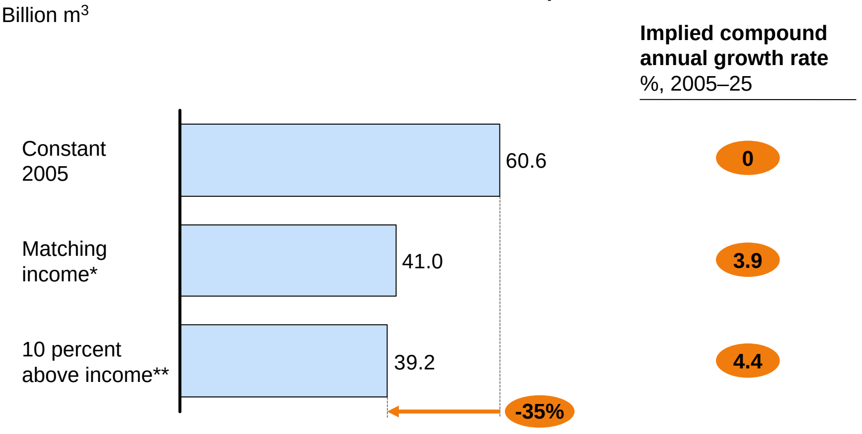
China has significant potential to use its water resources more efficiently and make savings in all urbanization scenarios. Efficiency would be paramount in scenarios with the highest water use—i.e., supercities—and where water is more scarce. Although the intensity of China's use of water has been falling quite sharply in recent years—by 15 percent a year in industry and 9 percent per annum in services sectors between 2001 and 2005—there is scope to do much better. For instance, Japan is five times more water-efficient than China, partly because of the former's concentration in high-tech industries that use less water but also because of a high water-reuse rate. We find that, even on moderate assumptions, China could abate urban water demand by some 39 percent through targeted water-saving measures and action to plug leakages. The biggest savings are potentially available in the residential sector where we estimate that China could nearly halve demand through both implementing water-saving measures and plugging leakage. In industry, the potential saving could be 25 percent. If China fully employed a number of policy opportunities including price increases in line with incomes and retrofitting of toilets, the country could reduce urban water consumption by 40 percent.

Exhibit 3.8.11

Water in China is cheap, and higher water tariffs could guarantee short-term savings

Urban domestic water demand in 2025 under different price scenarios

Billion m^3

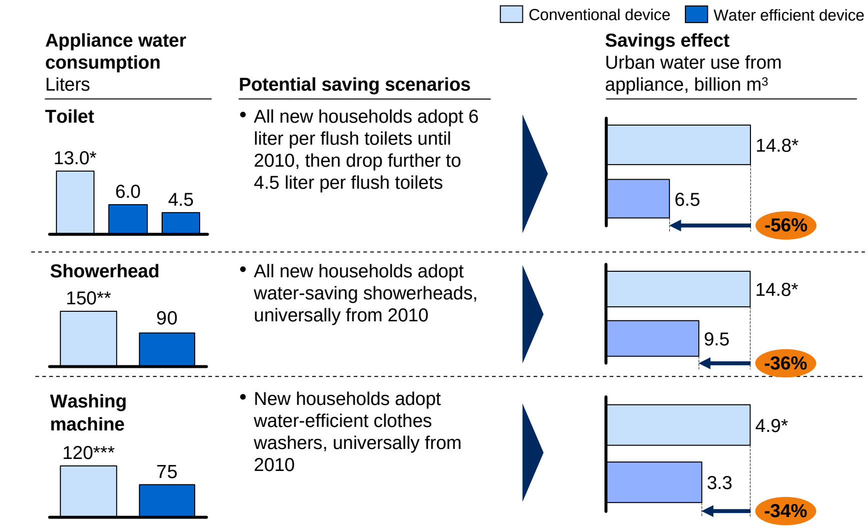


* Assuming water prices grow at same pace as income increases.
** Assuming water prices grow at a rate 10 percent greater than income.
Source: WaterChina; McKinsey Global Institute analysis

Water in China is as much as three times cheaper as a percentage of income than it is in other countries. For instance, water in France is 1.5 percent of income, while in China it is only 0.48 percent. Because the amount households in China spend on water is insignificant as a share of income, water demand is relatively price inelastic. As per capita incomes in China rise—we project incomes will triple in Shanghai over the next 20 years—water will become even cheaper. If China were to adopt a water price that kept pace with increasing incomes, the country could cut residential demand by some 30 percent compared with our trendline forecast, which assumes a constant real price. If water prices increased even more than incomes and thereby became a more significant cost for households, China could hope to achieve marginally larger savings. Evidence from other countries shows that, although aggressive price increases can reduce water demand in the short term, long-term demand reduction comes only from consistent increases in water prices together with other measures including imposing quotas on water consumption. Detailed pricing, however, needs to be staggered depending on income levels to avoid social issues.

Exhibit 3.8.12

Mandating the use of water-efficient appliances could drive large savings



* Liter per flush.
** Liter per time, assume 15-minute shower.
*** Liter per cycle.
Source: *US water efficiency manual*, North Carolina Department of Environment; literature search; McKinsey Global Institute analysis

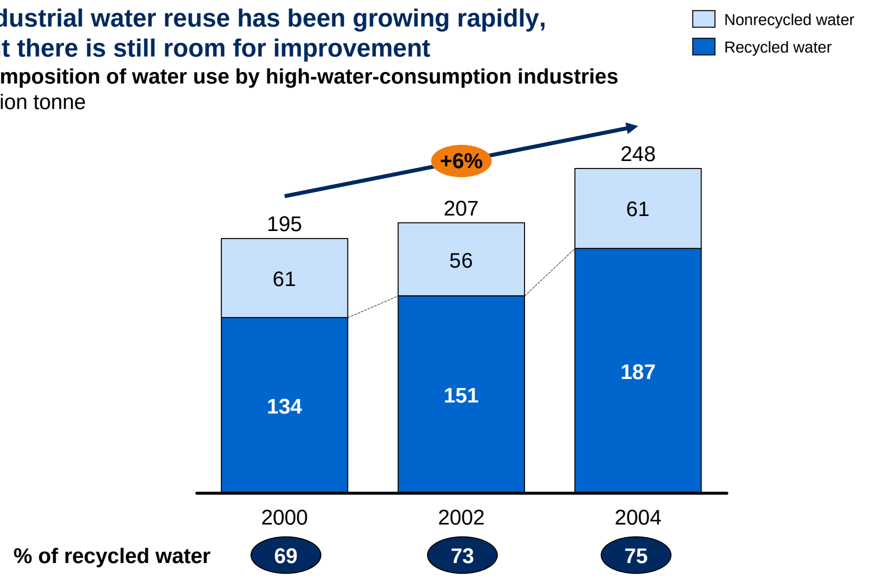
The universal adoption of water-efficient toilets would result in the greatest savings, cutting urban water demand by some 21 percent compared with current technology. If households adopted low-water-use toilets alongside water-saving showerheads and water-efficient clothes washers, even more substantial savings could be made of up to 32 percent. China has already put regulations in place to force the switch to higher-efficiency toilets. Not all water-efficient devices are economic investments for private consumers at this stage, and therefore central and local government will need to provide incentives or force their adoption. An increase in the price of water would act as an incentive to buy water-saving devices that would reduce the payback time on their investment. However, washing machines, for example, cannot reach a reasonable payback period even with higher prices, and government may have to introduce incentives or mandate manufacturers to introduce the new technology to ensure that scale effects reduce the price.

Exhibit 3.8.13

Industrial water reuse has been growing rapidly, but there is still room for improvement

Composition of water use by high-water-consumption industries

Billion tonne

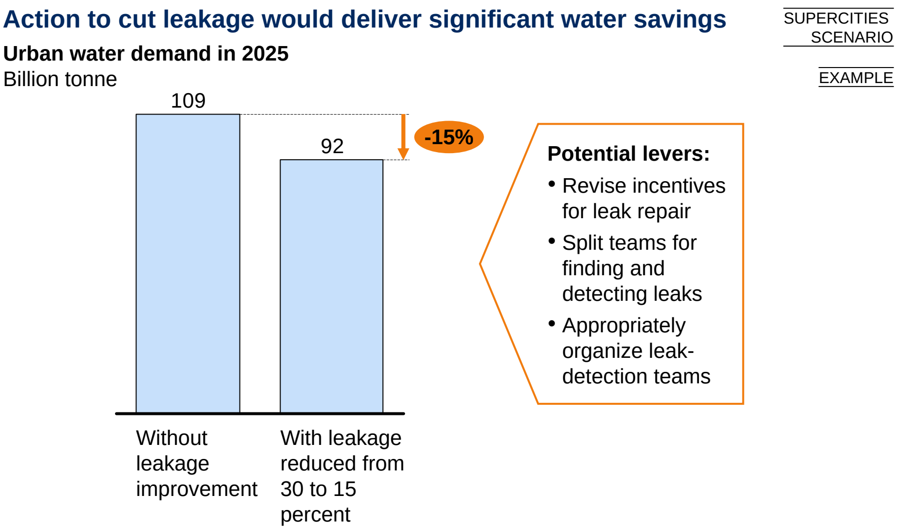


Source: CEIC Data; McKinsey Global Institute analysis

Industrial water use is almost inelastic to changes in pricing. For this reason, the most effective way to save industrial water use is to enhance the water-reuse ratio particularly for those industries that are intensive consumers of water. Consumption by such industries grew by 27 percent between 2000 and 2004, but recycled-water use grew by 40 percent during the same period. We can expect this recycling rate to climb somewhat further for these water-intensive industries, but there is not much potential left. China's current water-reuse rate is already relatively high at 75 percent. However, if this ratio were to rise over the next 20 years to the 80 percent level that prevailed in Japan in 2005, China could reduce consumption of high-usage industries by 18 percent and overall urban industrial water use by 7 percent.

Exhibit 3.8.14

Action to cut leakage would deliver significant water savings



Source: e-Digest of Environmental Statistics, Department for Environment, Food and Rural Affairs of United Kingdom; McKinsey Global Institute analysis

Unpublished estimates suggest that leakage from China's water-supply system could be as much as double the official estimate of 20 percent, making it the largest source of water waste—but not the easiest to tackle. China's estimated leakage rate vastly exceeds the average international rate of some 8 to 12 percent. If China were to revamp the water-supply system to cut leakage from more than 30 to 15 percent—a conservative number relative to the international range—the country could substantially cut urban water demand. While measures to reduce leakage are often thought to include heavy investment in pipelines and infrastructure, McKinsey's experience indicates that operational changes can be as effective. For example, a water-supply company in Europe had struggled to meet regulatory targets for leakage despite very large investments over a number of years, while changes to the incentives and organization of detection and repair teams soon led to rapid improvements, and the operator is now meeting its targets.

9. Implications for urban pollution

With China's urban GDP having been on a robust upward trajectory in recent years, air and water quality in China's cities have significantly deteriorated. In 2006, nearly 48 percent of urban residents lived in cities that failed to meet China's Level II standards for air quality—below which air quality is such that respiratory damage is likely—and almost 60 percent of China's river water is today below international potable standards.

MGI analyzed three major air pollutants at both the national and city levels—SO_2, PM_{10}, and NO_x/CO. In a supercities scenario, emissions of NO_x and CO would be highest—both raising primarily local concerns—with 70 percent of these pollutants coming from transportation. Megacities in a supercities scenario would have particularly serious local peak pollution problems, which could seriously compromise the health and productivity of citizens and, in the long term, put economic growth at risk. We did not investigate CO_2 in detail.

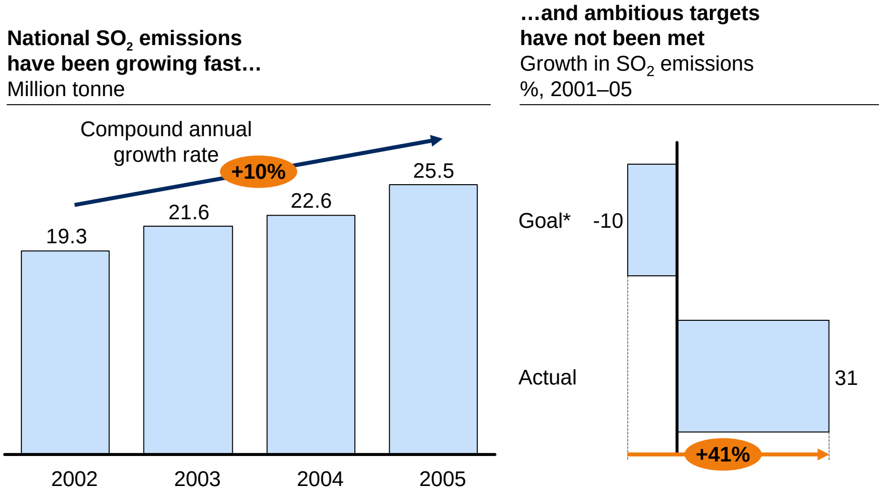
MGI's analysis finds that the ratio between emissions of a pollutant and the growth in its primary driver (e.g., between SO_2 and GDP)—a ratio that we loosely label "pollution efficiency"—is a far larger determinant of pollution outcomes than are different urbanization scenarios. The reduction of these ratios will be a crucial "no-regret" move whatever the urbanization scenario, especially under supercities under which megacities would face crippling levels of air pollution.

At both the national and local levels, China can tackle the air pollution challenge at the source by abating energy demand growth (for details, see "Implications for urban energy demand" in this section of volume II) as well as beefing up its enforcement mechanisms for pollution regulation. In addition, there are a range of smart-growth opportunities that will tackle pollutants directly such as increasing the utilization of SO_2 scrubbers in power plants. In transportation, smart spatial development, anticongestion measures, and the conversion of public fleets to clean technology coupled with stricter emissions standards could cut NOx concentrations by 90 percent. An aggressive agenda encompassing all these elements could bring pollution in supercities within safety limits.

On water, if the rate of treatment of wastewater remains at today's level, urban water pollution could increase five times. The challenge would be greatest under dispersed growth, given the much lower treatment rates in midsized and smaller cities than in megacities. The key challenge will therefore be for smaller cities and towns to reduce their discharge of pollutants. These cities could reduce chemical oxygen discharges by 22 percent simply by upgrading their wastewater-treatment infrastructure—or putting one in place. If urban China were to target a 75 percent wastewater-treatment rate, cities could achieve a 50 percent reduction in chemical oxygen demand (COD) discharges.

Exhibit 3.9.1

Improving China's urban air quality has become an urgent task in recent years



* Pledged by the Chinese government in 2002.

Source: Press search; National Academy of Engineering and National Research Council in collaboration with Chinese Academy of Engineering and Chinese Academy of Sciences, *Energy Futures and Urban Air Pollution: Challenges for China and the United States*, 2008

As urban China has expanded rapidly, its air quality has deteriorated significantly. In 2006, nearly 48 percent of urban residents lived in cities that failed to meet China's Level II standards for air quality. The United Nations has estimated that average PM_{10} levels in Beijing in 2006 were eight times higher than the World Health Organization's recommended levels, despite the fact that the Chinese capital has spent 2.6 percent of its GDP on pollution treatment.[59] There are a number of pollutants that contribute to the deterioration of air quality, but MGI has focused on NO_x/CO, SO_2, and PM_{10}, for which we have rich data.[60] Each of these pollutants has a primary driver. For instance, industry generates 85 percent of SO_2. Moreover, each pollutant has a different level of impact. China bases its air quality reporting and performance tracking on the trends in a city's dominant pollutant, and many cities tend to focus on tackling this particular pollutant in their locality to attain a better ranking in pollution league tables. As a result, a wide range of other pollutants and the overall state of the urban environment may go untreated.

59 China City Statistical Yearbook 2007.

60 Although it's a serious issue, we didn't consider $PM_{2.5}$ because data do not exist for this in China.

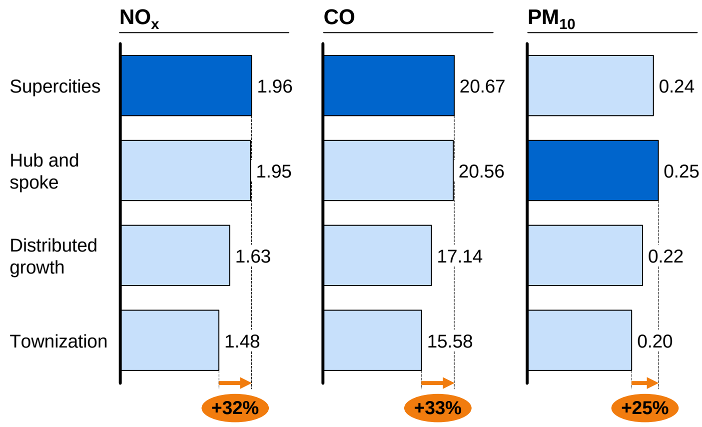
Exhibit 3.9.2

Each scenario brings a different pollution challenge

Urban air pollutants' emission from primary sources, 2025

Million tonne

Scenario with highest emission of respective pollutant



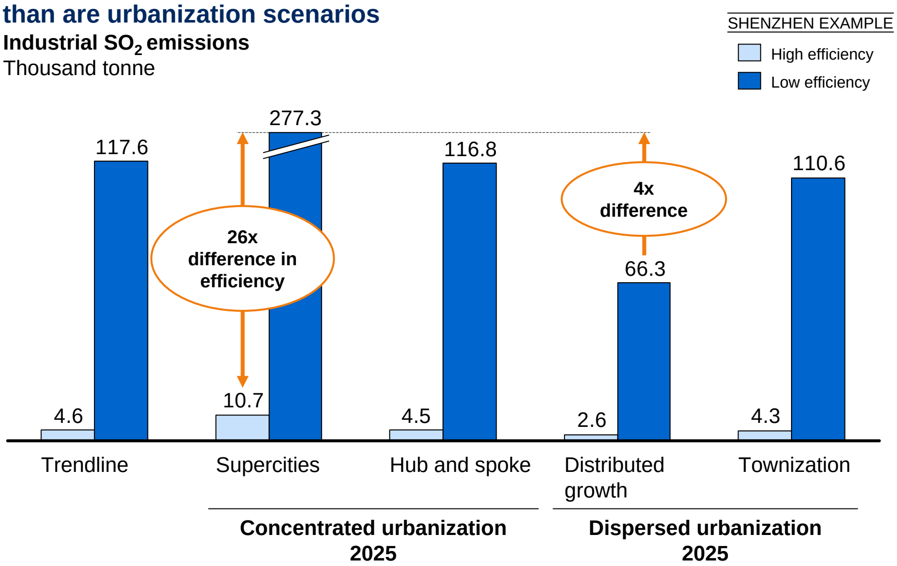
Source: McKinsey Global Institute analysis

To estimate the pollution challenges at the city level, MGI used the output on GDP and population from its China All City model for each scenario, together with forecasts for automobile ownership and construction. For the three pollutants that we analyzed, we considered a base, medium, and highly-efficient case for how these inputs relate to pollution. In our medium case for each pollutant, we see that the most egregious emissions for each pollutant vary in different urbanization scenarios. In a supercities scenario, emissions of NO_x and CO, both of which raise primarily local concerns, would be highest; 70 percent of these pollutants come from transportation. A hub-and-spoke scenario would generate the highest amount of PM_{10}, inhaled as dust near to the ground, due to the high level of construction in this scenario. Construction emits 1.3 to 1.6 times more of this pollutant than does transportation. Dispersed urbanization scenarios would have fewer issues in terms of peak pollution but would likely generate pressures on national-scale pollutants such as CO_2.

Exhibit 3.9.3

Efficiency is a more important determinant of city-level SO_2 emissions than are urbanization scenarios

Industrial SO_2 emissions
Thousand tonne



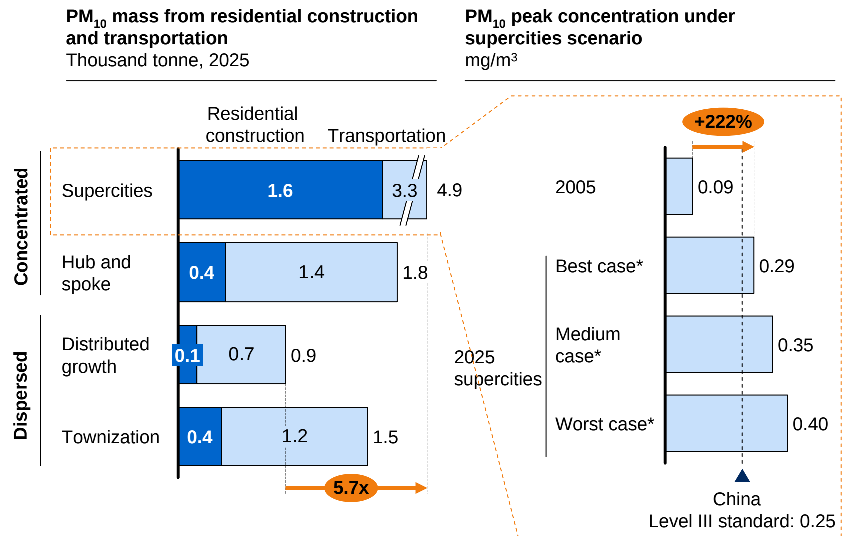
Source: China City Statistical Yearbook 2006; McKinsey Global Institute analysis

MGI's analysis finds that the ratio between emissions of a pollutant and the growth in its primary driver (e.g., between SO_2 and GDP)—a ratio that we loosely label "pollution efficiency"—is a far larger determinant of pollution outcomes than are different urbanization scenarios. For instance, in the case of SO_2 emissions in the future megacity of Shenzhen, we find that there is a 26 times difference between our low- and high-efficiency cases (depending on emissions standards), whereas different scenarios drive a 4 times variance at most. Our analysis produces similar results for NO_x, CO, and PM_{10} across city sizes. In all cases, the relationship between primary inputs—growth in GDP, automobiles, construction, and so on—plays a far larger role than any variation in those inputs resulting from the scenarios. It is clear from this analysis that the enhancement of efficiency and emissions standards will be a crucial "no-regret" move for China's cities under all scenarios.

Exhibit 3.9.4

Under supercities, megacities would face severe challenges in local peak pollution

SHENZHEN EXAMPLE



Note: Numbers may not sum due to rounding.

* Average PM_{10} emissions per car (g/km) in 2025 assumed for best case: -0.015; medium case: -0.02; worst case: -0.025.

Source: McKinsey Global Institute analysis

Many Chinese cities can achieve quality beyond even US standards if they manage to achieve best-case efficiency, even under the most rapid growth scenario. This is particularly true of dispersed urbanization. For example, in a distributed growth scenario, Huhhot and Xingping would be below or close to US standards for PM_{10}. Even megacities in dispersed urbanization scenarios should be able to control CO concentration at a safe level through emissions standards. However, a strong correlation between PM_{10} emissions and economic growth, which would be robust in large cities in concentrated urbanization shapes, implies that megacities in a supercities scenario would face the most critical challenge, even at best-case efficiency levels. This is due to these cities' rapid population growth and the resulting large, concentrated emissions. Shenzhen, Nanjing, and Hangzhou would all exceed US standards for PM_{10}, and Shenzhen in particular would far exceed even China's standards. The control of local pollutants would therefore be a core challenge in a supercities scenario.

Exhibit 3.9.5

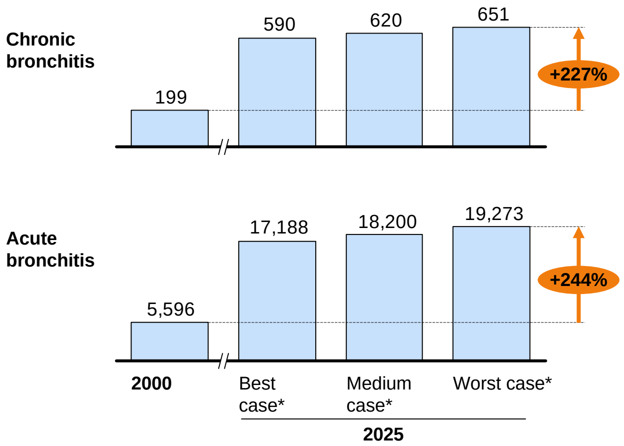
If not tackled, air pollution could compromise public health in a supercities scenario

EXAMPLE

SUPERCITIES SCENARIO

Number of incidences in Shanghai

Thousand per annum



* Average PM_{10} emission per car (g/km) in 2025 assumed for best case: -0.015; medium case: -0.02; worst case: -0.025, with a concentration-response coefficient of 0.45 percent for chronic and 0.55 percent for acute bronchitis.

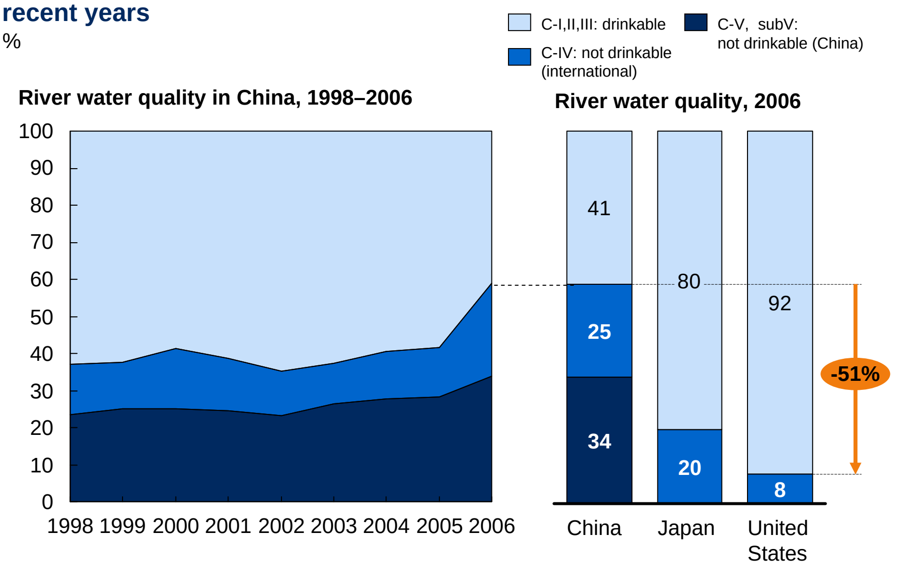
Source: Wang Xiaoping and Denise L. Mauzerall, *Evaluating impacts of air pollution in China on public health: Implications for future air pollution and energy policies*, Princeton University, July 2005

Severe local pollution in megacities in a supercities scenario would have a significant impact on public health—and ultimately, the competitiveness and economic growth of these very large urban centers would be undermined. The relationship between pollutant concentrations and health outcomes is broadly linear, and there is no threshold below which no adverse health effects are expected. MGI analyzed chronic and acute bronchitis in all age groups primarily affected by PM_{10} emissions. We assumed an estimated relationship of a 0.45 percent increase in chronic bronchitis incidence for each microgram increase in concentration and a coefficient of 0.55 percent for the acute form of the disease, while, for the sake of simplicity, disregarding any changes in the other drivers of their incidence.[61] In the case of Shanghai, we find that the city would suffer from huge increases in the incidence of these diseases unless the city brought down PM_{10} emissions to an even lower level than we assume in our best case. It is clear that Shanghai will have to implement tight measures to control pollution, not only to improve quality of life, but also to maintain public health and long-term economic competitiveness.

61 We base both coefficients on Wang Xiaoping and Denise L. Mauzerall, *Evaluating impacts of air pollution in China on public health: Implications for future air pollution and energy policies*, Princeton University, July 2005.

Exhibit 3.9.6

China's water quality is a dispersed phenomenon that has deteriorated in recent years
%

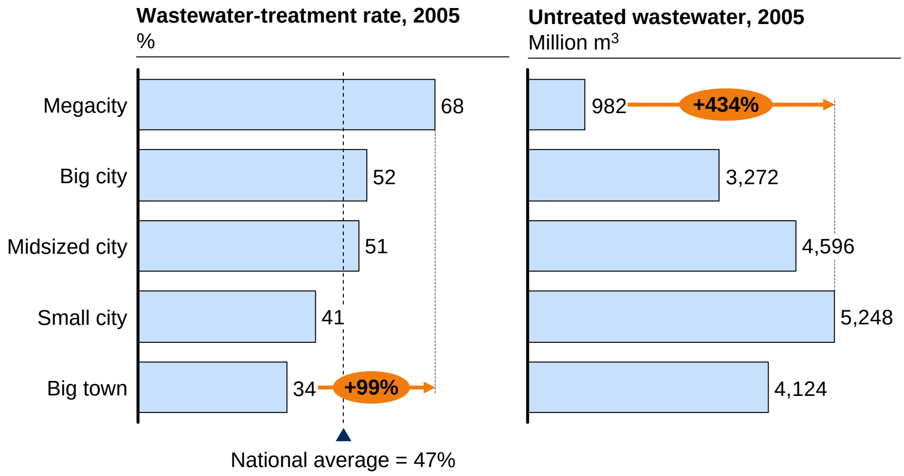


Source: Ministry of Water Resources of China; Ministry of Environment, Japan; Environmental Protection Agency, United States; McKinsey Global Institute analysis

Turning to water pollution, the quality of river water in China has deteriorated markedly in recent years, against both international potable standards and the country's own benchmarks. By 2006, 34 percent of China's river water was not drinkable, according to China's standard. Measured against international standards, 59 percent of China's water was not potable compared with 20 percent in Japan and only 8 percent in the United States. Underlying the worsening of water quality lies China's fragmented industrial structure, characterized by inefficient, small industries in relatively underdeveloped, small cities, with limited wastewater-treatment enforcement. Water quality would remain the most significant challenge in MGI's two dispersed urbanization scenarios. China's ability to tackle this issue effectively is currently compromised by gaps in incentives and enforcement. For example, although the Ministry of Environmental Protection (MEP) has repeatedly flagged water pollution as a critical issue and has raised the punishments for violation, local units of the agency are subordinate to local governments and are subject to local political pressures that often compromise their enforcement ability. Conversely, bigger cities have more effective enforcement and monitoring mechanisms, and these would drive significantly better performance under concentrated urbanization scenarios.

Exhibit 3.9.7

Water pollution generated by smaller Chinese cities is more severe



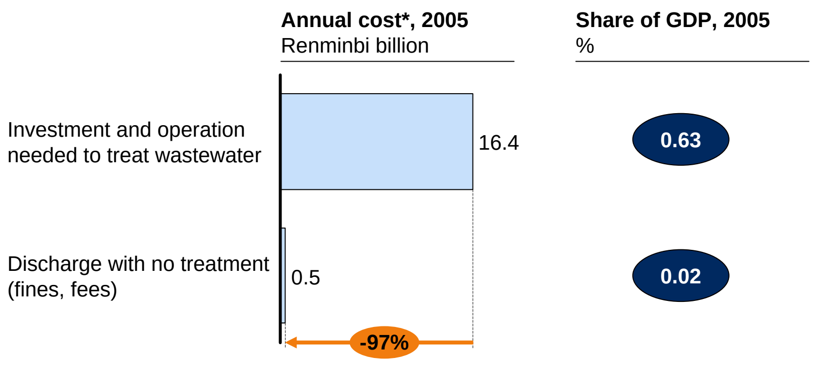
Source: China Urban Construction Statistical Yearbook; McKinsey Global Institute analysis

One of the major reasons why water pollution is worst in China's smaller cities is that these urban centers treat a great deal less wastewater than do larger urban centers. The gap is quite dramatic—megacities treated 68 percent of their wastewater in 2005 compared with only 34 percent in "big towns." It is much more difficult for central enforcement agencies to track activities in the large number of these cities than in the few megacities. In addition, the concentration of COD water pollutants has historically been higher in smaller cities that tend to be the home to smaller-scale industrial enterprises. The major sources of COD discharges are the pulp and paper and food-processing industries that tend to dominate in early urban industrial structures and whose revenues we project will grow at compound annual rates of 10 and 15 percent, respectively, between 2005 and 2010. Pulp and paper was responsible for 33 percent of industrial COD discharge in 2004 and food processing another 21 percent. Given strong growth in these industries, every scenario will face fierce challenges from industrial water pollution if wastewater levels remain similar. Distributed growth would have the most serious water pollution problem because of this scenario's low treatment rates and high industrial GDP.

Exhibit 3.9.8

Treating wastewater does not make economic sense today, and adjusted incentives, fines, and fees will be necessary to reduce discharge

CHEMICAL OXYGEN DEMAND EXAMPLE

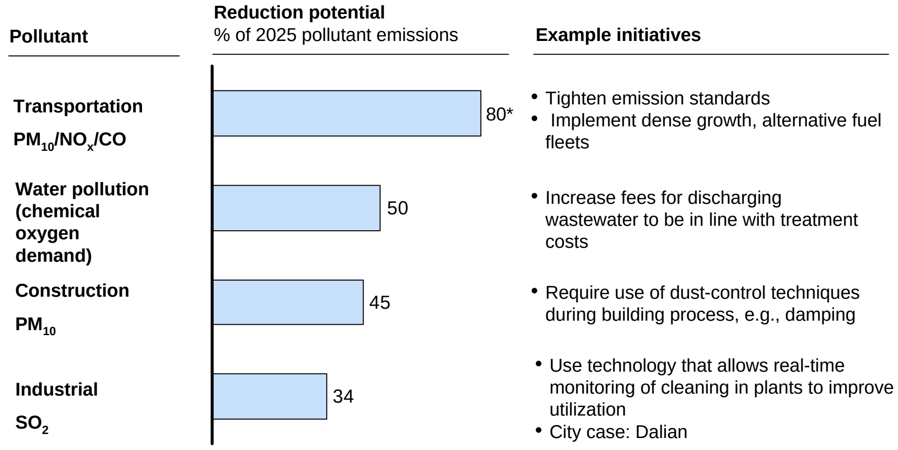


* Including initial construction and annual operating costs over the lifetime of the facility.
Source: China wastewater-treatment plants compilation; McKinsey Global Institute analysis

Increasing the wastewater-treatment rate in small cities could reduce pollution significantly. If small cities were to increase their wastewater-treatment rate by 15 percent through, for instance, building more wastewater-treatment factories at a unit cost of 1,733 renminbi per tonne, keeping the utilization rate of such facilities at 80 percent, these urban centers could keep the COD concentration in wastewater at 0.06 percent and cut COD discharges by 32 percent at an overall cost of 16 billion renminbi. However, at current fees for wastewater discharge, this would still be more expensive than simply continuing to discharge. It is clear that an adjustment of incentives is necessary. China's environmental agency has already recognized that there is an imbalance between discharge fees and fines and the cost of treatment and has therefore raised the maximum fine for polluted wastewater emissions to 1 million renminbi. However, the imposition of maximum fines is subject to local enforcement difficulties. MGI analysis suggests that raising the minimum discharge fee nationally would be a more effective step—indeed it may be necessary to quadruple that fee to make treating waste rather than discharging it economical.

Exhibit 3.9.9

China has many policy options to tackle pollution

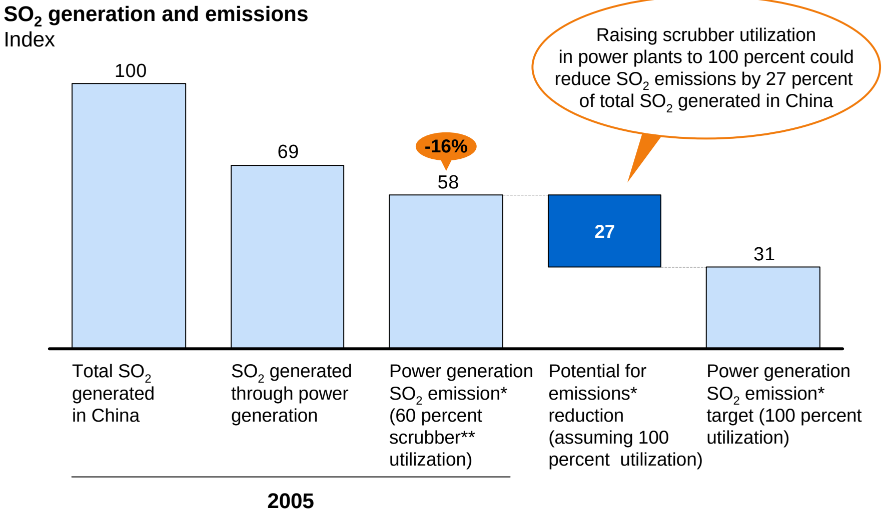


* Averaging all pollutants' concentration, for unit car emission; range stands for different cities under particular scenarios. Also, CO_2 emissions bound to decrease with this set of initiatives and overall energy efficiency.
Source: China Statistical Yearbook; Development of Vehicular Emission Inventory in China, Peking University, 2006; "Energy Futures and Urban Air Pollution: Challenges for China and the United States," Committee on Energy Futures and Air Pollution in Urban China and the United States, National Academy of Engineering and National Research Council in collaboration with Chinese Academy of Engineering and Chinese Academy of Sciences China & US air pollution, Washington, DC, 2007; academic interview; McKinsey Global Institute analysis

China can take a number of practical "no-regret" steps to tackle pollution, backed by fundamental policy shifts to boost energy efficiency and thereby abate energy demand as well as the strengthening of antipollution governance and monitoring. In some cases, national action is required, but city governments can rapidly undertake "smart-growth" pilots—with an eye to successful international models such as congestion charging in London, which Shanghai is considering emulating—targeted at different end-use sectors. Some cities in China have already pioneered effective smart-growth approaches. Through a government subsidy, Shenyang has catalyzed the replacement of conventional heating systems with heat pumps in the city center, achieving an annual cut in coal use of 120,000 tonnes and in SO_2. Many of these "smart-growth" antipollution actions have been at a marginal cost and have not therefore compromised economic growth in these cities. If China were broadly to replicate best practice already developed around the country and thereby boost urban energy productivity (for details see "Implications for urban energy demand" in this section of volume II), MGI estimates that China could cut its pollutants emissions in 2025 by more than 30 percent (depending on the pollutant and the urban scenario) without impacting GDP growth.

Exhibit 3.9.10

China can cut SO_2 emissions by boosting scrubber technology installation and usage

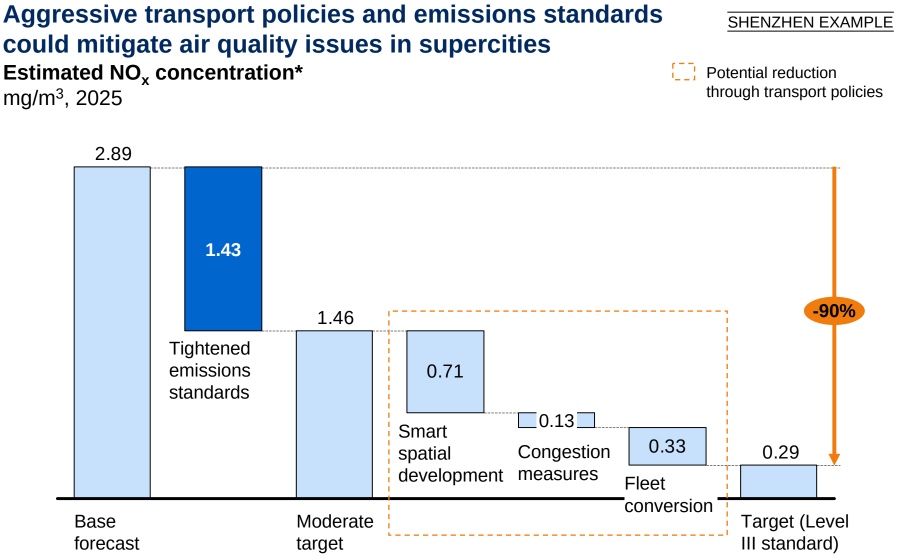


* SO_2 emitted = portion of SO_2 generated but not cleaned using scrubbers.
** Using flue gas desulphurization technology.
Source: National Development and Reform Commission; NAS, China & US air pollution, 2007; China Environmental Statistics Yearbook; McKinsey Global Institute analysis

One "no-regret" move would be to cut the amount of SO_2 currently emitted during power generation. This industry today accounts for 69 percent of industrially generated SO_2 but "cleans" only 16 percent of its emissions. MGI estimates that China could cut SO_2 emissions by 27 percent by ensuring that all new power plants not only install flue gas desulphurization (FGD) scrubber technology but continually utilize it. Current estimates suggest that only 60 percent of plants with FGD installed are actually using it, with the remainder often claiming subsidies as if the scrubbers were being employed. Difficulties in local enforcement are a key inhibitor of performance. The urgent introduction of real-time monitoring—the National Development Reform Commission (NDRC) has indicated it will start to require this in all new power plants—of FGD to ensure that the government pays subsidies only for the actual use of this technology, should have a dramatic effect on its utilization and therefore emissions. Cases of success already exist. Dalian has cut the city's annual SO_2 emissions by 20,000 tonnes by helping to fund the installation of FGD technology, monitoring its usage, and increasing the efficiency of combustion through latest-technology boilers in local plants. The city's SO_2 emissions relative to GDP are now 10 percent lower than those of Shanghai and one-third of the national average. The city has also seen significant drops in fly ash and NO_x.

Exhibit 3.9.11

Aggressive transport policies and emissions standards could mitigate air quality issues in supercities

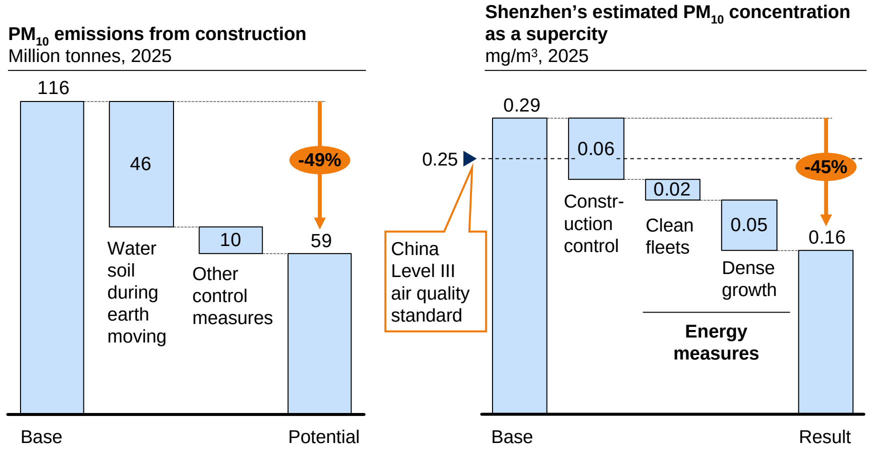


* Assuming a constant concentration factor; includes only transportation-related measures; further potential may exist in, e.g., NO_x scrubbers on power plants in addition to SO_2.
Source: Literature search; McKinsey Global Institute analysis

China could bring even supercities to a Level III air quality standard (defined as China's "safety level") through a combination of antipollution transport policies including increased density, expanded public-transit provision, the conversion of public fleets to clean technology, the implementation and enforcement of emissions standards, and congestion measures such as restricting vehicle ownership. The latter will be crucial. Our analysis of Shenzhen shows that smart spatial development, congestion measures, and fleet conversion along with stricter emissions standards could cut NO_x concentrations by 90 percent. Out of these levers, the most substantial one in mitigating emissions of common air pollutants will be vehicle standards. However, in a supercities scenario, emissions would remain far above standard even with tight controls. Increasing urban density from today's levels would also cut vehicle-based emissions (while Shanghai is indeed very dense, other potential Chinese supercities have lower densities than major Asian cities). The conversion of public fleets to alternative fuel technologies may not be clearly economic in some cases but could become so if both energy savings and impact on pollution are taken into account. Because of severe NO_x problems in a supercities scenario, fuel-cell buses may become relevant despite the fact that the energy savings that these would produce would not quite justify investing in them on pure economic grounds in all energy-price scenarios.

Exhibit 3.9.12

Measures in construction can cut PM_{10} significantly and help bring megacity pollution under control

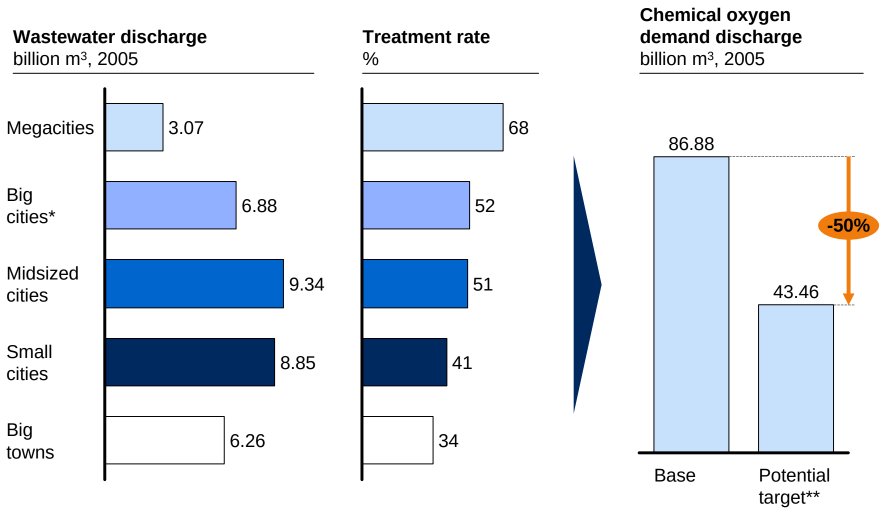


Note: Numbers may not sum due to rounding.
Source: Midwest Research Institute; McKinsey Global Institute analysis

China could reduce the PM_{10} emissions from the construction industry by nearly 50 percent through advanced control methods including watering soil during earth moving, for example. Requiring minimum soil moisture of 12 percent for earth moving alone would cut emissions of this pollutant by 40 percent. Watering soil after a demolition is completed and prohibiting demolition when wind speeds exceed 25 miles per hour would cut emissions by an additional 7 percent. Applying dust suppressants such as polymer emulsion would cut emissions by another 5 percent. Together with other policy actions including the conversion to clean fleets and dense spatial development, MGI finds that Shenzhen, for instance, could cut PM_{10} emissions by 45 percent. An aggressive mix of policies—implementing the full range of PM_{10} control measures, together with denser development, for instance—could bring supercities to within standard safety levels in terms of peak pollutant concentration.

Exhibit 3.9.13

Deployment of wastewater-treatment infrastructure and enforcement could net dramatic discharge cuts



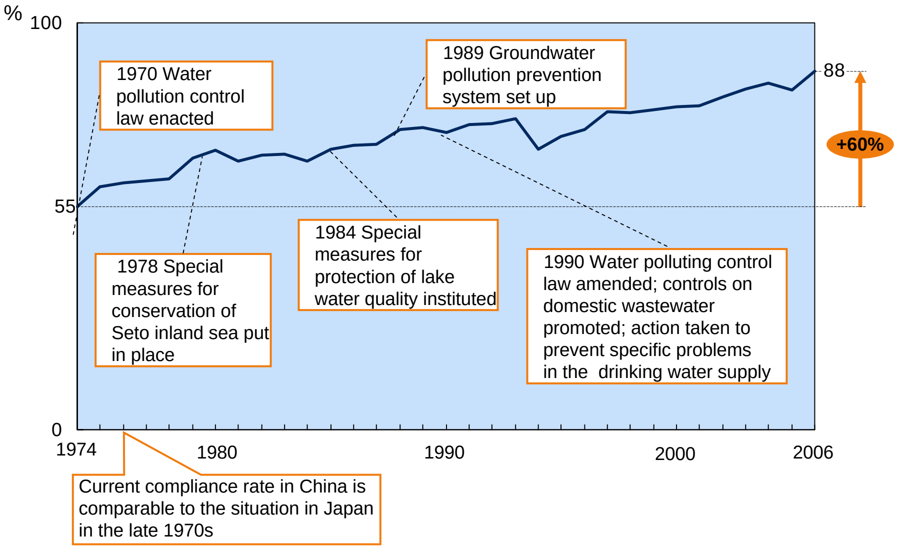
* Excluding Dongguan, as extreme outlier (9 percent reported treatment rate).
** With flat treatment rate of 75 percent.
Source: Interview; China wastewater-treatment plants compilation; McKinsey Global Institute analysis

There is a potential for smaller cities and towns to reduce their COD discharge by 22 percent simply by upgrading their wastewater-treatment infrastructure—or putting one in place. An estimated 240 big towns and small cities have no wastewater-treatment facility. If China allowed this situation to continue, particularly in a townization scenario, the implications for water pollution would be dramatic. If urban China were to target a more aggressive 75 percent wastewater-treatment rate, cities could achieve a 50 percent reduction in COD discharges. However, achieving this would require significant changes in behavior and approach. A variety of measures would be effective, including building more treatment capacity. The number of cities with treatment facilities has been growing at a rate of some 100 additional cities every two years since 2001. In addition, discharge fees need to be increased more aggressively, and incentives in the form of subsidies and fines are necessary to raise the utilization of treatment facilities. Fast growth in major dischargers in pulp and paper and food processing means that the necessary investment ought to be comfortably affordable. However, changes in enforcement mechanisms and the governance of institutions such as MEP will likely be necessary to make such changes effective.

Exhibit 3.9.14

Japan's effective policy response to water pollution from the 1970s offers a useful model

Compliance rate of COD/BOD* concentration in Japanese rivers, 1974–2006



* Chemical oxygen demand/biochemical oxygen demand.
Source: Ministry of Environment, Japan; McKinsey Global Institute analysis

Japan's flexible and concerted response to evolving water pollution problems could offer China a useful model. Japan's water pollution came to prominence in the 1970s when the country urbanized and residential water use rose strongly. At that time, Japan suffered large-scale red tides in certain water regions as the concentration of pollutants increased, and it was then that Japan put in place its first water pollution regulations. In the 1980s, groundwater pollution arose due to an era of mass production, consumption, and disposal. In response, Japan put in place special measures to safeguard the quality of water in lakes and, at the end of the decade, set up a system to ensure the quality of groundwater. In the 1990s, Japan amended its original legislation to target the drinking water supply and domestic waste. Compliance rates increased steadily between 1974 and 2006, and Japan's water quality is now far higher than water quality in China. One of the most crucial moves—one that China should make—was to hold companies responsible for the damage they caused via emissions of water pollutants. This not only significantly raised the cost of polluting but also allowed citizens (with the right to sue polluting companies) to act as enforcers of pollution codes.

Exhibit 3.9.15

The experience of the United states in developing enforcement across a large country offers useful lessons for China

Highly effective · Weakly effective

		China	United States
Regulation mechanisms	Implem-entation	Recent elevation of pollution agency to ministry	Long history of federal, state, and local enforcement
Control methods	Pollutant criteria for strategy	6 criteria pollutants	189 hazardous air pollutants
	Cap and trade	No commitment to cap and trade to date	Cap and trade for a wide range of pollutants
Monitoring system	Air quality forecast	180 cities implementing forecasts	$185m for state and local monitoring
	Reliability	Frequently questioned	Independently verified

Current level of effectiveness

Source: National Development and Reform Commission; NAS, China & US air pollution, 2007; China Environmental Statistics Yearbook; McKinsey Global Institute analysis

Although China is rolling out new "clean" technologies, their utilization remains low due to a lack of financial incentives and a poor supporting "ecosystem"—for instance, skilled professionals to install and maintain equipment, or designers of energy-efficient buildings. China could learn from the regulatory, control, and monitoring mechanisms that the United States has developed over many years and leapfrog the learning process. China proposed the protection of the environment as a core national policy in the 1980s, but local implementation has been very uneven. By contrast, US environmental protection has been developing since the 1950s, and implementation is extensive and effective. China's control strategies focus on six "criteria pollutants"—PM, CO, SO_2, ozone, NO_x, and lead; the United States deals with 189 air pollutants. China has not yet rolled out its cap-and-trade program nationwide, and the country's emission levy system is limited to primary pollutants from medium and large emitters. The US cap-and-trade program and emissions fees and taxes are applied for a wide range of pollutants. On monitoring, there is nationwide support in the United States for advanced air quality monitoring systems; in China, although 180 mid- to large-sized Chinese cities are now implementing air quality monitoring, policy makers still question the reliability of local data.

10. Implications for funding urbanization

Over the next 20 years, government spending in urban China will rise more than five times from almost 2 trillion renminbi per annum to above 10 trillion. However, because urban GDP will grow so rapidly to 2025, government spending as a proportion of GDP will not increase dramatically. During this period, the cost of other elements of the urban system that we have examined—most prominently energy—will rise in absolute terms but decline rapidly relative to GDP. Overall, there will be a shift in the urban system from being overwhelmingly concentrated on investment and resources to a situation in which administration and services are an increasingly large component.

The potential issue for funding is not aggregate numbers as much as variations in funding situations among cities. MGI's detailed analysis shows that, although large cities with relatively high per capita GDP—Shanghai included—are largely self-sufficient, some cities, particularly smaller urban centers and those "left behind" in the respective urbanization scenarios, are struggling to cover operational expenses without recourse to central government transfers, let alone to find the funds they need to continue building their urban infrastructure.

Spending will rise even more in these cities as social pressures and policy changes push strongly for the incorporation of migrants in service provision. MGI studied three potential cases for the evolution of government spending—low-, medium-, and high-funding paths. A low-funding case would largely restrict social provision to *Hukou* residents, but this is an unlikely option given cities' reliance on migrants as a labor pool and China's commitment to social cohesion. A high-funding case, in which cities would offer universal provision at per capita spending approaching the level of developed Asian economies, would be unsustainable fiscally without large tax increases.

We therefore assume that China will follow a medium-funding path with widespread coverage of migrants and per capita spending reaching the level of middle-income countries by 2025. In this case, government spending as a share of urban GDP would grow from 15 to 17 percent. This increase would be driven by an aging demographic—the number of urban residents aged 65 or over will rise from 50 million in 2005 to 130 million in 2025—and the extension of social provision to migrant populations. If current trends continue, the provision of public services (education, health care, urban maintenance) will come to be the dominant portion of spending. Health care budgets, for example, could rise by 11 percent per annum.

The national funding picture would shift only slightly between urbanization scenarios, although individual cities would see major swings, and some could fall behind in funding terms. Relative to GDP—with implications for the tax burden—urban spending would be highest in dispersed urbanization scenarios, although in absolute terms spending would be highest in concentrated urbanization shapes. The greatest financial difficulties would be among small and western cities under distributed growth and townization scenarios. Since land revenues are likely to drop because of new government restrictions on land acquisition and sales, central government transfers—already crucial in allowing cities to meet their obligations—may need to become larger and certainly more targeted to these cities.

In a supercities scenario, megacities would reduce their deficits to almost zero, allowing central government to divert transfers to smaller cities. These transfers would almost be enough to offset deficits in smaller cities and would leave a remaining gap to close of 0.5 percent of total urban GDP or 340 billion renminbi.

China's cities could potentially at least mitigate and even close this remaining deficit through the adoption of an urban productivity agenda with a focus on increasing the efficiency of administration. Such a program could cut spending on public services and general administration by 10 percent in the short and medium term. Along with other urban productivity measures, such as the management of demand for resources, China could cut its overall annual urban public spending by almost 1.5 trillion renminbi or almost 15 percent of projected 2025 spending. If we include the overall savings to the economy that would accrue from an urban productivity agenda—including a near 30 percent reduction in the urban energy bill—China could lower its spending by almost 2.5 trillion renminbi or 4 percent of urban GDP.

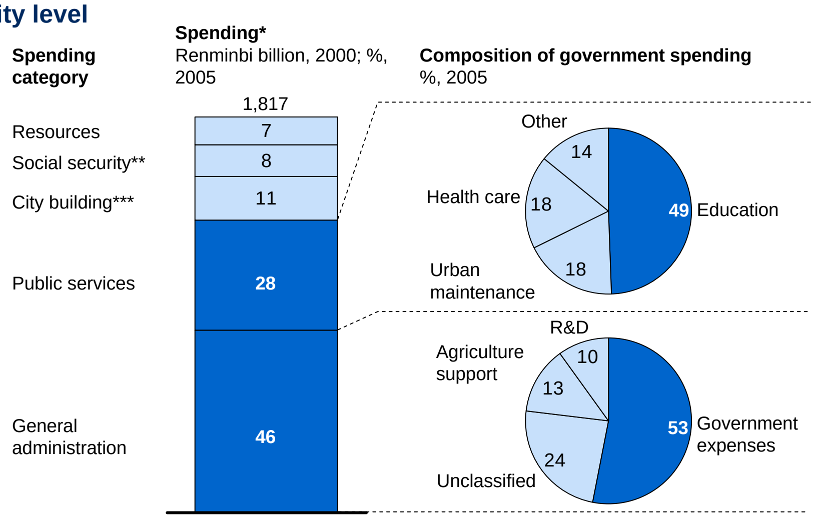
China today faces structural funding problems that it will need to tackle, notably a funding gap of up to 120 percent of urban GDP in social security funds, which cities largely administer.[62] As China extends pension provision to migrants, the large structural deficit should narrow over the medium term—to 2025—as working-age migrants pay into the system. However, in the long term, including these workers will exacerbate the funding challenge. While China's strong GDP growth will allow a number of wealthier cities to meet their pension obligations, a large portion will struggle.

62 Yvonne Sin, *China: Pension liabilities and reform options for old age insurance*, World Bank, Washington, DC, May 2005.

Long-term issues of funding will become more pressing. These include a lack of local transparency—there is little public information about off-budget revenues, for instance—which makes it hard for those providing finance to assess risk at city level. There are questions over price regulations, subsidies, and support for loss-making SOEs that distort the market. On pensions, the World Bank has proposed reforms to make the system sustainable, including raising and unifying the retirement age, but any reduction in benefits is likely to run into opposition. Pension returns need to increase, but achieving this will likely require the centralization of fund management as opposed to today's locally run system. Last but not least, shifting the mix of funding for infrastructure could reduce cities' cost of capital but will require continued financial-system reform, particularly of the banking system's "software."

Exhibit 3.10.1

General administration dominates China's government spending at city level



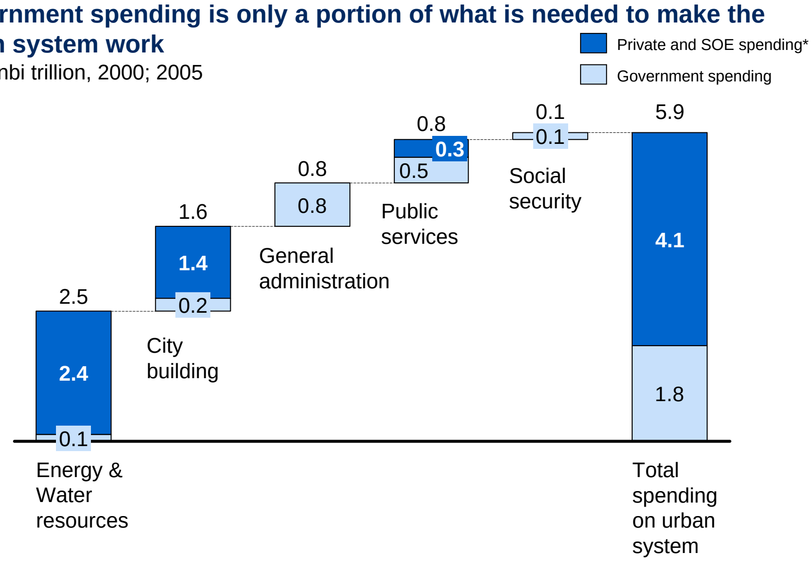
Note: Numbers may not sum due to rounding.
* City government spending.
** Including pension, health care, unemployment insurance, and housing and relief fund.
*** Including buildings and public equity in infrastructure.
Source: Finance Yearbook of China; China Urban Construction Statistical Yearbook; literature search; McKinsey Global Institute analysis

Urban government spending in China's cities falls into five categories. Of these, expenditure on administration and public services are the largest and second largest, respectively, and therefore drive overall spending. General administration accounted for 46 percent of total urban government spending of 1.82 trillion renminbi in 2005. Government expenses accounted for half of total administrative costs at nearly 450 billion renminbi, of which payroll costs made up 80 percent. Wage bills are the prime reason why less-developed cities have higher spending relative to their GDP: civil servants tend to receive higher incomes relative to the local economy than they do in richer cities. In cities such as Shanghai, Shenzhen, and Xiamen, government administration accounts for 2 to 2.5 percent of GDP, while cities such as Taizhou and Suzhou (Anhui) spend 3.5 to 6 percent. City governments make outlays on public buildings, including taking equity stakes in infrastructure, on covering shortfalls in the pensions system, and on public funding of health and other social provision. Local governments receive an indirect share of national subsidies on resources (e.g., energy and water), usually disbursed centrally via price regulation and support for loss-making SOEs.

Exhibit 3.10.2

Government spending is only a portion of what is needed to make the urban system work

Renminbi trillion, 2000; 2005



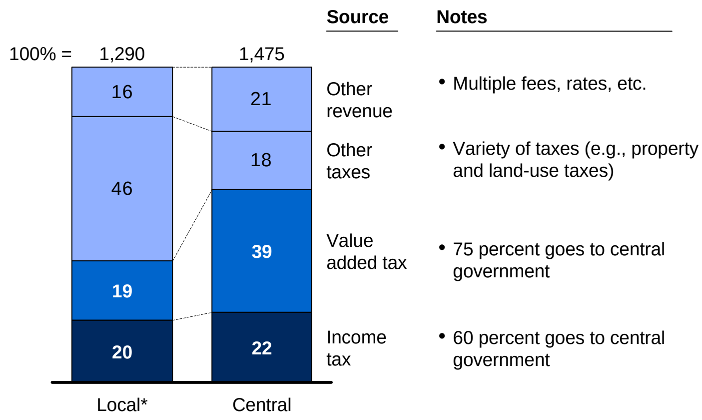
Note: Numbers may not sum due to rounding.
* SOE = state-owned enterprise.
Source: Finance Yearbook of China; China Urban Construction Statistical Yearbook; CEIC Data; literature search; National Bureau of Statistics; McKinsey Global Institute analysis

The private and state-owned sectors also make substantial outlays on crucial elements of the urban system that amount to more than double the spending of the public sector. This private spending includes private or debt financing for the construction of infrastructure as well as buildings, co-payments in health and education, and the costs of energy and water resources. MGI analysis shows that this spending, including expenditure on primary resources, infrastructure, and building construction, totaled 4.1 trillion renminbi in 2005. "Resources" is the most substantial category of spending by the private sector and SOEs, accounting for 21 percent of the total, followed by construction and investment at 13 percent. These high shares reflect today's energy- and investment-intensive urban economy. A confluence of trends will push this total spending up at about the rate of GDP growth nationally. However, the mix will shift dramatically as construction and resources grow more slowly than GDP, reflecting increasing energy efficiency and an economy whose growth will shift to other sectors.

Exhibit 3.10.3

Central and local governments have roughly the same income, but revenue sources vary significantly

Direct revenue, %, renminbi billion, 2000; 2005



Note: Numbers may not sum due to rounding.
* Includes rural and provincial revenue due to difficulty of untangling revenue sources at "urban" level. It does not account for "off-budget" revenues—mainly land sales—up to 20 percent of total amount.

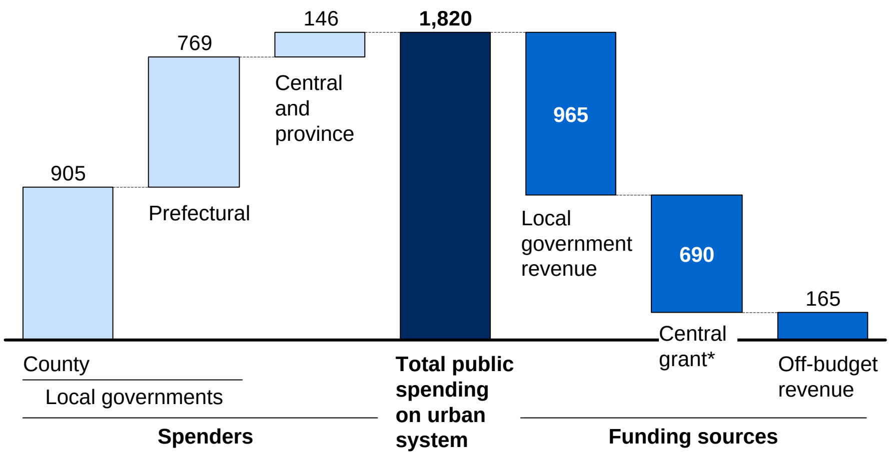
Source: Finance Yearbook of China; China Urban Construction Statistical Yearbook; McKinsey Global Institute analysis

A complex tax and transfer system largely finances public spending. Central and local governments have comparable incomes, between 1.3 and 1.5 trillion renminbi in 2005, but the sources of this income vary significantly. Nearly two-thirds of central revenue comes from income tax and Value Added Tax (VAT), while slightly above a third of local revenue comes from these sources due to the fact that 60 percent of income tax and 75 percent of VAT receipts go directly to central government. Instead, local governments largely rely on a range of rates and fees (e.g., property and land-use taxes). Local governments also generate an additional significant amount of "off-budget" revenue; in the past, this has come primarily from land sales, which MGI believes account for an average of 10 to 20 percent of revenues. However, this source of revenue is likely to be not sustainable in the long run.

Exhibit 3.10.4

Local governments are the main "spenders," but central government also provides large transfers

Renminbi billion, 2000; 2005



* Including transfers from central social security fund, transfers to "city" and "town," and proportionate share of "provincial" transfers.

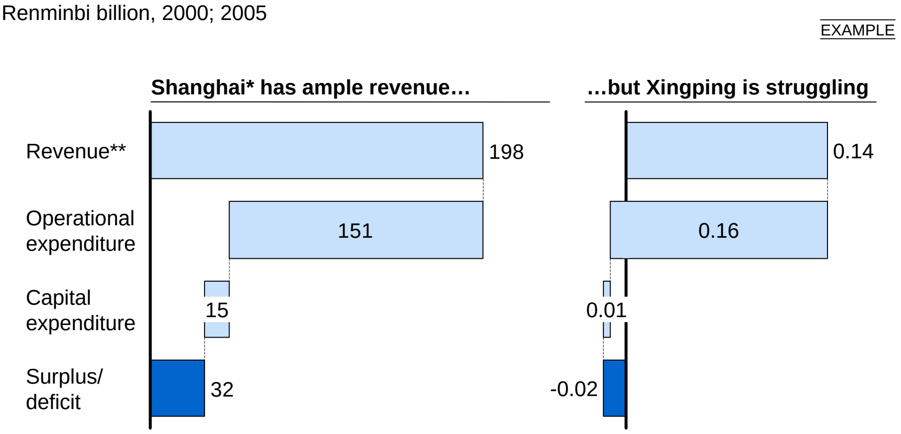
Source: Finance Yearbook of China; literature search; McKinsey Global Institute analysis

Although revenue splits almost evenly between central and local government, the vast majority of urban government spending occurs in county and prefecture-level cities. Direct spending by provincial and central government within cities makes up only 8 percent of the total. As a result, the central government needs to make substantial transfers to cities—690 billion renminbi in 2005—accounting for 38 percent of total urban government spending and 5 percent of total urban GDP.

Exhibit 3.10.5

Some cities have budget surpluses, while other struggle financially

Renminbi billion, 2000; 2005

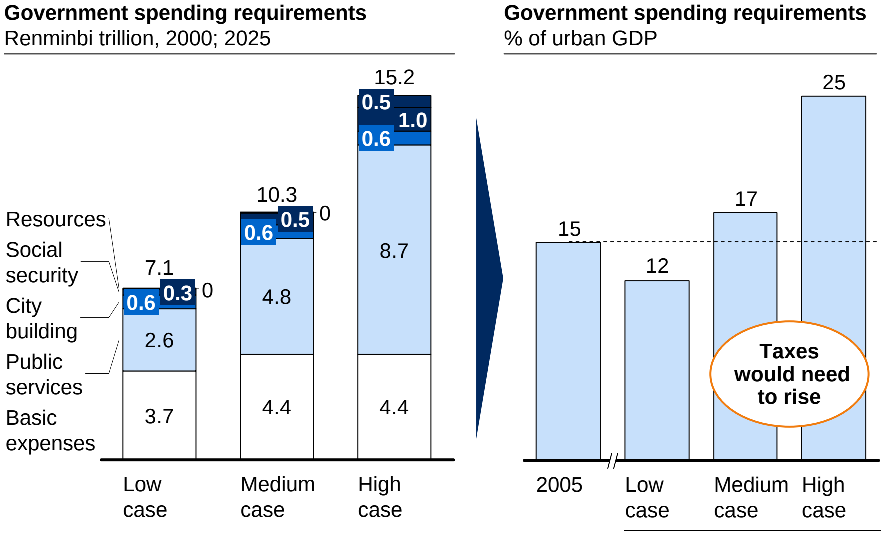


* Shanghai municipality (provincial government).
** Excludes central government grant; includes estimation for local off-budget revenue (25 percent of total for Shanghai and ~8 percent for Xingping, >60 percent of which comes from land sales).
Source: Ministry of Finance; China City Statistical Yearbook 2006; China Urban Construction Statistical Yearbook 2006; interviews; literature search; McKinsey Global Institute analysis

The financial position of individual cities varies enormously. The situation in Shanghai, for instance, is somewhat complicated by the fact that it is both city and province and officially has distinct budgets. At the city level, Shanghai runs a slight deficit of 2.5 percent of GDP, although this is significantly lower than the national urban average of 5 percent. However, on Shanghai's provincial budget, the city posted a surplus of 32 billion renminbi in 2005, even after operational and capital expenditure, on revenues of some 198 billion renminbi in that year. In comparison, Xingping has tiny revenues that are marginally outstripped by operational expenditure, leaving the city with a budget deficit before capital spending. It is important to note that it is policy in China that cities officially do not run deficits (e.g., Xingping does not take on any debt), and central government transfers cover the shortfall between revenues and operating expenses. Nevertheless, capital expenditure is generally severely constrained in cities with major pretransfer deficits, acting as a serious brake on these cities' ability to build the necessary infrastructure as they urbanize.

Exhibit 3.10.6

Government spending requirements are bound to rise



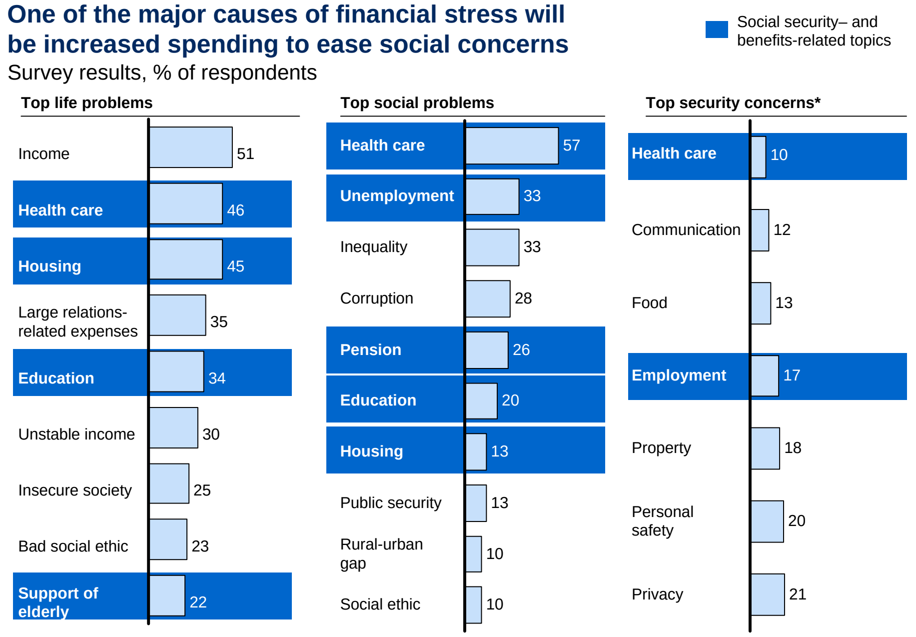
Note: Numbers may not sum due to rounding.
Source: McKinsey Global Institute analysis

MGI examined three potential paths for the evolution of government spending and urban costs over the next 20 years. The first is a "low case" in which service provision is largely restricted to *Hukou* residents, not the vast majority of migrants, and per capita spending grows only in line with rising incomes. In this case we assume low-range resource prices including a $70 a barrel long-term real oil price (i.e., adjusted to 2000). Second is a "medium case" in which cities offer widespread coverage for migrants and per capita spending reaches the level of middle-income countries by 2025; we assume a midrange oil price of $90 a barrel. Finally our "high case" sees cities offering universal provision and per capita spending approaching the level we see in developed Asian economies (e.g., South Korea); in this case, we assume oil at $110 a barrel. Spending would drop relative to urban GDP in the low case but rise in the other two cases and increase significantly in the high case. In both the medium and high cases, there could be pressure to raise taxes to help cities to continue to finance their public spending requirements.

Exhibit 3.10.7

One of the major causes of financial stress will be increased spending to ease social concerns

Survey results, % of respondents



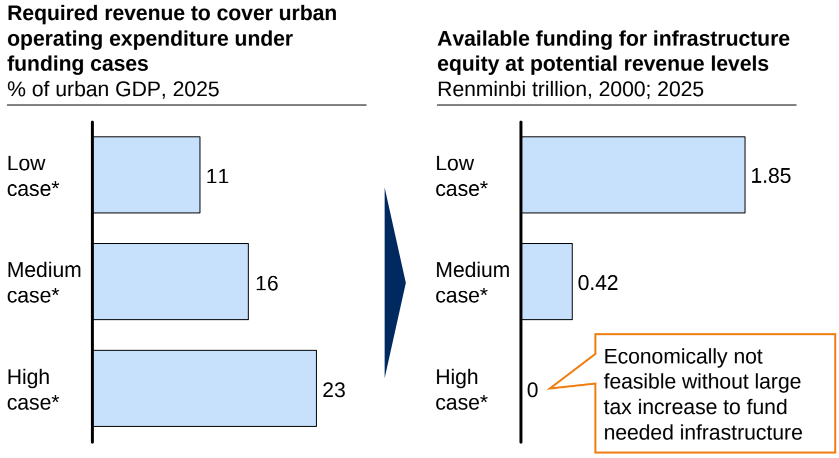
* Example: only 10 percent of respondents felt secure about health care.

Source: China Academy of Social Sciences, *China social attitudes survey*, 2007

China's Academy of Social Sciences conducted a nationwide survey of some 7,000 families in 28 provinces and cities in 2007 that ranked respondents' views on quality of life, social problems, and feelings of social security and insecurity. Health care emerges as the issue about which people feel most insecure. Housing is another key source of anxiety, along with other aspects related to social provision such as education and pensions. Recent announcements indicate that China intends to respond by taking a medium path on social provision, extending provision and therefore substantially increasing spending. For instance, China plans to roll out basic medical coverage to migrants from 2012 to 2020 and extend pensions to these mobile workers. It is highly unlikely that China can contemplate the low-funding case given the rapidly increasing migrant share of urban populations. China's cities need migrant labor to fuel further urbanization while maintaining social cohesion.

Exhibit 3.10.8

The high-public-spending case would not be possible without very large tax increases



*Low case: no social benefits coverage to migrants; per capita spending rises with income; miscellaneous costs rise with population. Medium case: migrants are covered; per capita spending closes on middle-income-countries level; miscellaneous costs rise with GDP. High case: migrants are covered; per capita spending approaches upper-middle-income-countries level; miscellaneous costs rise with GDP.

Source: McKinsey Global Institute analysis

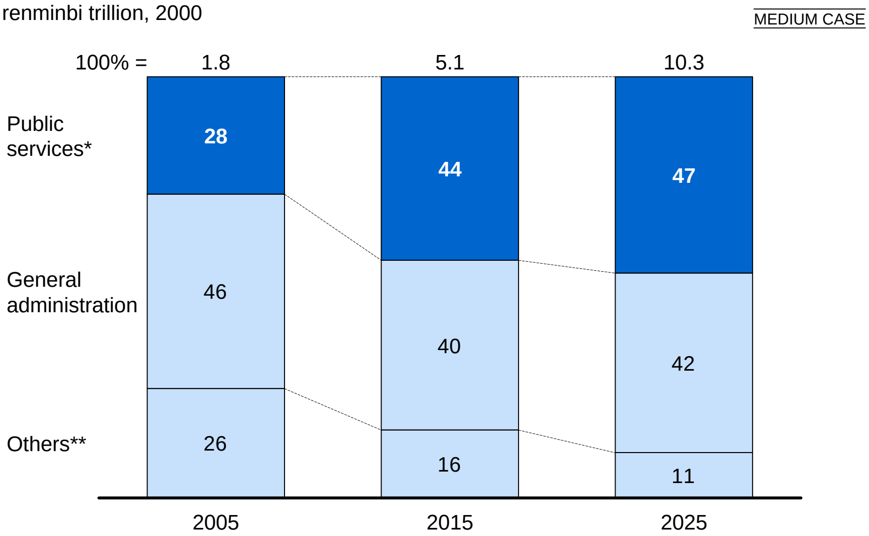
The high-funding case would be fiscally unsustainable without very large tax increases, unless China considers strong action to raise urban productivity. Assuming that revenues would need to be sufficient to cover operating expenditure—a basic tenet of sustainable public finance—revenues relative to GDP would have to rise by some 10 percent. Conversely, if revenues were to rise only modestly in line with the historical trend, the high case would leave local governments with no available equity to inject into infrastructure building (see section on "Implications for urban infrastructure" in this section of volume II). This effectively precludes China from pursuing a high-funding case (as well as a low-funding case). We therefore take the medium case as the default in the remainder of this analysis.

Exhibit 3.10.9

Outlays on public services will come to dominate government spending

Government spending on urban China

%, renminbi trillion, 2000



* Education, health care, maintenance, and other public services.

** Principally social security and equity portion of infrastructure company financing.

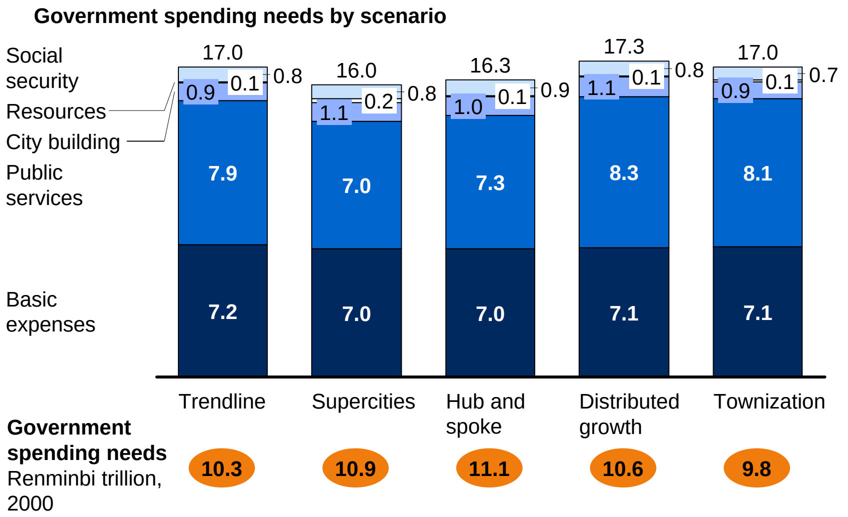
Source: McKinsey Global Institute analysis

In a medium-funding case, public-service provision will become the dominant component of urban government spending, rising as a share of the total from 28 to 47 percent by 2025 due to the two fundamental effects of urbanization: an expanding urban population and rising personal wealth. The former implies a rapid increase in the population covered by public provision, the latter an increase in input costs and a rise in service expectations—as we have seen in nearly every country as it develops. In addition, city maintenance costs will rise rapidly as the stock of built infrastructure soars. Basic expenses will remain substantial, their share dropping only 4 percent from 46 percent in 2005 to 42 percent in 2025, as government expenses increase in line with city populations and incomes, albeit at a lesser pace than public services. The remaining categories—city building, implicit resource subsidies, and funding the social security gap—will decline significantly in importance. Although the level of activity of city building will remain high, its growth rate will decelerate below GDP, as, for example, total floor space requirements level out with increasing density.

Exhibit 3.10.10

Government spending would be highest as a share of urban GDP in dispersed urbanization scenarios

% of urban GDP, 2025



Note: Numbers may not sum due to rounding.

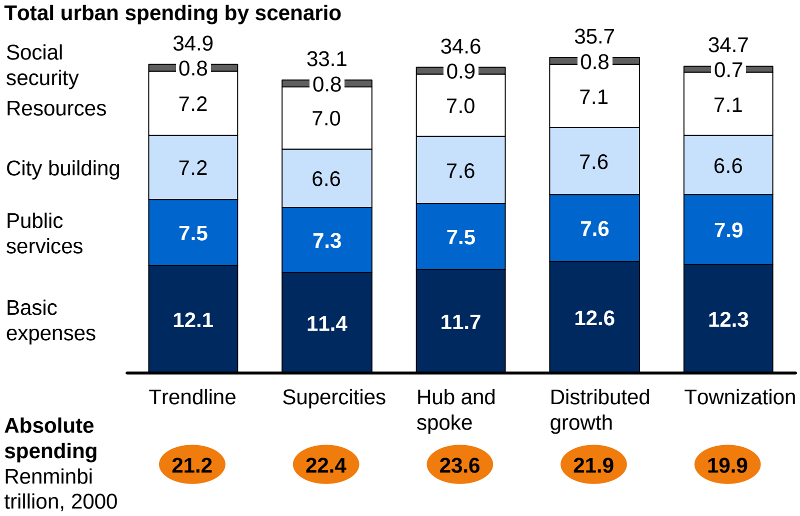
Source: McKinsey Global Institute analysis

Among scenarios, the absolute amount of government spending will vary significantly, from 9.8 trillion renminbi under townization to 11.1 trillion renminbi in a hub-and-spoke scenario, a difference of 13 percent. The absolute amount of spending under concentrated urbanization would therefore be higher—incomes increase more in this scenario, raising the cost of many inputs. However, not all costs increase in this way under more efficient concentrated forms of urbanization (e.g., as we show in “Implications for urban infrastructure” in this section of volume II, resource and transit efficiency actually lead to a drop in infrastructure construction and maintenance and are compensated for by the substantial increase in GDP). This means that the relative burden of government expenses on the economy would be lower in concentrated urbanization. Public spending as a share of GDP would range from a low of 16 percent in a supercities scenario to a high of 17.3 percent under distributed growth.

Exhibit 3.10.11

Dispersed urbanization scenarios would also see the highest total urban spending as a share of GDP

% of urban GDP, 2025



Note: Numbers may not sum due to rounding.

Source: McKinsey Global Institute analysis

Turning to the overall urban economy, and outlays on the key elements of the system for which we have projections (energy, water, private construction, etc.), we find that the cumulative outlays on China's urban system will be between 250 trillion renminbi and 290 trillion renminbi in the period from 2005 to 2025. This is equivalent to more than four times 2025 urban GDP. However, because urban GDP will grow so rapidly to 2025, the annual costs of the urban system will decline as a share of GDP in all scenarios from 50 to around 35 percent of GDP. We find no significant variance among urbanization scenarios as increases in absolute terms in concentrated urbanization would be balanced by higher GDP. So, in a supercities scenario, such costs would be 33 percent of GDP (as, for example, higher energy efficiency would reduce costs relative to GDP) compared with about 36 percent in distributed growth. Relative to GDP, urban spending would be highest in dispersed urbanization scenarios, but in absolute terms, spending would be highest in concentrated urbanization scenarios.

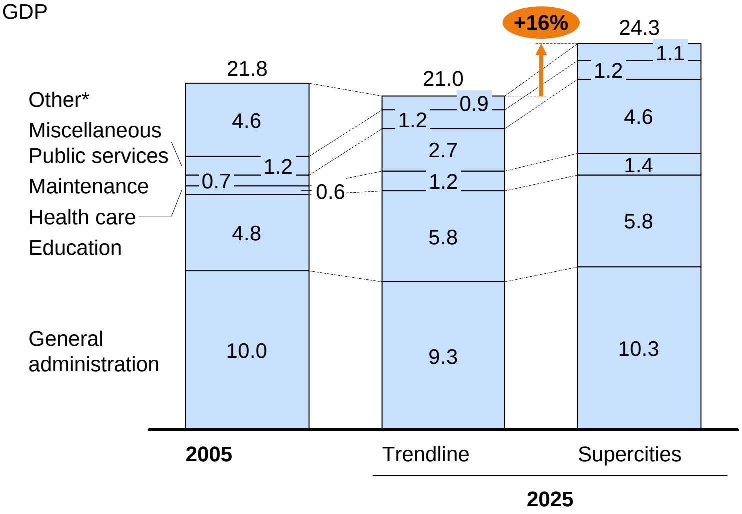
Exhibit 3.10.12

Fiscal pressure will arise in cities "left behind" in each scenario—e.g., midsized cities in a supercities scenario

EXAMPLE

Government spending needs in Taizhou

% of GDP



Note: Numbers may not sum due to rounding.
* Principally social security and equity portion of infrastructure company financing.
Source: McKinsey Global Institute analysis

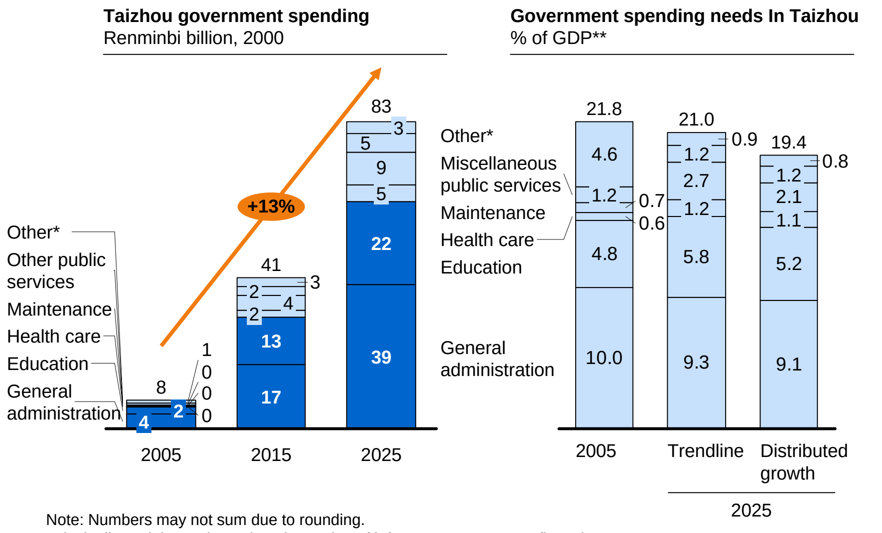
National trends mask significant differences at the local level. In general, spending pressure will arise in those cities that are "left behind" in each urbanization scenario—those that see relatively slow GDP growth but still face broadly the same spending needs. A city such as Taizhou would see public spending at 24.3 percent of urban GDP under supercities, the highest share of the four urbanization scenarios. One of the growing expenses for poor cities is health care. In Shenzhen, a large city with relatively high per capita GDP of 60,000 renminbi, health care spending accounts for 1.7 percent of its GDP. Nanchong, a smaller city with relatively low per capita GDP of 5,000 renminbi, spends 12.0 percent of its GDP on health care. Although health care spending by the Nanchong city government is a much larger share of its GDP compared with Shenzhen, it is only because of the city's poor financial situation.[63] In reality, Nanchong's citizens bear a heavier burden of private health care spending than the citizens of Shenzhen. Similarly, at a country level, richer governments tend to contribute more (e.g., in South Korea and Japan), so that we expect a trend of a slight rise in government share of spending in the future as incomes rise in general.

63 We refer here to direct government spending, i.e., not including government-administered health funds.

Exhibit 3.10.13

Midsized city spending needs will be substantial in distributed growth—but rising GDP will help

DISTRIBUTED GROWTH SCENARIO
EXAMPLE

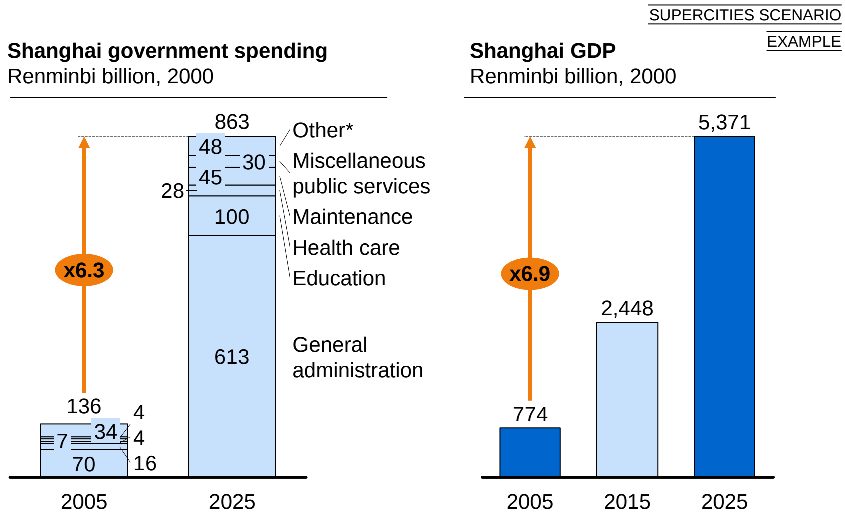


Note: Numbers may not sum due to rounding.
* Principally social security and equity portion of infrastructure company financing.
** Including share of implicit energy subsidies.
Source: McKinsey Global Institute analysis

Midsized cities' spending requirements will grow considerably. Taking Taizhou under distributed growth as an example, we project that the city's spending needs will rise at an annual rate of 13 percent from 2005 to 2025, driven by large increases in education and administrative costs. Rising GDP, also growing at an annual rate of 13 percent, should virtually match this projected increase in spending. As a result, public spending in Taizhou relative to GDP will actually decline from 21.8 percent in 2005 to 19.4 percent in 2025. In distributed growth, therefore, Taizhou's transfers from central government would decline from some 3.5 percent of the city's GDP today (7 percent if implicit subsidies are included) to just below 2 percent. However, under other urbanization scenarios, Taizhou would see spending rising more rapidly than GDP and net transfers from central government increasing—in a supercities scenario by 5 percent of Taizhou's GDP, for example.

Exhibit 3.10.14

Strong growth in GDP will mitigate spending pressure in megacities

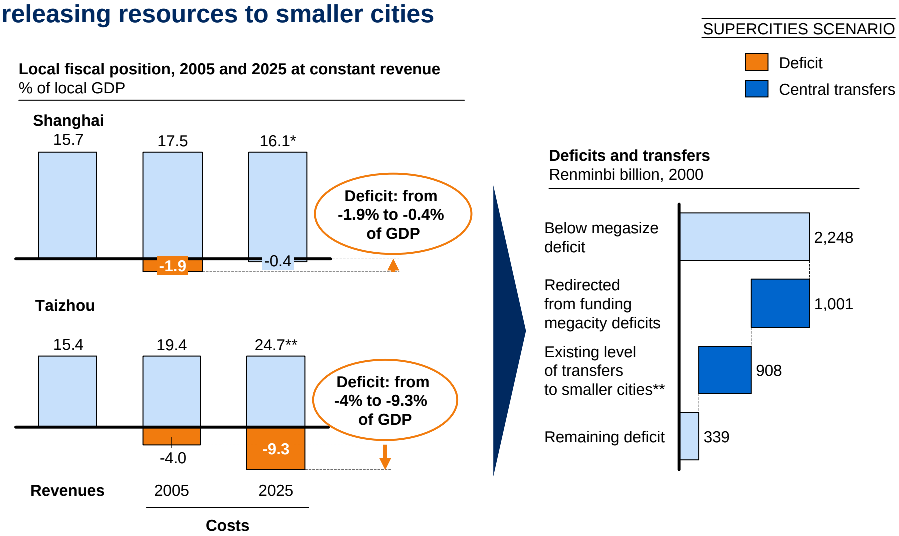


Note: Numbers may not sum due to rounding.
* Social security and equity portion of infrastructure company financing.
Source: McKinsey Global Institute analysis

Strongly rising GDP should also mitigate spending pressures in megacities. For example, in a supercities scenario, Shanghai's public spending needs would multiply more than six times between 2005 and 2025 with a particularly large increase in administrative costs as the city manages a large and rapidly growing population. However, GDP growth will grow almost seven times over the same period, allowing the city's public spending as a share of GDP to drop from 18 to 16 percent in 2025. Even under a distributed growth scenario, Shanghai's share of public spending to GDP would drop from 19 to 17 percent, indicating that megacities will be financially robust across scenarios.

Exhibit 3.10.15

In a supercities scenario, megacities would have no deficit—releasing resources to smaller cities



* Costs rise rapidly (9.7 percent per annum), but GDP rises even faster (10.2 percent per annum), allowing deficit reduction.

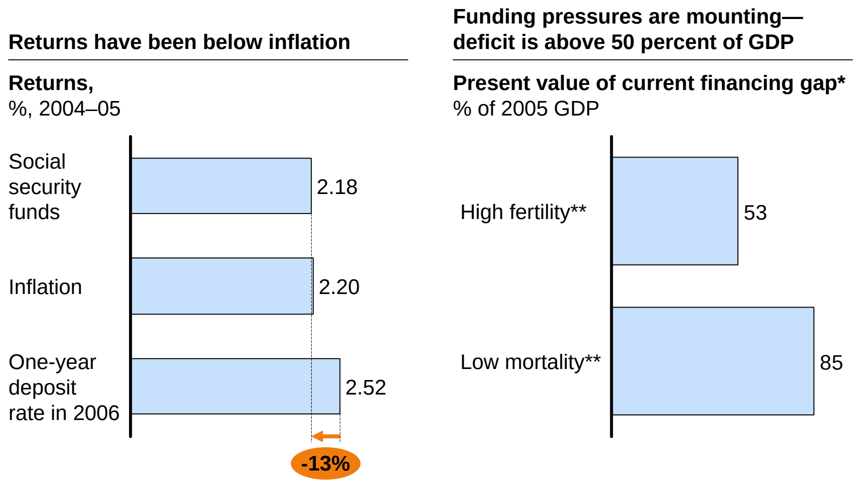
** Transit/utility costs rise quickly at >15 percent per annum, and health care and administration spending rises 9 percent per annum, driven by rising input costs and GDP rising by 7.5 percent per annum.

Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

In a supercities scenario, megacities would be able to reduce their deficits virtually to zero. In the case of Shanghai, the 2025 deficit would be some 0.4 percent of GDP or 26 billion renminbi. Because China's megacities would no longer need financial support from central government, central government could divert transfers to nonmegacities, and this would be sufficient to cover budgetary gaps in these urban centers without increasing taxes. However, the 15 megacities that we see in a supercities scenario would be the exception rather than the rule in terms of budget balance. All other cities in this scenario would grow much less rapidly, and we expect almost all nonmegacities, containing 59 percent of the urban population, to face funding pressures. In contrast, in a hub-and-spoke scenario, in which entire city clusters would see accelerated GDP growth, we see some 71 percent of the urban population living in cities with little or no funding pressures.

Exhibit 3.10.16

City social security funds would have a funding gap of more than 50 percent of GDP even in a best-case scenario



* A measure of sustainability that takes the net present value of the current balances over the period 2001–75.
** Based on scenario calculations from World Bank Pension Report, 2005 (high fertility: fertility rates to increase to 2.1 by 2020 instead of 2030; low mortality: mortality rates to decrease by 5 percent vs. baseline).
Source: Interviews; literature search; Xinhua; World Bank; McKinsey Global Institute analysis

Guaranteeing the long-term sustainability of the social security system is likely to cause the biggest headache for Chinese policy makers. It is a particular challenge that the system's management is highly devolved. Cities largely administer social security funds in line with regulations set by provincial and central government, and this fragmentation makes it difficult to oversee and manage the system. Social security generally covers only *Hukou* residents, although non-*Hukou* workers in large companies will also contribute. Contributions are generally equivalent to 28 percent of salary (although even this varies among cities), and these are split into two funds: a "universal fund," taking 10 percent of salary, and "individual accounts," into which the remaining contribution is paid and that accumulate over time. Disbursements take two forms: a "basic payment" equivalent to 20 percent of the local average wage of the previous year, plus an "individual payment" every month equal to the total amount in the account paid out as if the individual had ten years to live. Individual accounts continue to pay out even if the participant lives substantially longer than ten years after retirement. This is a particular problem because the retirement age has remained at 50 to 60 years old, but life expectancy has steadily crept up. This implies that the system is fiscally unsustainable. The system is under additional pressure because, as a result of strict rules on portfolio allocation, eturns have been below inflation.

The World Bank has estimated that the financing gap is equivalent to between 80 and 120 percent of the current system.[64] Local funds cover the annual shortfall, and the national fund steps in when local funds are insufficient. In 2005, there was a local funding gap of 119 billion renminbi. The Bank argues that, to close this gap, China needs to increase the retirement rate and change its formula for individual account disbursements. However, these steps will cut benefits, and this would be difficult politically and might require that China seek alternatives. In the case of pensions, the returns on local pension funds are low, in some years below the rate of inflation. If returns were lifted by 2 percent per annum to 2025, this would compensate for the decline in personal benefits that reform would cause. Achieving higher rates of return is not impossible given modern portfolio management, but this effort would almost certainly require centralization of these funds to enable professional management, reap scale benefits, and enable more effective oversight to eliminate instances of local misuse of funds. Instances of such approaches include Chile and Australia, which allow external management of funds, and most American pension funds, which diversify their investments internationally. China has already taken some steps down this path by, for example, the role and size of the national social security fund.

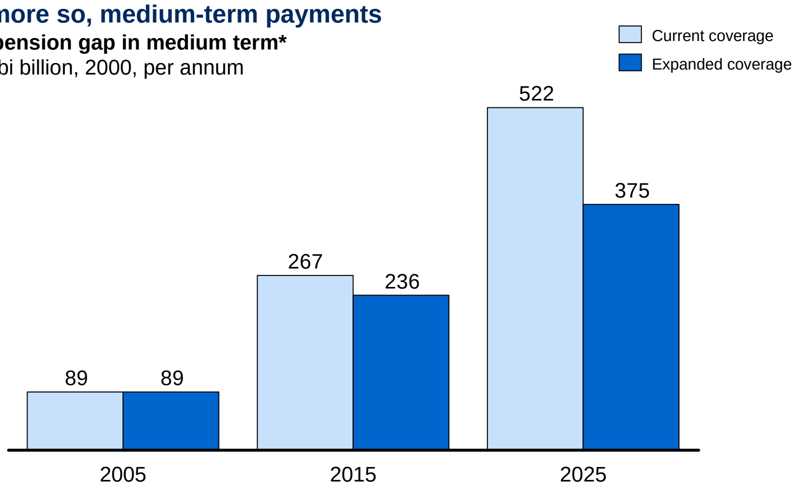
64 Yvonne Sin, *China: Pension liabilities. and Reform Options for Old Age Insurance*, World Bank, May 2005.

Exhibit 3.10.17

Adding more migrants to the pension system could support short- and, even more so, medium-term payments

Urban pension gap in medium term*

Renminbi billion, 2000, per annum



* With "baseline" return assumptions (retirement, life expectancy, etc.) and with overall urban population growing in line with historical trends.

Source: Yvonne Sin, *China: Pension liabilities and reform options for old age insurance*, The World Bank, Washington, DC, May 2005; McKinsey Global Institute analysis

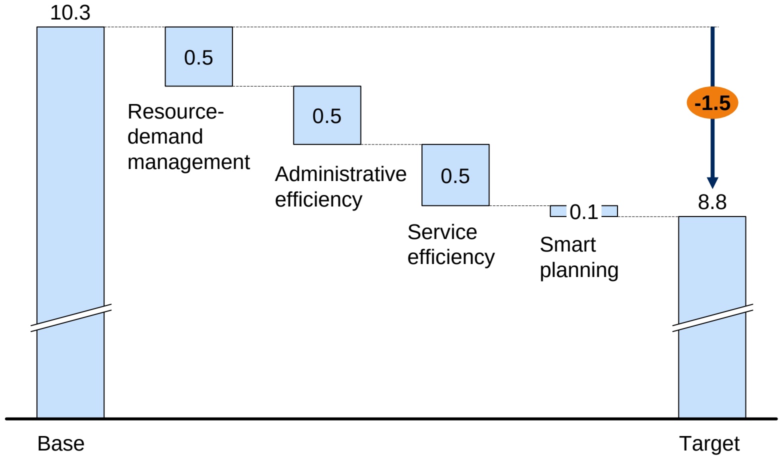
A complex set of effects could play out as China extends its pension system to the migrant population. The "pay as you go" component of China's system incurs a deficit when its immediate obligations are not met by current inflows and is therefore tied to the current balance between workers and retirees in the system. The incorporation of migrants would in fact close this deficit because they are overwhelmingly of working age and will remain so in 2025. On the other hand, these migrants will be contributing to individual accounts, which have a structural shortfall due to the way in which their payments are calculated. Therefore, in the long term, urban China will have more participants in the pension system who will need to be paid more than they contribute. As a result, although short-term pressures may ease, the long term will see even greater deficits.[65]

65 Ibid

Exhibit 3.10.18

Urban productivity could reduce urban government spending by more than 1 trillion renminbi

Government spending, renminbi trillion, 2000; 2025

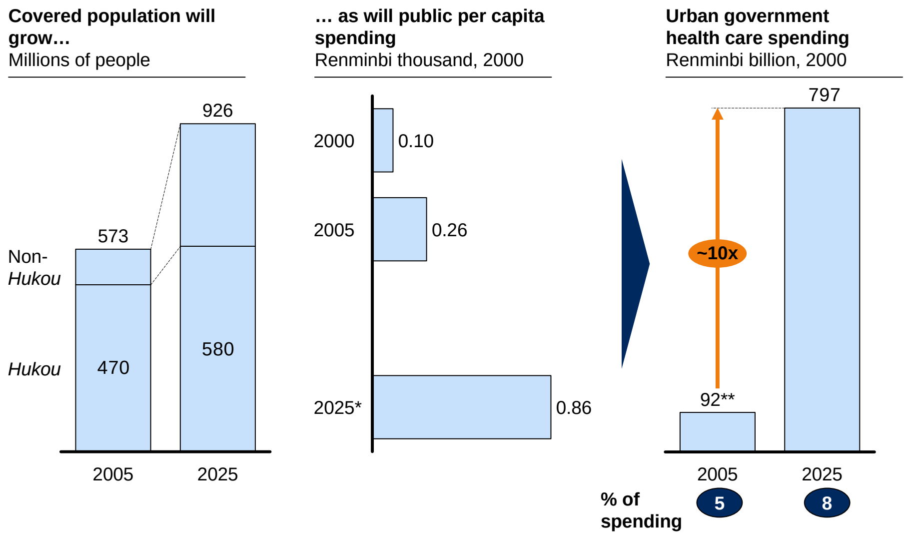


Note: Numbers may not sum due to rounding.
Source: McKinsey Global Institute analysis

Independent of the urbanization scenario, if cities were to shift to an urban productivity agenda, they could reduce China's urban government spending by more than 1 trillion renminbi, equivalent to 15 percent of government spending in 2025. Including measures to boost overall urban productivity (e.g., by lowering resource demand), the savings for the economy as a whole could amount to more than 2 trillion renminbi or 4 percent of urban GDP in 2025. This would free up substantial resources to midsized and smaller cities that face the most serious funding pressures. In land development, China has the option of building denser, more productive cities. On resources, cities could manage energy demand rather than simply building the supply infrastructure to meet demand and significantly abate energy-demand growth. Cities can make significant improvements in the efficiency of service provision, particularly in health care. Shifting the mix of financing for infrastructure development could cut the current cost of capital.

Exhibit 3.10.19

Against the background of health care public spending growing tenfold, public sector productivity will be key



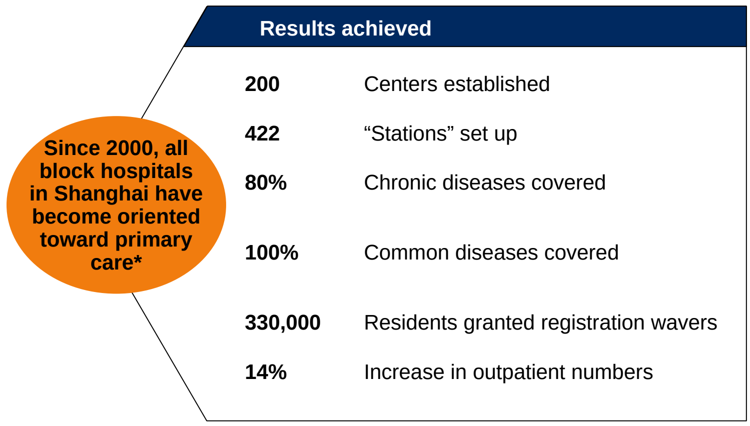
* Assuming growth rate matching income growth.
** Currently only ~75 percent of *Hukou* residents are covered.
Source: Ministry of Finance; World Health Organization; McKinsey Global Institute analysis

Following current trends, we estimate that government spending on health care will grow ten times between 2005 and 2025 to 797 billion renminbi (driven by an increase in both population covered and per capita spending), with urban health care spending accounting for 10 percent of overall funding growth in this period. Boosting the productivity of the system will be crucial. Root-and-branch reform of the health care system will require a major national debate, but there are immediate steps that China's cities can take that could yield savings equivalent to some 9 percent of health care spending—close to the benchmark of 10 percent productivity opportunity that McKinsey uses based on its international experience. In the short term, China could reduce the burden on specialized and general hospitals by up to 25 percent—higher-class hospitals are at 85 to 95 percent utilization, while basic facilities are at only 40 to 50 percent (an initiative to boost primary care in a part of Cairo increased revenues by almost 35 percent). China could also cut the length of stay by up to 20 percent to international benchmark levels (dramatic achievements were achieved in some European hospitals by adjusting doctor incentives and improving cross-department coordination). China could also reap major savings through prevention, such as education campaigns to attack obesity before rising incomes make it an increasingly widespread condition. Reducing the cost of projected obesity alone would drop annual costs by up to 3 billion renminbi.

Exhibit 3.10.20

It is possible to reduce health care costs, and China is already pursuing some options at the local level

SHANGHAI EXAMPLE



* Designated as Community Health Service Centers.
Source: Interviews; literature search; press search; McKinsey Global Institute analysis

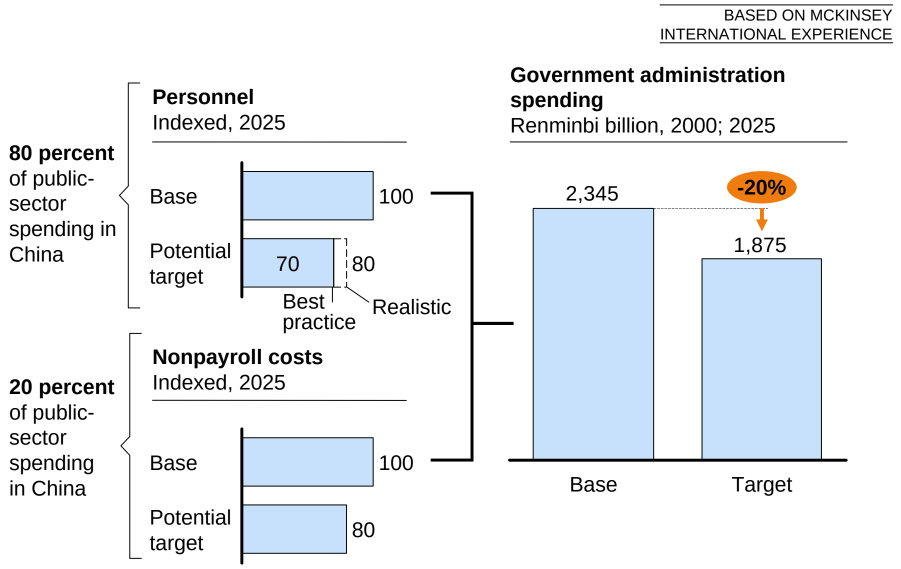
Some cities in China are already taking positive steps in four key areas.

- **Extending social coverage.** Chongqing’s pioneering rural cooperative medical scheme instituted in 2003 now covers 77 percent of farmers; the participation rate in basic medical insurance in the Qingpu district of Shanghai has reached almost 100 percent.
- **Encouraging primary care.** Jiangsu has established more than 1,800 primary clinics covering almost 100 percent of residents in the southern province and 60 percent in the remainder; in Shanghai, nearly 200 centers and more than 422 stations provide primary care for common diseases and 80 percent of chronic diseases.
- **Improving basic productivity.** Beijing has introduced convenience clinics to reduce outpatient waiting times; Shanghai gives 10 percent of disease-prevention subsidies to doctors and institutions to incentivize distribution.
- **Prevention.** The urban areas of Shaoxing in Zhejiang Province now offer five free annual health care checks to women.

There is a major opportunity for China to replicate best practice across other cities. The range and diversity of its cities is a unique strength in China, giving the country a wide pool of new ideas from which to draw and the ability to pilot new policies on a broad scale. On the other hand, without coordination or replication of best practices, there is a risk that cities will become even more polarized with some cities finding that effective action attracts investment and talent disproportionately while others increasingly fall behind.

Exhibit 3.10.21

There is a significant opportunity to boost overall public-sector efficiency



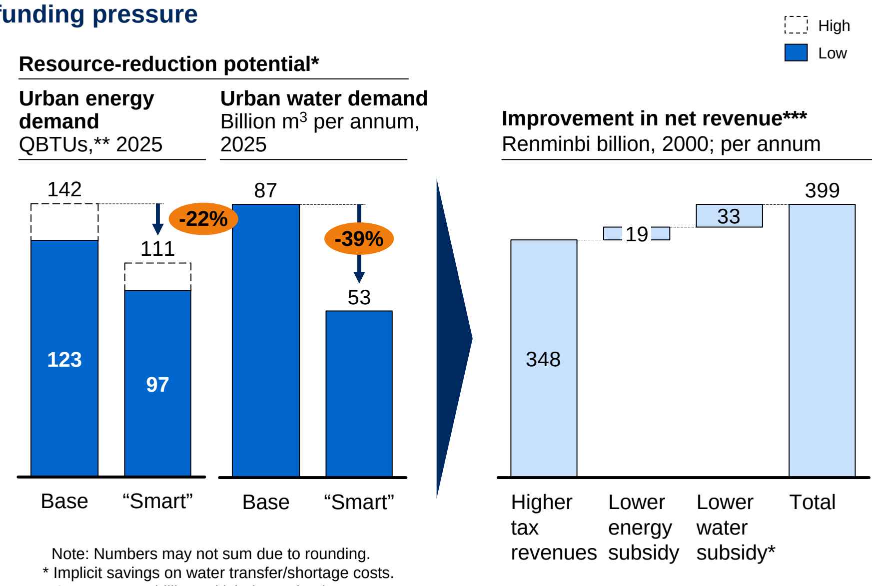
Source: McKinsey Global Institute analysis

Boosting public-sector efficiency is a major opportunity for China's cities given that general administration is such a large component of spending and—with salaries increasing by 6 percent a year and personnel numbers by a total of 60 percent to 2025—will continue to drive government spending growth. McKinsey's international experience shows that lean techniques can improve productivity by 30 percent and lead times by a factor of seven.[66] In China, the salary bill accounts for 80 percent of costs. In one government security agency, detailed process redesign reduced theoretical staffing needs by two-thirds, and the agency captured half of this. China's cities will add the bulk of its government staff between now and 2025—only emphasizing the importance of increasing productivity now rather than facing the painful politics of retrenchments later on. Given the inherent difficulties of managing rapid urban growth, we assume that China will capture only two-thirds of the benchmark potential in personnel. The installation of new systems is another major opportunity. Based on McKinsey's work on streamlining IT architectures and other cost items, we estimate a 20 percent reduction potential in nonpersonnel government spending.

66 Nina Bhatia and John Drew, "Applying lean production to the public sector," *The McKinsey Quarterly*, June 2006 (www.mckinseyquarterly.com).

Exhibit 3.10.22

Implementing an urban productivity agenda would provide a valve for funding pressure



Note: Numbers may not sum due to rounding.
* Implicit savings on water transfer/shortage costs.
** QBTUs = quadrillion British thermal units.
*** Total improvement across central and local governments, related to reduction in only urban demand.
Source: McKinsey Global Institute analysis

Urban China has the potential to make significant reductions in its resource requirements through higher efficiency. Cities could reduce energy demand by about 20 percent from 142 QBTUs in our trendline projection to 111 QBTUs by capturing available energy productivity opportunities. Cities could encourage or mandate the use of more energy-efficient technologies and enforce higher efficiency standards. Urban China could also cut its water use by nearly 40 percent. Simply by reducing leakages, urban China could realize savings of more than 30 billion cubic meters of water a year. On top of these direct savings, there are indirect financial benefits from cutting demand for resources. For instance, as demand falls, so subsidies on energy and water would also decline. In addition, as companies' energy bills drop, so corporate profits and their tax payments would rise.

Exhibit 3.10.23

In the long term, resolving some big issues could further decrease funding pressures

Challenges	Details	Big areas to solve
Increasing revenue needs	• Declines in off-budget revenue will require compensating increases in taxes • Less-developed cities struggle for sufficient revenue	• Fiscal transparency • Tax levels • Fiscal revenue distribution • Resource subsidies
Infrastructure financing availability	• Midsized (and smaller) and western cities do not receive sufficient capital for infrastructure needs	• Returns on projects in less-developed cities • Financial system reform • Bond market development
Mounting service costs	• Delivering higher quality while containing overall costs, particularly in fiscally challenged cities	• Health care reform • Education system reform • Overall public-sector productivity

Source: McKinsey Global Institute analysis

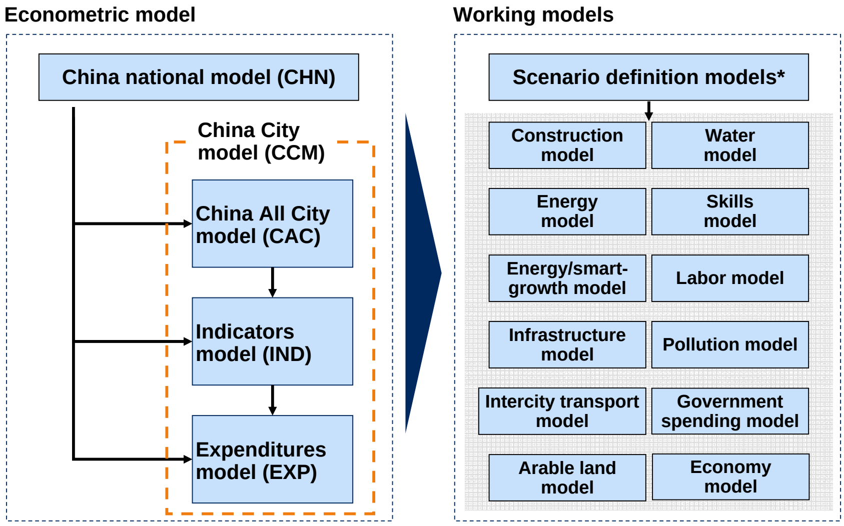
China is already engaged in a debate on some long-term outstanding issues that could further ease funding strains. It would, for example, be feasible for China to undertake a shift in the structure of its infrastructure financing, reducing the role of equity, which currently accounts for some two-thirds of total funds (with loans accounting for the other one-third), to a mix that is more even across equity, loans, and bonds. Doing so would allow China to cut its cost of capital by between 1 and 2 percent. However, to achieve this would require substantial reforms to its financial system, looking at its "software" rather than just its "hardware" (see "Implications for urban infrastructure" in this section of volume II).

11. Impacts of urbanization: Technical appendix

To evaluate the pros and cons of our trendline forecast and our four urbanization scenarios, the McKinsey Global Institute (MGI) constructed a series of sector-specific working models to forecast the evolution of a series of variables under each scenario (Exhibit 3.11.1).

Exhibit 3.11.1

McKinsey Global Institute's All China model system



* Scenario definition models are essentially population models that generate population figures for our trendline projection and four urbanization scenarios.
Source: McKinsey Global Institute analysis

The first task was to define the scenarios in terms of their population distribution across cities over the period under study. We did this by means of hypothesizing a coherent set of distortions to underlying population-growth trends. For example, we accelerated megacities in a supercities scenario, while decelerating all other cities. With these definitions in hand, we then forecast economic performance under each scenario, using sensitivities to population dynamics derived from the China City model (CCM) system and other factors reviewed in academic papers.

We then constructed models building on these two foundations. These working models cover the economy, labor, skills, construction, infrastructure, intercity transport, arable land, energy, energy/smart growth, water, pollution, and funding urbanization (government spending). We use observed relationships among these drivers, additional data (for example, geography and price), and relevant output factors to construct these satellite models, which forecast dynamics in respective areas.

We now turn to our methodology in defining population, and then we look at the ten sector-specific satellite models that correspond to the ten sections on the impact of urbanization on different metrics that make up chapter 3 of volume II.

POPULATION

Our analysis of China's urbanization scenarios began with defining the various population distributions underlying each of them. To arrive at this definition, we used a series of distortions that form the essential technical theoretical definition of the scenario. We then transformed these via logical steps into a complete population model for all cities over the period 2005–25.

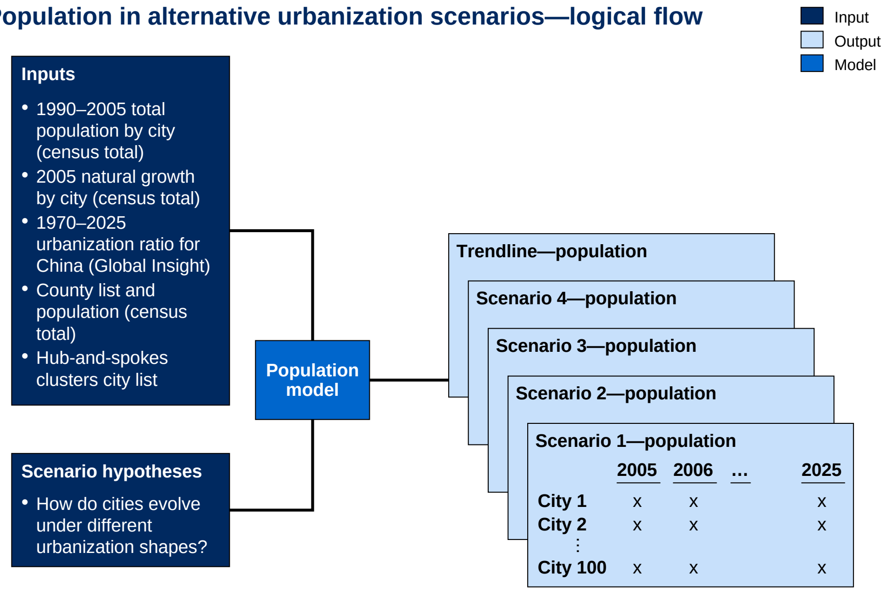
Methodology

The broad methodology of the population definition model can be seen in Exhibit 3.11.2. We took as input the historical population for each city, based on a census total as embodied in MGI's China City model. We also used census data for all the counties in China (i.e., noncities), as well as the natural growth rates for all cities. Using this data, we divided the cities in each scenario into two distinct sets—those that would be accelerated or favored under a particular scenario, and the rest. For example, under a supercities scenario, the "accelerated" cities are those 15 that would become megacities. In a distributed growth scenario, the first group consists of cities with populations of between 0.5 million and 4 million as cities of this magnitude would be likely to become midsized cities by 2025.

For the remaining cities, we then adjusted their growth rates to keep total urban population growth broadly in line with forecast trends. In other words, we apportioned the remaining urban population growth in accordance with each "remainder" city's share of historical growth. The result was a complete set of population time series for each city under each scenario.

Exhibit 3.11.2

Population in alternative urbanization scenarios—logical flow



Source: McKinsey Global Institute analysis

Assumptions

- **Supercities**

  — We classify as "potential" supercities urban centers with populations of more than 7 million today, or above 4 million today and with historical compound annual growth rates of more than 6.5 percent.

  — These cities accelerate to twice their historical population-growth rates over the next 20 years (based on the demonstrated performance of Tokyo, New York, and Mexico City).

  — The expansion of these cities decelerates when they reach the 25 million to 28 million people population mark (around 2 percent of the national population), before reaching a plateau at the 36 million mark (3 percent of the national population point when growth reverts to its natural rate).

  — The same number of cities will develop as in MGI's trendline projection.

- **Hub and spoke**

  — We classify cities as hubs and spokes when the urban clusters in aggregate accelerate to twice their previous growth rates (roughly in line with performance of the Seoul cluster in South Korea).

— Hub cities account for a maximum of 50 percent of total cluster population (based on Guangzhou-Shenzhen in Pearl River Delta).

— Accelerated spoke cities have a maximum growth rate of 11 percent per annum, the maximum seen over a 20-year period (stripping out outliers such as Shenzhen). This is also in the line with the fastest growth rate seen elsewhere, for example, Chicago at the turn of the 20th century.

— Clusters plateau—decelerating to natural growth rates at 6 percent of the total population or 72 million people.

— The number of cities is the same as in MGI's trendline projections.

- **Distributed growth**

— Cities in smaller regions—those with less than 20 percent of the total urban population—accelerate to double historical growth rates.

— Cities with populations of between 0.5 million and 4 million maintain historical growth rates, while others decelerate in the long term toward natural growth rates.

— The number of cities is in line with MGI's trendline scenario.

- **Townization**

— Cities with populations of 0.3 million to 0.7 million people (0.02–0.05 percent of national population) accelerate to three times the national urban population growth before decelerating significantly once they have reached the 1.08 million population threshold.

— From 2008, new cities develop at an increased pace, ramping up to a rate of 20 new cities per year from 2010 onward.

Sources

- Individual city population: China City model; National Bureau of Statistics (NBS)
- Natural growth rates: NBS
- County populations: NBS

- National population, historical: NBS
- National population, forecast: Global Insight
- Hub-and-spoke list: National Development and Reform Commission (Jincheng Xiao, Zhu Yuan, NDRC Regional Economic Research Institute)
- International comparisons: Demographia; Tokyo Metropolitan Government; Japan Statistical Yearbooks; KOSIS (Korea Statistical Information System); US Census Bureau; Federal Office for Construction and Spatial Structure (Germany); "One hundred years of economic statistics," *The Economist*; School Census of the City of Chicago; CONAPO (Mexico)

1. ECONOMIC GROWTH

The first major result of our scenario analysis comprised projections for different economic outcomes. We employed some fundamental methodological choices, but our findings were largely an immediate derivation from the population distributions in different urbanization scenarios.

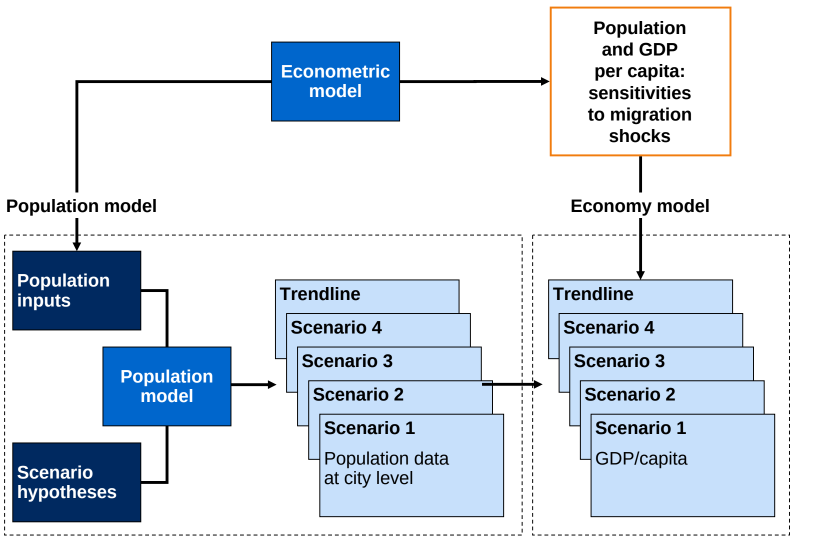
Methodology

Underlying our methodology is MGI's CCM econometric model and this model's estimates of growth in GDP and per capita GDP (see Exhibit 3.11.3 for the logical flow of our scenario economic analysis). In order to derive the returns to cities from changes in their long-term population, we "shocked" the CCM model by increasing the net rate of migration by 10, 50, 100, and 300 percent. We then observed the impact on the per capita GDP of cities in multiple size categories (Exhibit 3.11.4). After this, we applied these impacts on a "percentage change per person" basis, with the premise that changes in city structure from this model are driven by the arrival of incremental people rather than by proportional changes in population structure.

We then modeled the productivity up- or downgrade of major scale shifts by comparing the average per capita GDP of a city's historical trendline-based population category (with ten distinct population categories) to each city's population category in the scenario under consideration. We then applied the ratio between these categories—whether positive or negative—to the city's per capita GDP. This had the effect of limiting the impact to the 10 to 15 percent upside per doubling of population that has emerged from academic literature.

Exhibit 3.11.3

Linkage between the population and economy models in defining scenarios

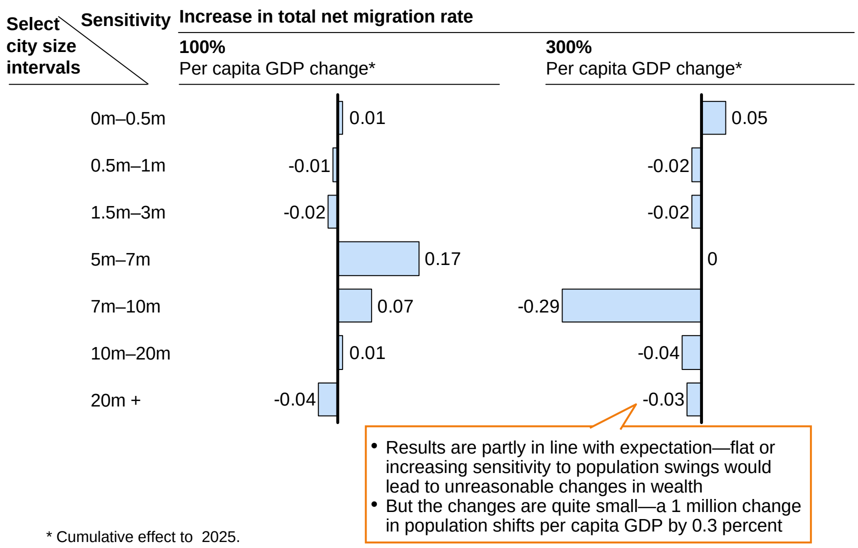


Source: McKinsey Global Institute analysis

Exhibit 3.11.4

Diminishing returns to GDP occur in midsized and megacities as they expand their migrant pools

% per thousand people in 2025



* Cumulative effect to 2025.

Source: McKinsey Global Institute China All City model; McKinsey Global Institute analysis

For our analysis of Shanghai's future economic structure, we applied sets of assumptions for scale-up services, high-value pillar industries, and "steady-growth" manufacturing and services to their labor, GDP, and productivity in a supercities scenario (Exhibit 3.11.5). We describe the granular productivity and GDP results in Exhibit 3.11.6.

Exhibit 3.11.5

In a supercities scenario, we could expect sectors to grow at pace with the economy

Future sector	Drivers of growth: Employment	Productivity	Output
"Scale-up" services*	• Correlated with population • Benchmarked against international comparisons (e.g., retail and wholesale jobs per 1 000 people equivalent to Singapore)	• In general, current trend but slows with overall forecast (from 11% to 7%) • For high outliers, matched to overall trend and/or similar sectors	• Determined by employment and productivity
High-value "pillar" industries	• Determined by output and productivity	• Maintain current trend growth rates (i.e., outperform city as a whole)	• In general, grows with city as a whole • Outliers (e.g., general equipment at 29%) moderated down in relation to average city growth
Steady-growth manufacturing and services	• Determined by output and productivity	• In general, current trend but slows with overall forecast (from 11% to 7%) • Price-sensitive sectors (e.g., chemicals) in cases of global inflation slow to city average growth	• In general, current trend but slows with overall forecast (from 11% to 7%) • High outliers, particularly price-sensitive sectors (e.g., chemicals), slow to city average growth

* Mimics the general relationship between services as a share of output and per capita output.
Source: Shanghai Statistical Yearbooks; McKinsey Global Institute analysis

Exhibit 3.11.6

Growth in output per worker in different economic sectors in Shanghai

Subsector	2006 output Renminbi thousand per worker, 2000	2025 output Renminbi thousand per worker, 2000	2004–06 Compound annual growth rate (CAGR), %	2006–25 CAGR %
Retail and wholesale	69	170	8	5
Resident services	14	29	17	4
Business services	65	88	3	2
Transportation, warehousing	136	695	15	9
Communications equipment, etc.	1,238	4,271	7	7
Real estate	230	270	1	1
Education	113	691	16	10
Hospitality	75	75	5	0
General equipment	602	5,337	2	12
Garments, shoes, etc.	184	975	15	9
Electrical machinery	580	4,320	11	11
Transportation equipment	939	9,941	13	13
Finance	422	1,455	7	7
Public administration	114	651	16	10
Welfare	88	330	12	7
Metal products	403	1,034	8	5
Scientific/technical research	145	449	6	6
Textiles	227	824	11	7
Plastic products	330	1,081	10	6
Special-purpose equipment	390	1,529	12	7
Chemicals*	1,170	3,876	32	7
Recreation	87	165	6	3
IT	426	10,559	18	18
Nonmetal Minerals	446	1,413	10	6
Other	79	79	16	3

* Current high output growth due to high commodity prices in 2006; return to more stable cycle expected over 20 years.
Source: Shanghai Statistical Yearbooks; McKinsey Global Institute analysis

Assumptions

- We calculate sensitivities on an absolute, rather than a relative, basis.
- Increases in GDP from shifts between categories have a cap on their upside of 15 percent.[67]

Sources and inputs

- Scenario population figures
- Population categories: 0.5 million, 1 million, 1.5 million, 3 million, 5 million, 7 million, 10 million, 20 million, 30 million
- Sensitivities to population changes from CCM econometric model
- Literature: Chun-Chung Au and J. Vernon Henderson, "Are Chinese Cities too small?" *Review of Economic Studies*, 2006, Vol. 73, No. 3, pp. 549–76; Edward L. Glaeser, *Urban colossus: Why is New York America's largest city?* Harvard Institute of Economic Research Discussion Paper No. 2073, June 2005

2. LABOR AND SKILLS

We conducted two analyses—one of the overall labor market and the other of university graduates. For both of these, we estimated aggregate demand based on growth in the economy and its underlying productivity, and then we forecast supply based on current demographic and educational trends.

Labor methodology

The first step of our analysis used CCM's trendline GDP forecasts for each city as well as age-breakdown estimates. We then applied a national labor force participation ratio (i.e., the proportion of people over age 15 who are working). We calculated this from the trends evident in census data series, modified by the evolution of the age structure from the trendline forecasts, i.e., taking into account the shift in the 15-plus age bracket toward mortality. The decline is moderate from 67 to 63.5 percent, reflecting the high ratio of the elderly that work in China (22 percent of those aged 65 and above). With this data, we calculated the 2025 trendline workforce in each city and, dividing out GDP, the trendline productivity in the city. Using this trendline productivity, we

67 Chun-Chung Au and J. Vernon Henderson, "Are Chinese cities too small?" *Review of Economic Studies*, 2006, Volume 73, No. 3, pp. 549–76.

then estimated the required labor force in each city under each scenario while we used age breakdowns to estimate labor supply for the cities. From this, we derived an indication of the likely structural tensions in each city's labor market—the tendency toward "shortage" or "surplus."

At the same time, we forecast the evolution of the labor force in each city under "static" conditions, that is, with no population expansion other than from natural growth. To do this, we took the 2005 labor force and added to it those under 15 in 2005 and those born between 2005 and 2010. We then subtracted those in the 45 to 65 bracket in 2005 as well as forecast deaths among those aged 25 to 45 in that period. Comparing labor force demand in 2025 under each scenario allowed us to estimate the portion of the labor force in each city that would need to be made up of new urban residents.

Labor assumptions

- Labor markets in every city are "balanced" in 2025, that is, demand matches supply.
- Cities' natural growth rates slow down over the next 20 years in line with the decline in national natural growth rates.
- Labor force participation rates are homogeneous across cities—simplifying the assumption.
- Unemployment rates are homogeneous in every city—data integrity issues prevent any other input. Urban unemployment declines very moderately over time to stabilize at the government target of 4 percent.
- Demographics of Shanghai migrants—only those for which we have reliable data—roughly match the rest of the country.

Labor sources and inputs

- Labor force participation ratio in differing age brackets: NBS, Ministry of Labor, press search
- Population age structure breakdown: CCM
- Shanghai demographics: Shanghai Migrant Survey 2000
- UN demographics division's age forecasts for China

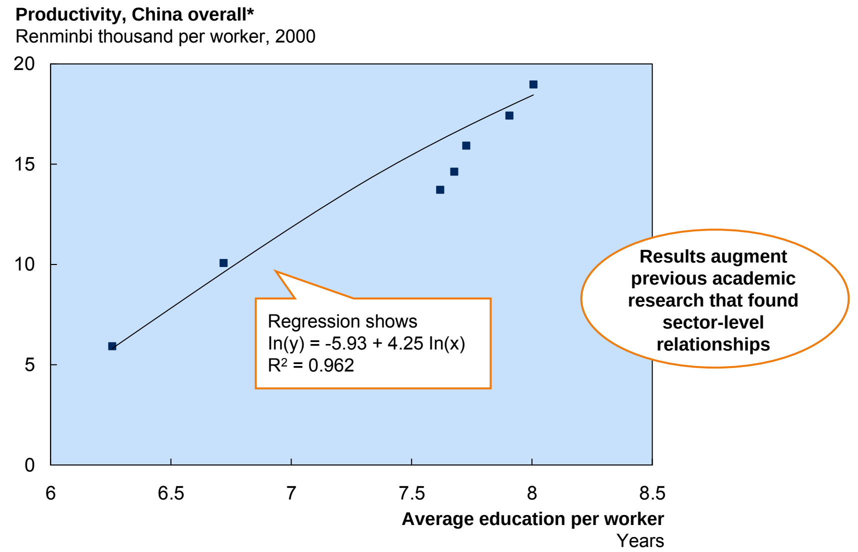
Skills methodology

To estimate the evolution of skills in urban China, we decided to analyze university graduates in total because, although the talent market operates on a much finer level—that is, in specific professions—there are data limitations. We first estimated the demand for graduates and then compared this to forecasts of supply.

For demand, we first derived a relationship between average education years in China as a whole and basic productivity figures (Exhibit 3.11.7). We made the methodological assumption that this national-level assumption would apply to individual cities uniformly. This would mask some differences but on the whole matches what we have observed in the cities we visited. Using the relationship, we calculated the average education years for each city over time.

Exhibit 3.11.7

Average education levels are closely tied to productivity growth



* 1990, 1995, 2000–04 data.
Source: China Statistical Yearbooks; China Population Statistical Yearbooks; McKinsey Global Institute analysis

From interviews, our visits to case cities, and data from further example cities, we then estimated the education profile of the labor force for a city within a given size bracket—assuming some homogeneity in the profile among city sizes. Similarly, we estimated the evolution of this profile, as educational attainment rises in general, using both enrollment forecasts from the CCM and interviews with education experts. Working backward from the average education years, we then estimated the proportion of the workforce the productivity level implied had a college education. This then is the demand for graduates in the workforce.

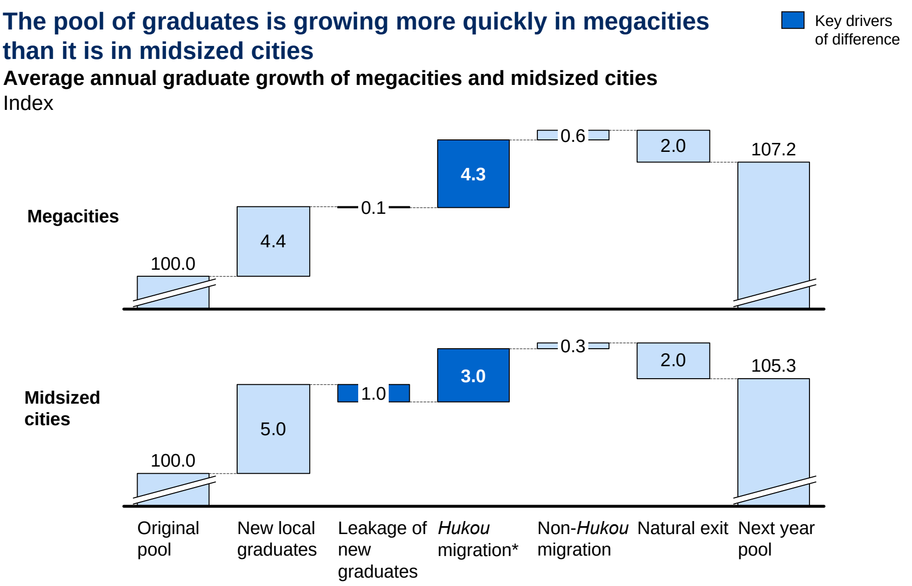
For talent supply, we evaluated the annual flow of graduates within each city, based on graduate numbers (in turn derived from CCM enrollment forecasts), migration of college graduates from other cities, and out-migration of graduates from the city in question (Exhibit 3.11.8).

Exhibit 3.11.8

The pool of graduates is growing more quickly in megacities than it is in midsized cities

Average annual graduate growth of megacities and midsized cities

Index



Note: Numbers may not sum due to rounding.

* Including students from outside the city studying at a local institution and receiving a *Hukou* upon graduation.

Source: China Labor Statistical Yearbooks; city statistical yearbooks; 1% census; literature search; interviews; McKinsey Global Institute analysis

Skills assumptions

- Size categories among cities are homogeneous.
- The minimum threshold of primary school–only percentage of the workforce is as follows: big towns, 10–15 percent; small cities, 5 percent; midsized cities, 2 percent; big cities, 1 percent; and megacities, 0 percent.
- Annual graduates are one-fifth of that year's employment (to take account of dropouts, more first years than final years, etc.). This assumption matches history quite well.

Skills sources and inputs

- Workforce education breakdown: yearbooks; interviews
- In- and out-migration of graduates: interviews

- Annual change in proportion of workforce with only primary or junior high school degrees: interviews, CCM primary/junior enrollment forecasts

- CCM enrollment forecasts

3. BUILDING CONSTRUCTION

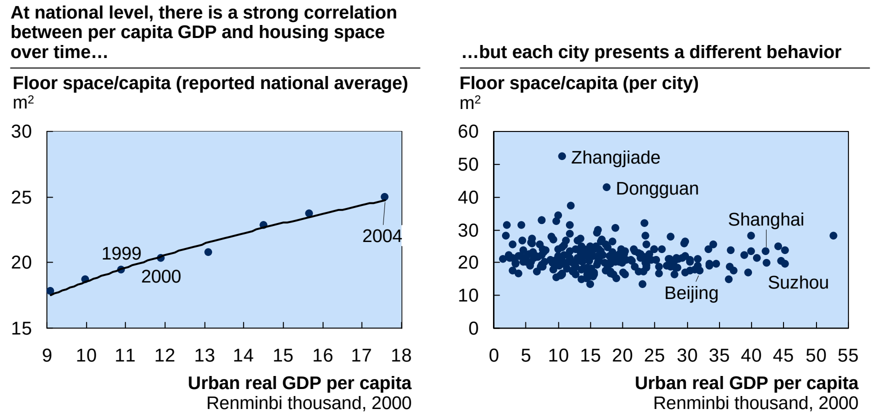
We constructed models to forecast demand for residential floor space at city level, aggregate urban demand for nonresidential space, and the resulting building profile, investment, and basic-materials demand.

Methodology

For construction, we started from the observed relationship between per capita GDP and residential floor space per capita (Exhibit 3.11.9). We used a national correlation applied at city level, using CCM and scenario economics and population model forecasts of per capita GDP and population to determine the evolution of the residential stock of floor space in each city. For each city and year, the addition in net stock, plus the rebuild rate, produced the growth path of construction. We then adjusted this downward by a factor of approximately two-thirds to match the historical national construction figures (indicating that even our downward-adjusted floor space per capita estimates are conservative).

Exhibit 3.11.9

MGI has also adopted a per capita GDP-based approach applied to the city level



- Over time trajectories have similar shape
- Affordability—wealth and price—determine space in each city
- Price in turn reflects local GDP, construction costs, mortgage markets, etc.

Source: National Bureau of Statistics; Ministry of Construction; McKinsey Global Institute analysis

For nonresidential floor space, data limitations restricted our analysis to an all-urban forecast. We observed a strong correlation between sectoral GDP and all urban floor space. The limited time series prevented a strong conclusion on the type of relationship (linear or logarithmic). We found that the most recent indications from press reports most closely match use of a linear relationship for commercial space and services GDP, and the average of a linear and logarithmic relationship for industrial space and industrial GDP. We have therefore used those forms in projecting national space. The combination of net additional stock and rebuild requirements gives the annual construction.

To estimate the required number and type of buildings we then applied standard building profiles by city size, as explained in the construction section in this chapter.

Projecting trends in nonresidential floor space is hampered by the fact that there is no data series long enough to determine trends on the basis of historical experience. We instead used a combination of trend data—for per capita evolution—and different starting points, and we then adjusted the calculations to reported construction.

Assumptions

- County cities and "unofficial" cities have the same GDP per capita to floor space per capita relationship observed in the smallest prefectural cities.
- Rebuild rates gradually decrease over time to reach 1.5 percent in 2030 and 0.5 percent, or developed world levels, by 2050.

Source and inputs

- City data: China City Statistical Yearbooks
- National-level city commercial and industrial construction: Ministry of Construction
- Rebuild ratios: interviews with developers; press searches
- Caps on big- and megacity floor space: interviews with developers
- Building profiles: city visits
- Steel demand: interviews

4. URBAN INFRASTRUCTURE

We reviewed all major urban infrastructure needs but developed detailed analysis focused only on the infrastructure that cities would have to build to provide transportation for their populations. To do so, we disaggregated the components of urban transit and built demand projections for each component, constraining the total system to serve peak-hour commuters adequately. We then used these demand forecasts to estimate investment.

Methodology

We used a complex construction of different factors to estimate future requirements in public transport, including road and rail demand, using a combination of government criteria, international benchmarks, and our estimates of population and GDP. First, we estimated modal shares based on a combination of factors including a regression of public-transport share to density, which yielded a high correlation; cities' own stated targets; and central government targets for broad categories of cities.

We then estimated peak population using forecasts of age distribution and labor force participation. We assumed that everyone age five and up commutes (e.g., for education) and that the entire workforce commutes. To determine whether or not cities would build rail, we applied central government targets for subway and light rail. These take the form of criteria by which cities are for the moment permitted and in the long term required to build these systems. To estimate the extent of these systems, we benchmarked each city in terms of land area against currently known plans for systems in similar type cities.

For road area we used the modal shares we have described, combined with peak population shares, to forecast the number of commuters per mode each day. We then combined this with standard benchmarks of the amount of road space required for each transport mode (from 40 square meters per private vehicle commuter to 5 square meters for cycling). Where necessary, we adjusted this calculation of latent demand to the maximum potential road space in the city, using a benchmark of 20 percent of total land area that can be used as road area. Combining all of this, we found demand for road area, buses, and so on and compared this to current supply. We then used some basic yardsticks for cost per unit against each element.

Assumptions

- Example cities provide a good comparison set to determine transport modal splits.
- Modal splits are homogeneous among cities within the same size bracket and transit classification.
- Cost of equity on public-transit systems is 9 percent.
- "Tolerable" mass-transit vehicle usage is 80 percent.
- Bus fleet replacement cycle is eight years, according to China's regulation.
- These are investment benchmarks: subway, 500 million renminbi; light rail, 250 million renminbi; mass-transit vehicle cost, 6.8 million per vehicle; road, 800,000 renminbi per square meter; bus, 200,000 renminbi per unit.

Inputs and sources

- Road area in square meters per mode of transport: Land Use Planning and Urban Transport, German Association for Technological Cooperation
- Current modal splits: City statistical yearbooks
- Targeted modal splits: City five-year plans
- International densities and public-transport usage: Land Urban Planning, Demographia
- Mass-transit planning criteria: Ministry of Construction
- Mass-transit vehicle capacity: McKinsey Infrastructure Practice
- China National model for long-term interest rates in 2005

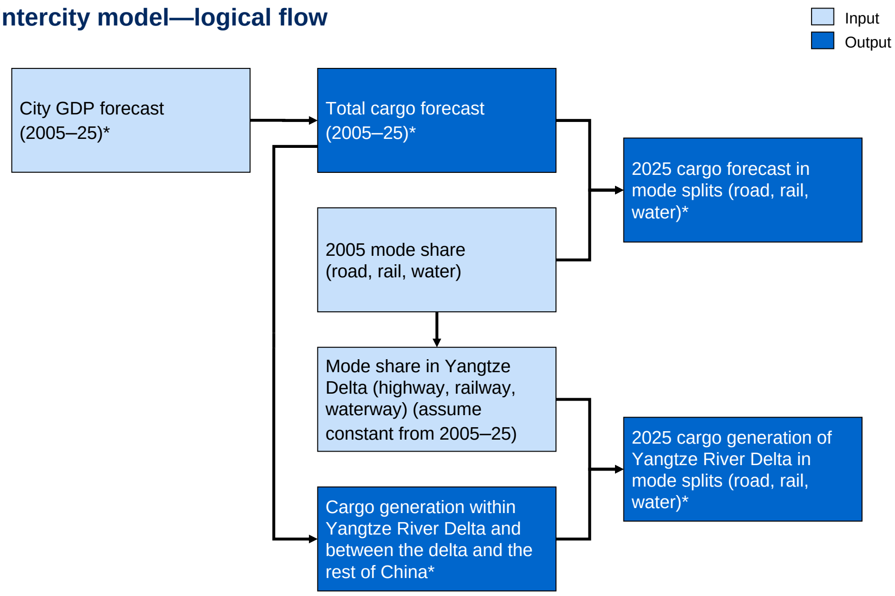
5. INTERCITY TRANSPORT

Methodology

We divided Chinese cities into five categories, each with a strong correlation between GDP and freight origination. We then applied the regression formulas from these groups to our various forecasts of GDP to compile our forecast of city-level cargo (Exhibit 3.11.10).

Exhibit 3.11.10

Intercity model—logical flow



* For trendline and four urbanization scenarios.
Source: McKinsey Global Institute analysis

To estimate modal shares, we did not forecast individual cities' adjustments in modal shares, considering it beyond our scope. Rather, we took 2005 data on the modal shares for each city and applied the percentage breakdown as it existed then to 2025 total cargo forecasts. Results, therefore, are indicative only.

To estimate investment requirements in the Yangtze River Delta (YRD), we took today's origination and destination (OD) data as far as we could locate these using existing Chinese data, global trade flow databases, and other sources, and then we adjusted for potential scenario outcomes. We then derived freight volumes for the various modes within the delta. We translated cargo weight into trucks and road lengths and used peak-hour transport to estimate needed capacity. For rail, we used 2005 cargo turnover as maximum capacity per kilometer and berth (given capacity constraints are evident in China's rail network). For waterway freight, we translated cargo weight into a number of average berths. Using these methodologies, we arrived at an aggregate set of demands for different freight modes—for highway and railway kilometers as well as water berths—and then applied some simple benchmarks on investment amounts to get the total.

To estimate the expansion of the highway network in a townization scenario, we used criteria from the government's road agency to estimate the total number of cities. We then used the average length of highway per city in the network and adjusted this downward to take into account greater proximity to the network in new cities in order to arrive at an estimate of additional length.

Assumptions

- Cross-sectional regressions of GDP and freight traffic among cities in a specific year will hold for single cities over time.
- YRD assumptions include an average road trip of four hours; length of road traffic peak hours of three hours; peak hours' volume as a proportion of daily volume of 33 percent; and peak cargo days in the year at 344.

Sources and inputs

- Historical freight origination: NBS National City Yearbooks
- GDP: CCM and scenario definition models
- YRD: global trade database
- Highway benchmarks: Guangdong Road Engineer Price Info Network; ChinaCars.com
- Rail benchmarks: China Railway Industry Annual Report, 2007
- Port benchmarks: Drewry shipping report

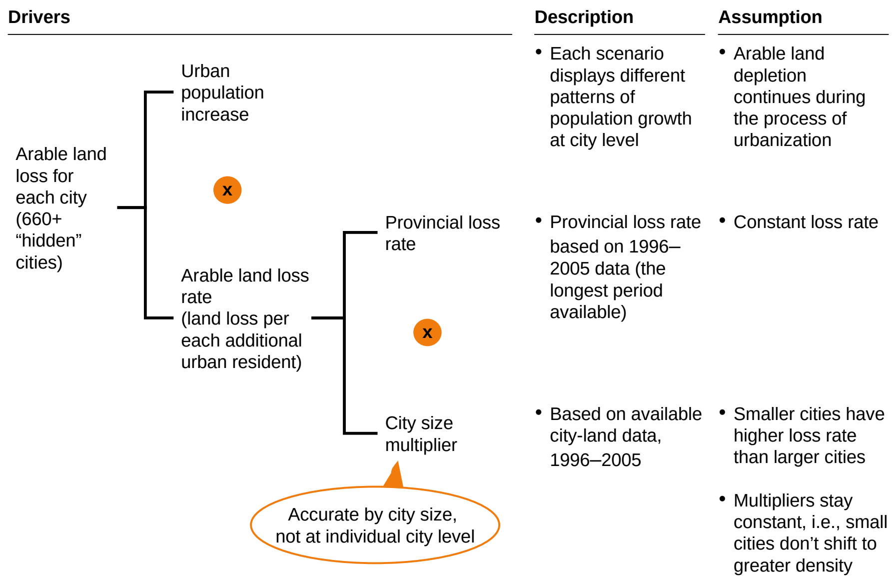
6. ARABLE LAND

Methodology and assumptions

To forecast arable land trends, we used a bottom-up methodology (Exhibit 3.11.11). For our projections of the rate of loss of arable land, we assumed that the historical provincial loss rate would remain stable over the next 20 years. We then looked at how much land cities of different sizes have been losing. Our analysis showed that larger cities lost land less quickly than their respective provinces, while smaller cities lost land more quickly than their provinces. Through this exercise, we arrived at a set of "city-size multipliers" that we used to calculate a rate of arable land loss per new resident for all the cities we analyzed. We then applied this rate of loss to our projections for population growth in each city between 2005 and 2025 that we derive from our trendline and scenario population models.

Exhibit 3.11.11

MGI's arable land analysis adopts a bottom-up methodology



Source: China City Yearbooks; McKinsey Global Institute analysis

We also built our food-production forecasts from the underlying drivers. We used provincial-level data on cultivation cycles (the national average is 1.25) and the share of sown land employed in production (with a national average of 66 percent). We assumed both of these factors would remain constant. We acknowledge that large-scale changes in climatic conditions could change these averages, but projecting these developments is beyond the scope of this report.

Sources and inputs

There are many data sources available for estimating the arable land implications of urbanization, but these are often contradictory (Exhibit 3.11.12). For instance, there have been widely varying estimates from different ministries and private institutes for the stock of arable land at the provincial and local levels. Based on a number of interviews, MGI has used the following sources for each level of analysis, which we believe to be the most authoritative:

Exhibit 3.11.12

Different sources of arable land data are inconsistent and incomplete

Data used for arable land analysis

Category	Source	Rationale/remarks
National and provincial arable land	Ministry of Land and Resources	Ministry of Land and Resources began conducting systematic surveys in 1996. Before then, there was no comprehensive land survey. National Bureau of Statistics data is not up-to-date
City-level arable land	China City Yearbook 1990–2005	While data set is incomplete between 1996 and 2005 for all cities, available city-level data points provide strong reference for city size multipliers
Productivity (per hectare yield)	National Bureau of Statistics	Productivity figures from National Bureau of Statistics are survey-based, not based on self-report numbers by farmers

- Widely varying estimates
- No single authoritative source even within the Chinese government
- Expert interviews revealed "trusted" sources

Source: Expert interviews; literature search; McKinsey Global Institute analysis

- National and provincial arable land estimates: Ministry of Land and Resources, which began conducting systematic surveys in 1996, before which no comprehensive land survey was available; alternative land data from the NBS not sufficiently up-to-date

- City-level data: China City Yearbook 1990–2005, which, apart from the period between 1996 and 2005 when complete data is not available for all cities, provides a strong reference set

- Yield and production data: NBS, whose production figures are survey-based rather than self-reported by farmers and, we therefore believe, less liable to bias

- Estimates of changes in rural population and labor force: UN population forecasts for China's demographics; consensus forecasts for China's total population; forecasts of urban populations and workforces from our trendline and scenarios models

- Qualitative inputs such as the levers for increasing food production: interviews with relevant experts in China; published research

7. URBAN ENERGY DEMAND

Methodology

We based our projections of energy demand growth in urban China on the MGI Global Energy Demand model, principally using energy-intensity data and forecasts, and extending MGI's demand projections beyond 2020 to 2025 using International Energy Agency (IEA) figures. We estimated city-level energy demand by linking the MGI and IEA projections on energy intensity to 2025 to projections of population and GDP growth, for instance, for each city in each urbanization scenario. For industrial and agricultural energy demand we matched national- and sector-level energy intensities to city-level drivers, such as sectoral GDP. At the same time we adjusted these national intensities to take into account higher efficiencies in more developed cities. For other sources of energy demand, such as residential and transportation, we linked forecast for the drivers (e.g., lighting intensity per square meter) to city-level projections for each scenario (e.g., of net floor space). Aggregating these various sources of demand, we found that overall energy intensity will fall in cities of varying sizes and that the absolute gap between the levels of intensity in different-sized cities will narrow.

To model fuel intensities, we built on the historical fuel intensities of China's provinces and prefectural cities, for which data is available. We then projected city-level total energy-intensity improvements onto these to estimate fuel intensity for each city in the future. This allowed forecasts of total fuel use for each city in the future (e.g., quadrillion British thermal units of coal for Qingdao). Comparing these to total energy use, and triangulating with government plans for the expansion of renewables (which we assume are largely going to be met), provided estimates of fuel shares for each city, on a ceteris paribus basis (noting that changes—for example, delivery of new gas supplies to a specific city—could change the picture dramatically).

Assumptions

- Fuel-mix intensities per industry fall in proportion to the industry's overall energy efficiency. Radical shifts in a city's mix due to unexpected supply changes are not considered. For example, whether or not a new gas field is found near the city is not taken into account.

Sources and inputs

- Specific drivers such as vehicle miles traveled, lighting intensity per square meter, heating and cooling intensity: MGI

- Other assumptions (e.g., decline in lighting intensity, drop in vehicle miles traveled per vehicle, renewables expansion plans): MGI, *Curbing global energy demand growth: The energy productivity opportunity*, May 2007; National Development and Reform Commission, *Midterm and long-term development plan for renewable energy*, 2007

- Appliance penetration curves: ibid.

- National energy intensity: IEA

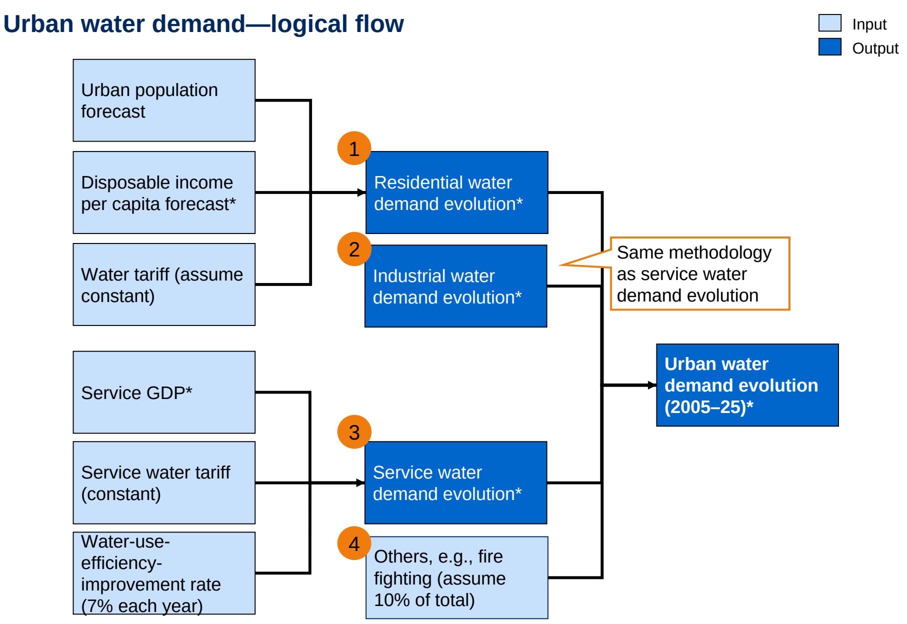
- Fuel intensities: City Energy Yearbooks

8. URBAN WATER

Methodology

We used a bottom-up methodology to develop our forecasts of urban water demand and structured the analysis into four primary components (Exhibit 3.11.13):

Exhibit 3.11.13



* For trendline and four urbanization scenarios.
Source: McKinsey Global Institute analysis

We estimated residential water demand based on a logarithmic correlation between residential water demand and population, income, and water tariff (Exhibit 3.11.14). We used a snapshot of 2005 data to derive the equation and assumed the water tariff as a constant in the next 20 years.

Exhibit 3.11.14

After discarding multiple methodologies, we used a triple regression for residential water demand

Methodology	Description	Barriers	Adopted
• Link with per capita GDP	• Relationship between per capita GDP and residential water use per capita was tested	• Regression yielded no significant relationship	✗
• Bottom-up	• Components of residential water demand were identified and individually analyzed to link with urbanization parameters, e.g., we attempted to find the relationship between number of showers per week and economic indicators	• Data are hard to obtain for key components of household water use, including flushing toilets and taking showers • Composition of household water use is subject to change in the future and cannot be reasonably estimated	✗
• Multivariable regression with population, income, and water tariff	• Based on an academic paper and literature search • Relationship between total residential water demand and three variables was tested with 2005 data		✓

Source: McKinsey Global Institute analysis

We estimated industrial/service water use based on a linear correlation with industrial/service GDP and water tariff. We derived the linear equation from a regression on 2005 city-level data for different regions.

We divided our estimation of water infrastructure investment into two parts—investment in pipeline and in water plant:

1. We estimated investment in pipelines based on changes of water demand. Length of pipeline has a linear relationship with water demand, while we established the investment level per unit length of pipeline through a literature search. Pipeline investment is the product of the two.

2. To arrive at an estimate of investment in water plant, we analyzed changes in water demand. We assumed that the increase in water demand could be accommodated by building plants of four different sizes, with large plants preferred over small ones. We established the investment required for water plants of different sizes through a literature search.

Analysis of water-saving potential focused on two components—water-saving potential of residential water use, and industrial water use. Additional potential to save water from service water use was determined to be limited, based on interviews with academia.

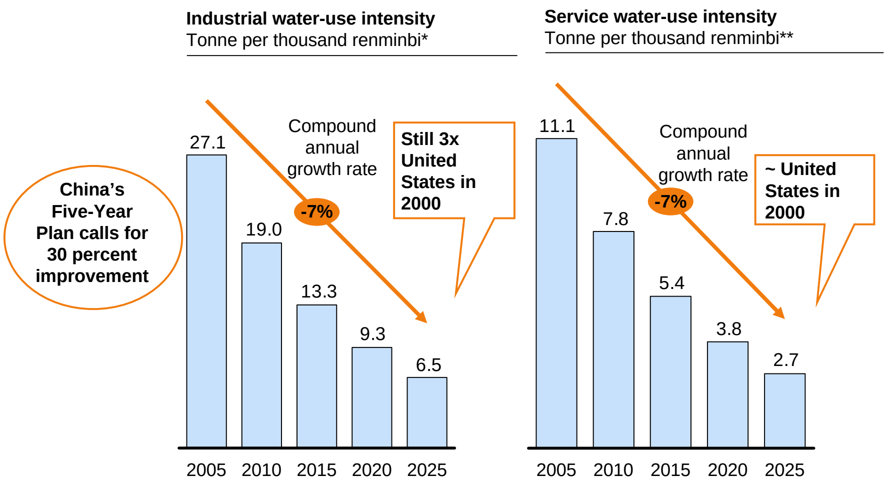
1. We derived the water-saving potential of residential water demand from two means—price increase and the adoption of water-saving devices. We estimated the effect of raising the water tariff by factoring in the changes of price into the previous modeled output. We estimated the effect of the adoption of water-saving devices using a bottom-up methodology.
2. We identified the main lever for saving water in industry to be the water-reuse ratio and based our estimate of changes in this ratio on historical analysis.

Assumptions

- Based on historical trend (regression with 2003 and 2004 city-level data) and analysis of international counterparts, we assume a reasonable level of water-use-efficiency improvement of 30 percent every five years, as mentioned in the 11th Five-Year Plan (Exhibit 3.11.15).

Exhibit 3.11.15

We assume China will continue to meet its goal of a 30 percent improvement in water efficiency every five years



* Industrial GDP.
** Service GDP.
Source: China Urban Construction Statistical Yearbooks; McKinsey Global Institute analysis

- We assume firefighting and other sources of water consumption to be a constant percentage of urban water demand (at 10 percent), because of the limited amount that this source of demand for water represents and a lack of sufficient data to make an effective forecast.

- To estimate rural water demand, we took a high-level approach and assumptions. We linked agricultural water use directly to available arable land, and rural residential water use directly to the rural population.

Sources and inputs

We used multiple data sources, because there is no consistent source that captures both national- and city-level statistics. We therefore evaluated on a case-by-case basis the authority and reliability of the data sources and cross-checked the statistics to match different levels of data. Specifically, we used the following resources for the main body of our analysis:

- City-level data on residential, industrial, and service water demand: China Urban Construction Statistical Yearbook 2000–05, which, although the snapshot dataset for 2005 does not include data for all the cities, is the most complete source we have found thus far

- City-level data for the average salary of urban employees (a meaningful approximation of income): China City Yearbook 1990–2005

- National and provincial level of water use under various categories: China Water Resources Bulletin 2003–05

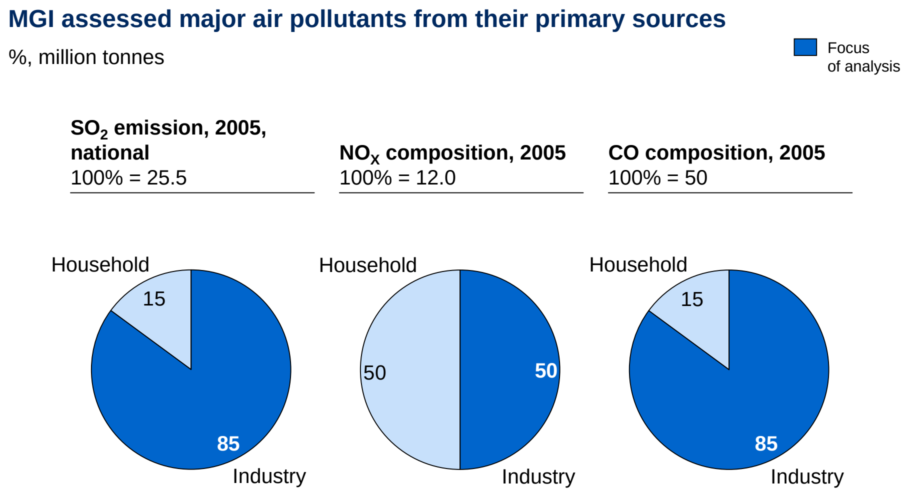
- Statistics on industrial water use and water reuse, especially the breakdown between high-water-consumption industries and other: CEIC database

9. URBAN POLLUTION

Air pollution methodology

For our projections of the major air pollutants—PM_{10}, NO_x, CO, and SO_2—we focused on the principal drivers of emissions, notably construction, transport, industrial GDP, and energy use (Exhibit 3.11.16). We then calculated each of these as follows:

Exhibit 3.11.16



Source: China Statistical Yearbooks

- For PM_{10}, we took the amount of floor space being constructed and divided by an assumed average floor space ratio to calculate ground area disturbed. We then multiplied this by the average months of construction in China. From there we calculated the PM_{10} emitted by building activities. For transport, we multiplied our projections of passenger cars by average vehicle miles per car and emissions per mile.

- For NO_x and CO, we applied a similar methodology to PM_{10}. We multiplied the number of cars by the vehicle miles traveled and emissions per mile.

- For SO_2, we took the industrial share of GDP and calculated the historical ratio between that and SO_2 emissions. We then estimated future emissions using the different forecasts of industrial GDP from our underlying models, and used a range of different improvements/deteriorations in the ratio of emissions to GDP.

For each of these pollutants, we calculated the volume of emissions at national level as well as at local level for a set of cities where we felt the data was more reliable (Shenzhen, Nanjing, Hangzhou, Huhhot, and Xingping). At local level, we then applied concentration ratios to the volumes, based primarily on land area and historical data, to estimate local peak concentration.

Air pollution assumptions

- We make the simplifying assumption that the volume-concentration peak ratios will remain static over time. We acknowledge that this is a substantial simplification. However, our purpose was to uncover the impact of the different scenarios. It is beyond the scope of this report to make any estimate of how meteorological conditions might affect those ratios. In any case, we do not have a basis to believe that the external factors affecting this ratio will change significantly between scenarios.

- We make a range of assumptions on the key ratios of emissions volumes to industrial output, vehicle miles, and construction activity, classified under a "best case," "moderate case," and "worst case," basing each on comparisons among cities and to international standards, where possible.

Air pollution sources and inputs

- Air pollution data: NBS City Statistical Yearbook

- EU and US vehicle emissions standards and air pollution standards

- China and US air pollution: National Academy of Sciences

- Disease incidence: Ministry of Health, People's Republic of China

- Time period for construction: press search

- X.Y. Song and S.A. Xie, "Development of vehicular emission inventory in China," *Huan Jing Ke Xue*, June 27, 2006, Vol. 6, pp. 1041–5 (www.ncbi.nlm.nih.gov/pubmed/16921931)

Water pollution methodology

For water pollution we constructed quite simple and high-level forecasts to understand potential future trends. For each city, we calculated the ratio of total wastewater generated to GDP, and the treatment rate of that water. We then made an indicative calculation of the total wastewater generated in 2025 by multiplying the ratio of waste to GDP in 2005 by 2025 GDP. We also calculated the weighted average treatment rate for different classes of cities and, assuming those remained unchanged, calculated untreated wastewater in 2025.

Sources and inputs

- China Urban Construction Statistical Yearbooks
- Target treatment rates: academic interviews
- Water Market China
- China wastewater-treatment plants compilation
- Annual statistical report on environment in China

10. FUNDING URBANIZATION

Methodology

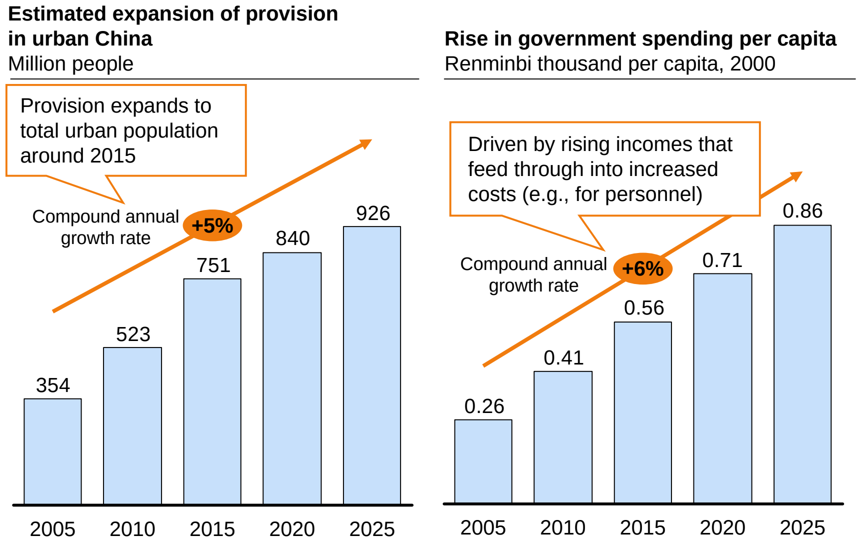
To estimate government spending in 2025, we analyzed each key expense item and drew on other forecasts and models. To do so, we took current spending and applied growth factors for each line item as follows:

- **General administrative.** We broke this category into R&D, agricultural, administrative, and others. We assumed that R&D spending grew at a rate marginally above GDP, in line with the government target to take R&D spending for the economy as a whole from 1.44 percent of GDP to 2.5 percent. We assumed that the share of agricultural spending in GDP drops in line with our forecasts for declining amounts of available arable land. For administrative expenses, we assumed that the number of civil servants grew with population, and their salaries with income. We calculated the "other" expense item as growing in line with GDP.

- **Public services.** For health care, we calculated total spending as a share of GDP and took government spending as a share of that. We assumed that the former would remain steady and that the latter would rise toward levels in more developed countries (Exhibit 3.11.17). We triangulated this estimate with one based on spending per person covered that is rising toward the levels of middle-income Asia, and we found the numbers closely matched. For education, we assumed that per capita costs would rise in line with incomes and calculated spending based on this assumption. We forecast government spending on urban maintenance as keeping pace with the growth of the cumulative stock of urban infrastructure, which we took as an aggregate of our forecasts of each separate piece of infrastructure (urban transit, energy, etc). Again, we assumed some opaque expenses classified as "others" to grow with GDP.

Exhibit 3.11.17

Health care spending rises as urban population and costs increase



Source: Ministry of Health; McKinsey Global Institute analysis

- **City building.** We calculated infrastructure spending as a weighted average of the increases in transit, energy, and water spending. There are other elements of infrastructure spending that we did not calculate, so that we used the previously mentioned elements to calculate a total growth factor and applied that to total historical infrastructure spending. We assumed that government spending on public buildings would increase with overall real-estate investment, as projected in our construction model.

- **Social security.** We calculated social security based on the gap between contributions and payouts (i.e., on a cash basis). We did so using the standard contribution and disbursement rates relative to income for the "basic account" (using income as a proxy for wages), and external estimates of the funding shortfall as a proportion of wages for the accrued individual accounts, with contributors and receivers calculated as a proportion of the overall labor force. We assumed that the participation rate would increase based on observed relationships between per capita income and participation rates. We used demographic and labor force data to model the retirement population.

- **Resources.** We used the energy and water models as inputs on volumes. In our "middle case," we assumed that oil prices would be at $90 per barrel (in 2000 prices), gas at $16 per million British thermal units (MBTU), and coal at 500 renminbi per tonne. We also assumed that implicit energy subsidies amounted to 1.5 percent of the total energy bill (based on estimates by UBS). For water, we assumed the cost to government at 1.5 renminbi per tonne, based on the regulated price of source water. For water in shortage regions, we calculated a price to government that reflected the premium to earn the cost of capital on the south-to-north water-transfer projects. For the savings from urban productivity, we assumed that energy savings would return to government at the corporate tax rate, which we took as a constant 25 percent.

Cross-cutting assumptions

- Overall, we developed three cases for evolution of the key assumptions—low, medium, and high (Exhibit 3.11.18).

Exhibit 3.11.18

We evaluated three cases of funding evolution over the next 20 years

NOT EXHAUSTIVE

Funding "case"	Policy choices	External factors
Low	• Migrant population is not widely covered • Per capita spending grows in line with rising incomes	• Low-range resource prices (e.g., oil at $70*) • "Other" government costs grow with population (i.e., static per capita)
Medium	• Widespread coverage of migrant population • Per capita spending reaches middle-income-country levels by 2025	• Midrange resource prices (e.g., oil at $90*) • "Other" government costs grow with GDP
High	• Widespread coverage of migrant population • Per capita spending reaches upper-middle-income country	• Upper-range resources prices (e.g., oil at $110*) • "Other" government costs grow with GDP

* In 2000 dollars.
Source: McKinsey Global Institute analysis

- Besides those assumptions that we have explicitly mentioned in volume II chapter 3 when we discuss our detailed findings on funding, we make a range of pricing assumptions across spending factors (e.g., that the price of maintenance will not rise in real terms). Our forecasts are all essentially volume based.

- To estimate total spending on urban areas, we added together direct city budgets, town budgets, and central and provincial government budgets spent in urban areas. For the latter, we assume that all provincial-level social security spending was on urban areas (given low levels of social security provision in rural areas). For all other city categories, we assume that cities conduct almost all spending, given the generally high ratios of city government budgets to local GDP (higher than most other Asian cities).

Sources and inputs

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- *China: Pension Liabilities and Reform Options for Old Age Insurance*, World Bank, May 2005
- Interviews with multiple academic experts and officials
- Labor Statistical Yearbook
- World Health Organization
- International Monetary Fund
- China Coal Transport and Distribution Association
- China Energy Statistical Yearbooks
- Lawrence Berkeley National Laboratory
- German Association for Technological Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit [GTZ] GmbH)

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