OVERVIEW

CHONGQING 2035

SPATIAL AND ECONOMIC TRANSFORMATION FOR A GLOBAL CITY

WORLD BANK GROUP

ESMAP
Energy Sector Management Assistance Program


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Foreword

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China's remarkable economic success is inextricably linked to the country's rapid urbanization: the urbanization rate grew from 31 percent in 1996 to almost 59 percent in 2018. Abundant labor, inexpensive land, and a massive boost in infrastructure investments fueled by local governments' drive for investment have formed a conducive environment for such rapid growth.

While the economic transformation has thus far been enormously successful in eliminating extreme poverty and boosting shared prosperity, the accompanying rapid urbanization has been extremely resource-intensive and relies heavily on infrastructure investment. This type of development puts tremendous strains on the environment and is unsustainable in the long term. Recognizing the limitations of the current development model, the government has embarked on a new model of urbanization that prioritizes sustainability and human-centered urban development. Specifically, the model places emphasis on the better allocation of land, labor, and capital; the goal is to address the inefficient use of urban density that leads to low-density sprawl, ensure equal access to education and public services for urban and rural residents, restore cultural assets, and preserve each city's unique identity.

China's megacities, including Chongqing, are a critical part of this new model of urban growth, offering an opportunity to achieve a new typology of urbanization that is driven by efficiency, sustainability, and inclusiveness.

Chongqing's strategic location in the southwest of inland China positions it as a gateway to China's west, a key connection in the Yangtze River Economic Belt. As one of the largest cities in the world, and with four decades of experience in the delivery of basic urban services and sustainable and inclusive economic growth, Chongqing offers valuable lessons not just for other cities in China but globally.

Chongqing's development trajectory generally mirrors China's own transformative pathway. Over the past two decades, Chongqing has made an impressive transformation. Its gross domestic product per capita has increased 16-fold, from US$544 to US$8,908, and the urbanization rate has doubled, from 29.5 percent to 62.6 percent. In this rapid urbanization process, Chongqing has avoided some major challenges faced by first-tier Chinese cities, such as the scarcity of affordable housing. Chongqing's ample public housing provision and land supply have allowed the city to absorb more than 10 million new urban dwellers while ensuring that housing costs remain affordable. Structurally, Chongqing has successfully transitioned from its

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heavy industrial base and is now China's major automotive and IT center, producing one-third of all laptops worldwide.

If the past 20-year period has entailed catching up to other major Chinese cities, in the next 15 to 20 years Chongqing has the capacity and opportunity to become a global city. While there is no one-size-fits-all model, leading cities such as London, New York, Paris, Tokyo, Singapore, and Hong Kong SAR, China, are characterized by common attributes such as economic competitiveness, environmental sustainability, and a high quality of life. Moreover, the compact urban form of these cities has provided a spatial structure that enhances the potential for economic agglomeration and resource efficiency.

To transition into a global city, Chongqing will face significant economic, social, and environmental challenges. For example, its current economic success is largely driven by massive fixed-asset investment and concentration on a few types of industries. Chongqing's strategic land reserve is also depleting at a fast pace, in part due to its land-intensive urbanization. Like many other Chinese cities, Chongqing is facing severe challenges of an aging population, and risks growing old before growing rich.

However, these challenges can be overcome through a long-term strategy that systematically manages risks and creates pathways toward achieving the vision of becoming a global city. The World Bank Group is proud to have been a strong and long-term partner with the Chongqing Municipal Government since 1996. Our collaboration covers a wide range of infrastructure investments, policy reforms, technical assistance, and analytical reports.

This report, *Chongqing 2035: Spatial and Economic Transformation for a Global City,* is another step in our long-standing partnership. It provides a framework resting on five strategic pillars that create an enabling environment for long-term growth opportunities in Chongqing. The pillars are (1) increasing spatial efficiency and livability by promoting compact and transit-oriented development; (2) enhancing connectivity and economic integration to become one of China's inland hubs for the ASEAN (Association of Southeast Asian Nations) region; (3) increasing R&D expenditure and moving up the production value chain; (4) allowing free flow of people and creating equal opportunities for all; and (5) decoupling growth from resource use to promote green and low-carbon growth.

I hope that this report will be a useful input for policy makers that will not only provide the basis for a strong, sustainable, and inclusive growth trajectory for the city, but also foster the continuing strong partnership between the municipal government and the World Bank Group. In this way, lessons learned from Chongqing's unique urbanization experience can be shared across the East Asia and Pacific region and globally.

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Abbreviations

ASEAN	Association of Southeast Asian Nations
CPDC	Chongqing Productivity Development Center
CSTC	China Sustainable Transportation Center
CTPRI	Chongqing Transport Planning Research Institute
GDP	gross domestic product
GHG	greenhouse gas
MJ	megajoule
NBS	National Bureau of Statistics
PPP	purchasing power parity
R&D	research and development
SAR	special administrative region
WHO	World Health Organization

Hongyadong. Photo: pengpeng.

1. Introduction

Chongqing: "A City of Mountains and Rivers" and One of the Largest Cities in the World

Chongqing Municipality, located in the southwest of inland China and upstream on the Yangtze River, is on the scale of a small country, with an area of 82,400 km^2 and a population of 33.92 million.[1] To put this into perspective, the municipality is as large as Austria and its population is close to that of Canada. Administratively, Chongqing shares the same status as Beijing, Shanghai, and Tianjin—a provincial city that reports directly to the central government.

Geographically, Chongqing is strategically positioned as a gateway to China's west, a key connection in the Yangtze River Economic Belt, and a strategic base for China's Belt and Road Initiative.

The municipality has a distinct topography and limited developable land. The Yangtze River flows for 679 km through the entire municipality and has its confluence with the Jialing and other rivers. As a city built on mountains and surrounded by rivers, Chongqing is known as a "city of mountains and rivers." While the municipality is large, mountainous areas account for 76 percent and hilly areas for 18 percent, leaving only 6 percent of flat land suitable for development.

Over the past two decades, Chongqing has faced significant challenges, including the resettlement of over 1 million people and numerous enterprises due to the construction of the Three Gorges Dam. The bankruptcy of a number of state-owned enterprises, particularly in heavy industry, caused adverse economic and social effects. The environmental damage largely caused by its heavy industry was severe—in the 1990s, Chongqing had the highest level of acid rain in China and less than 6 percent of wastewater was treated (World Bank 2007).

Despite these challenges, Chongqing has made an extraordinary transformation. When Chongqing became a provincial city in 1997, its gross domestic product (GDP) per capita was less than US$600, and the urbanization rate was a mere 30 percent. Nearly 20 years later (2016), its GDP had grown to almost US$9,000, and its urbanization rate stood at 62 percent. The rate of treated wastewater is now 92

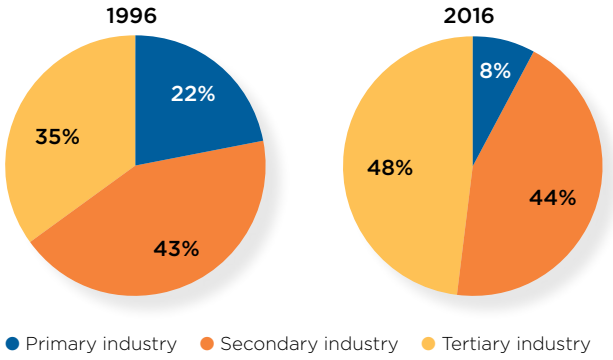
percent, and 100 percent for solid waste (Chongqing Municipal Government 2017).

This transformation has resulted in an important sectoral shift. The municipality's economy, formerly based in agriculture and heavy industry, is now more balanced, with the secondary and tertiary industries contributing to 44 percent and 48 percent of GDP respectively (Figure 1). Using a successful cluster strategy that leverages the city's supply chains and investment in strategic transport links, Chongqing has transitioned out of heavy industry and into automobiles and IT manufacturing. Today, **Chongqing is the largest automobile and motorcycle manufacturing base in China, and it produces one-third of the world's laptops and 90 percent of the world's IT network terminals.**

Despite rapid urbanization and growth**, Chongqing has avoided some of the main challenges faced by the first-tier Chinese cities, such as high cost of living and housing.**[2] Chongqing's ample public housing (Box 1) and land supply have allowed the municipality to absorb more than 10 million new urban residents while ensuring housing costs remain affordable. For example, the price of an apartment in Chongqing is one-seventh of the price in Beijing, one-sixth of the price in Shanghai, and one-third the price in Tianjin (Figure 2). Chongqing residents have more living space per person (43 m^2) than Beijing (32 m^2) and Shanghai (18 m^2) residents.

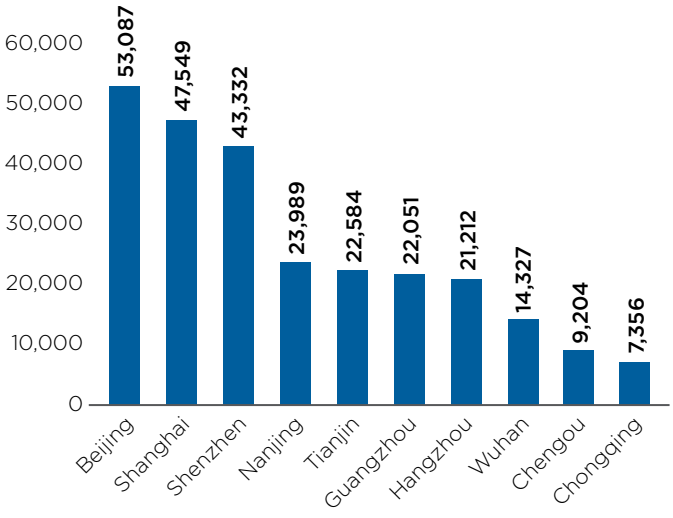
Chongqing's economic transformation goes hand in hand with improvements to social inclusiveness. As part of urban-rural integration, Chongqing provides "five guarantees" to migrant workers: the right to urban employment, retirement pensions, entitlement to public housing, education in city schools, and

FIGURE 1 **Industry Sectors, 1996 vs. 2016**



Source: Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing, 2016.

FIGURE 2 **Housing Prices in Major Chinese Cities** (RMB/m^2)



Source: National Bureau of Statistics of China 2016.

BOX 1 **Construction of Public Rental Housing in Chongqing**

To enable new residents such as university and college graduates, rural migrants, and other groups to better integrate into the city, Chongqing has developed a two-tier housing system. Chongqing's urban housing supply system is a combination of government assurance and market regulation that aims to provide housing for lower-income households, develop a housing supply market for middle-income households, and restrict housing purchases by high-income households. About 40 million m^2 of public rental housing was planned for construction within three years beginning in 2010, to ensure that lower- to middle-income groups (accounting for 30–40 percent of the city's total population) would have access to public rental housing and resettlement housing provided by the government. By 2016, a cumulative total of 297,000 units of public rental housing had been completed, benefiting over 900,000 people from 329,000 lower-middle-income households.

Source: Chongqing Public Rental Housing Department 2016.

health insurance. This policy aims to accommodate 10 million rural migrants into cities between 2010 and 2020 to reach an urbanization rate of 70 percent by 2020.

Chongqing's Rapid Transformation

Chongqing's impressive growth in the past 20 years reflects China's development pathway. Urbanization and GDP growth in Chongqing and China mirror each other, with urbanization doubling from approximately 30 percent to 60 percent. GDP per capita in Chongqing Municipality and China as a whole both increased more than tenfold during this period, from US$500–700 to US$8,000–9,000. By sector, the two growth trajectories also strongly resemble each other, with primary industry reduced by half, to less than 10 percent of GDP, secondary industry remaining stable, and tertiary industry growing by around 10 percentage points (Table 1).

TABLE 1 **National and Metropolitan-Level Growth Trends**

	Urbanization (%)	GDP per capita (US$)	Share of primary/ secondary/ tertiary industry
China			
1996	31	700	19 : 47 : 34
2016	56	8,100	9 : 48 : 43
Chongqing			
1996	30	550	22 : 43 : 35
2016	63	8,900	7 : 44 : 48

Sources: National Bureau of Statistics of China 1996, 2016; Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 1996, 2016.

As China transitions to a new growth model, its cities are also revisiting their growth objectives. After China's rapid development over the last decades, the country is moving away from the pursuit of high-speed growth at any cost to focus on achieving a higher quality of growth. China's cities, including Chongqing, are a critical part of this new model of growth, offering an opportunity for a new model of urbanization with a focus on efficiency, sustainability, and inclusivity.

A New Era: Vision 2035—Toward a Global City via Four Strategic Outcomes

Chongqing can move up the value chain to become a global city within the next 15 to 20 years.[3] If the past two decades can be characterized as a period during which Chongqing was catching up with other major Chinese cities, the coming two decades will be a critical period for Chongqing to make another leap. This goal corresponds to the central government's overall strategic two-stage development plan for China, which covers the periods 2020 to 2035 and 2035 to 2050.[4]

Chongqing Municipality's sheer size and large population, thriving economy, and increasing integration into the global economy are significant assets in its move toward becoming a global city. Chongqing's rapid rise in global stature has already been noted by many. In a 2016 study by the Brookings Institution and JP Morgan, which divided globalizing cities into seven categories, Chongqing was part of a group of cities (including Johannesburg and São Paulo) categorized as "Emerging Gateways" (Trujillo and Parilla 2016). Chongqing's national and global appeal is increasing—in 2017, Chongqing was the fastest-growing tourism city in the world, with 14 percent growth in its tourism sector (World Travel & Tourism Council 2017).

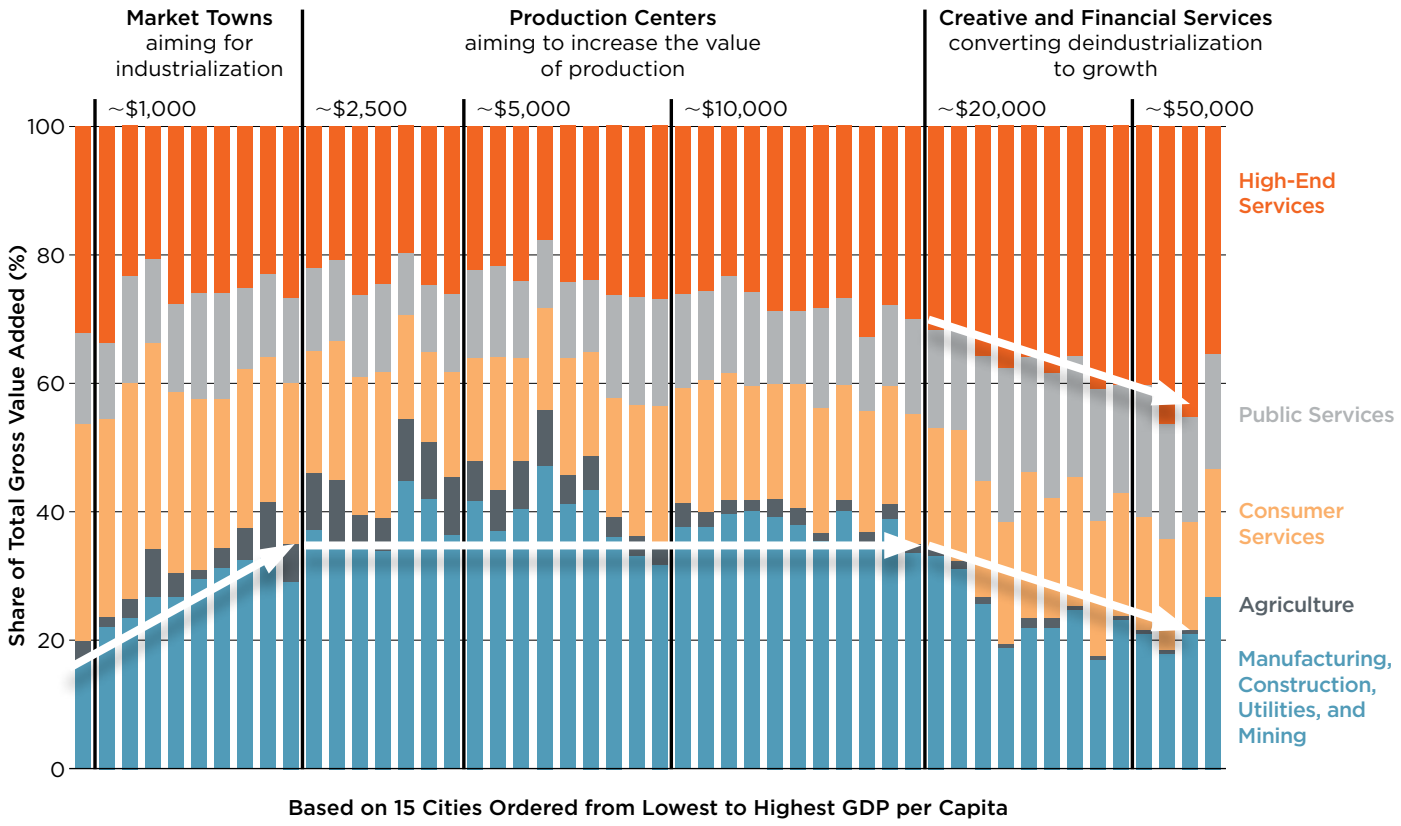
However, becoming a global city requires a well-designed policy strategy that builds on Chongqing's strong existing asset base and enables it to move to the next stage of development. The policy package can be structured around four strategic outcomes.

1. A hub for advanced manufacturing and knowledge-intensive services

Chongqing's comparative advantage has always been its production-oriented real economy.[5] Leveraging its industrial base, Chongqing successfully upgraded its manufacturing sector to focus on IT and automobiles. In the next round of transformation, Chongqing can continue to build on its strengths in the real economy and aim to develop advanced manufacturing and technological capabilities.

At the same time, to become a globally competitive city, Chongqing must progressively climb the value chain. According to a survey by the World

FIGURE 3 **Industry Structures and Needs of Cities with Different Income Levels**



Source: World Bank 2015b. © World Bank.

Bank (Figure 3), high-end services account for a larger share of the economy in cities with per capita income exceeding US$20,000 (World Bank 2015b). Chongqing falls within the middle category, "production center." To increase per capita incomes in Chongqing, policies will need to support the city's transition to a "creative and financial services" profile with a larger share of the tertiary sector than the current 48 percent (Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016).[6]

2. A base for broader ASEAN regional development

Chongqing is a strategic fulcrum for the development of western China, and a node on the Yangtze River Economic Belt as well as the Belt and Road Initiative. It has an extensive system of highway and rail networks that connect major markets. The recently completed highway corridor that links the city to southwest China will further facilitate trade between the country's western region and the Association of Southeast Asian Nations (ASEAN). The Belt and Road Initiative offers Chongqing a strategic opportunity to position itself as part of broader regional development and to become an important hub in the integrated economy of the Chongqing-Chengdu corridor, Yangtze River Economic Belt, and fast-growing ASEAN region.

3. A city that provides opportunities for all

Despite progress, urbanization and economic growth in Chongqing have not removed significant inequalities in income, education, and health between rural and urban populations and between districts. On average, per capita disposable income is 2.7 times higher for Chongqing's urban residents than for rural residents, a gap that has remained large despite Chongqing's efforts in urban-rural integration (Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016).[7] Moreover, significant differences remain across Chongqing's districts in access to health care and education, with better social services provided in central Chongqing.

It is important for Chongqing to close these gaps and create opportunities for all residents to participate in the city's new stage of development. The United Nations Sustainable Development Goals call for inclusive cities,[8] and while Chongqing has made significant progress in improving access to urban services and jobs among its large rural population, the municipality will need to do more to create equal access and the right enabling environment to ensure that growth can be equitably shared among all residents.

4. A city of mountains and rivers that is green and highly livable

Chongqing, like other cities throughout China, is paying a high price for its rapid urbanization, including the deterioration of environmental quality, resource wastage, high carbon emissions, and a car-oriented urban environment dominated by superblocks.

To become a global city and attract global talent, Chongqing must become a green and livable city. Being green and improving livability go hand in hand. A green environment, efficient resource use, good public infrastructure and services, and a vibrant urban life enhanced by the city's unique urban fabric and historical assets are important factors in the competition for global talent. Without talent, Chongqing will not achieve its goal of becoming a global city. It is therefore imperative that Chongqing change its model of urban development to what the national government calls "quality growth" so it can reclaim its image as a city of mountains and rivers and become known as a city with a high quality of life.

Copenhagen commuters. Photo: 4045.


Beautiful Chongqing, China
the City of Mountains & Rivers
MOUNTAINS & RIVERS
BEA

2. Benchmarking Chongqing's Potential against Global Cities

With the right development strategy, there is little doubt that Chongqing can achieve its ambition of becoming a metropolis with international appeal in the next 20 years. To develop such a strategy and understand its main priorities, this report begins by benchmarking Chongqing against a set of global cities.

What Makes a Global City?

To begin, a basic question must be answered: which cities are global cities, and what are their common features?

Although there is no internationally agreed definition of what constitutes a global city, there are some common characteristics that many such cities share. The so-called Big Six leading global cities—London, New York, Paris, Tokyo, Hong Kong SAR, and Singapore—are global economic hubs.[9] They all have high levels of business and investment activity and attract talent and businesses from around the world.[10] In particular, global cities have developed comprehensive competencies in four mutually reinforcing dimensions:

1. **Economic competitiveness** that is defined by robust economic performance, a large and skilled labor force, high innovation capacity, and excellent connectivity
2. **Environmental sustainability** driven by resource efficiency and the effort to maintain a low carbon footprint
3. **High quality of life** with a unique urban fabric, vibrant neighborhoods, and cultural interaction
4. **Compact spatial structure** to support agglomeration and maximize efficiency—a cross-cutting and enabling dimension that is vital for the other three areas

Key Findings of Benchmarking Chongqing with Global Cities

Compared to the Big Six and other leading global cities, Chongqing has its own strengths, as well as a number of weaknesses that any long-term plan must aim to address and improve. Due to its sheer size, Chongqing Municipality can be benchmarked against entire countries, while central Chongqing, comprising nine districts, can be compared to leading global cities. Chongqing Municipality's area, for example, is approximately 80 percent that of the Republic of Korea, and its population about 60 percent. The population of central Chongqing's nine districts is about 7.4 million (2015, registered population) and is thus comparable to Tokyo's 23 wards, Seoul Special City, Singapore, Hong Kong SAR, London, or New York City.[11] For the purpose of this report, benchmarking is done at the scale of both the municipality and central Chongqing, as relevant (see Annex 1).

Benchmarking reveals a number of strengths that make Chongqing well placed to become a global city in the future. Chongqing Municipality's economy has recently been the fastest growing in China, expanding 9.3 percent year-on-year in 2017. This **rate of growth** is about three times higher than that of Singapore or Hong Kong SAR. The municipality's **land transport infrastructure**, especially roads and railroads, is strong; and its **location**, as a gateway

Facing page photo: The municipal government highlighted the city's distinct urban form when advertising Chongqing at New York's Times Square on New Year's Eve, 2017. Photo: Chongqing Municipal Government.

to China's west, to Europe, and to Southeast Asia, is an asset. At 2,818 km, the length of Chongqing Municipality's network of expressways is 57 percent that of Korea. When the extension of Chongqing Municipality's high-speed rail network is completed, the network's length will be double that of Korea's network and three-quarters that of Japan's (Table 2). Chongqing also has an unusually **strong manufacturing base**, both in automobiles and IT. Lastly, **Chongqing's housing market**, underpinned by strong public housing provision (Box 1), is affordable compared to China's other province-level municipalities and to global cities, ensuring its attractiveness for young talent.

However, benchmarking also reveals weaknesses that threaten the city's potential to develop the economic competitiveness, environmental sustainability, and social inclusiveness required of global cities.

Chongqing lags behind global cities in three areas in particular: density, innovation, and environmental sustainability. Concerning the first, Chongqing's built-up area has increased twice as fast as its urban population in the past two decades. The city has used more land to accommodate each new urban resident (136 m^2) than the average for China, other Chinese cities, and Hong Kong SAR (94 m^2). **As a result, the municipality's urban population density has almost halved**, dropping from 22,820/km^2 in 1997 to 12,013/km^2 in 2015, and is now much lower than that of other provincial-level municipalities in China (Table 3).

The share of people and jobs within walking distance of public transport is also low compared to London, New York, and Hong Kong SAR (Table 4).

TABLE 2 **Connectivity in Chongqing and Global Cities**

Indicator	Chongqing	International benchmarks
High-speed rail network length	2,032 km at municipality scale (when the mi [米] railway network is complete)	Japan: 2,765 km Korea: 1,048 km
Annual international passenger air traffic (2017)	5 million (target 2020)	Greater London: 110 million New York JFK: 32 million Seoul Capital Area: 57 million Tokyo Narita: 32 million Hong Kong SAR: 70 million Singapore: 58 million

Source: Based on data from Chongqing Planning Bureau; Chongqing Municipal Government 2017; Migiro 2018; ACI 2018.
Note: Figures for London include Heathrow and Gatwick.

TABLE 3 **Land Expansion and Density in Chongqing and Global Cities**

Indicator	Chongqing	International benchmarks
Land expansion 2000–2009		
Additional land per new urban resident (m^2)	136 (central Chongqing)	Hong Kong SAR: 40 Singapore: 38
Density		
Population density (people/km^2 in built-up area)	12,129 (municipality)	Seoul Capital Area: 11,880 Greater Tokyo Area: 8,062
	13,248 (central Chongqing)	Hong Kong SAR: 37,100 Seoul Special City: 29,100 Singapore: 18,248 Tokyo 23 wards: 15,346

Source: Calculated based on data from Seoul Metropolitan Government; Tokyo Metropolitan Government; Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016; Angel et al. 2016; and Government of Hong Kong Planning Department 2018.

Furthermore, economic agglomeration is significantly lower in central Chongqing than in other Chinese and global cities (Table 5).

Chongqing lags global cities in terms of research and development (R&D). This is visible both at the country level and city level, and both internationally and within China. The total R&D spending in Korea, Japan, Finland, and Sweden is more than 3 percent of GDP, and the same is true for Beijing (5.9 percent), Shanghai (3.8 percent), and Tianjin (3.1 percent). In comparison, R&D spending in Chongqing amounts to only 1.6 percent. In addition, R&D expenditure by industry enterprises in Chongqing is relatively low as well. This is an important factor, given that innovation is largely driven by private sector participation in research.

Chongqing's energy intensity and CO_2 emissions are very high compared to global cities. As Table 6 shows, Chongqing emits approximately twice as much CO_2 per capita as Tokyo and Seoul, rising to eight times as much when measured per unit of GDP, and uses 8–10 times the amount of energy per unit of GDP as Hong Kong SAR and Tokyo. Chongqing also uses about three times more water per capita than New York, and Chongqing's air quality is well below World Health Organization (WHO) critical thresholds. $PM_{2.5}$ concentration is, for example, more than three times higher than in Singapore and Paris, four times higher than in Tokyo and London, and 6.6 times higher than in New York.

TABLE 4 **Accessibility of Housing and Jobs by Public Transport in Chongqing and Global Cities**

Indicator	Chongqing	International benchmarks
Share of people living within walking distance to transit (less than 1 km in global cities)	20 percent (central Chongqing)	London: 53 percent New York: 48 percent Hong Kong SAR: 75 percent
Share of jobs within walking distance to transit (less than 1 km in global cities)	35 percent (central Chongqing)	London: 67 percent New York: 58 percent Hong Kong SAR: 84 percent

Source: Based on an assessment made by Calthorpe Associates for this report and Rode et al. 2013.

TABLE 5 **Economic Density in Chongqing and Global Cities**

Indicator	Chongqing	International benchmarks
GDP density (GDP/km^2 of built-up area in billion US$/km^2 at current prices)	0.166 (municipality)	Greater Tokyo Area: 0.31 Seoul Capital Area: 0.34 New York Metropolitan Area: 0.23
	0.180 (central Chongqing)	Hong Kong SAR: 1.18 Singapore: 1.07 Seoul Special City: 0.78 Greater London: 0.60 New York City: 0.94

Source: Calculated based on data from Seoul Metropolitan Government; Angel et al. 2016; Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016; Government of Hong Kong Planning Department 2018.

TABLE 6 **Carbon Emissions and Energy Consumption in Chongqing and Global Cities**

Indicator	Chongqing Municipality	International benchmarks
CO_2 emissions per capita (tons)	8.22	Greater Tokyo Area: 4.8 Seoul Capital Area: 3.7
CO_2 emissions per unit of GDP (US$10,000 at PPP)	7.8	Greater Tokyo Area: 1.1 Seoul Capital Area: 1
Energy consumption per unit of GDP (MJ/US$1,000 at current prices)	12	Greater Tokyo Area: 1.2 Singapore: 3 Hong Kong SAR: 1.5

Source: Calculated based on Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016 and Economist Intelligence Unit 2011.
Note: PPP = purchasing power parity.

The development pathway of many global cities suggests that when wealth reaches a certain level, resource consumption decouples from increasing GDP per capita. For example, the Asian Green Cities Index shows that when incomes exceed around US$20,000 per person, average resource consumption decreases (Economist Intelligence Unit 2011).

However, **decoupling does not happen automatically.** The experiences of global cities such as Copenhagen (Box 2), London, New York, and Hong Kong SAR show that increasing wealth creates the preconditions for decoupling, but active and well-integrated policies are crucial for it to actually happen. Policies that should be put in place include planning for a compact urban form with densities aligned with transit, mixed-use developments, and a good job and housing balance; policies favoring nonmotorized transport; and replacement of coal with renewable energies.

BOX 2 Copenhagen's Goal of Becoming the First Large Carbon-Neutral City by 2025

Copenhagen commuters. Photo: LeoPatrizi.

Copenhagen's GDP per capita increased by 30 percent between 1993 and 2010, while carbon emissions have halved since 1993 to reach 3.5 tons of CO_2 per capita. Thus an absolute decoupling of economic growth and carbon emissions has been achieved. Copenhagen is well known for its "Finger Plan" of development from 1947, which has channeled urban growth along rail corridors radiating from the city center while protecting "green wedges" from development. Through effective spatial planning, the city has achieved a high level of integration between land use and transit, with 57 percent of the population and 61 percent of the jobs within walking distance from urban rail stations. Moreover, the city is aiming for 50 percent of commuting trips to be made by bike. Replacing coal and biomass for heating and power generation and the increased use of wind energy have also made a substantial contribution to reducing the city's overall emissions.

Source: Rode et al. 2013.

Four Risks That Must Be Managed for Chongqing to Achieve Its Vision

Based on the strengths and weaknesses identified in the benchmark analysis, four main risks can be identified as potential barriers to Chongqing's Vision 2035:

Risk 1
The gradual depletion and misuse of Chongqing's most important asset for development—its land reserve

Risk 2
Risks arising from its current drivers of growth: fixed-asset investment and the twin engines of Chongqing's core industry base—automobiles and IT

Risk 3
Demographic change, including an aging population and a looming shortage of skilled labor

Risk 4
Increased competition from other regional urban centers, such as Chengdu.

Among these four risks, the first two are a result of the current growth modality—that is, the trend that would endanger Chongqing's transition to the next stage of transformation. These risks can be mitigated if Chongqing fundamentally rethinks its development strategy. The last two risks arise from external forces, which are inevitable; they require Chongqing to prepare early to mitigate the risks and to develop a strategy for adaptation to the new circumstances. Each is discussed in more detail below.

Risk 1

Fast depletion and suboptimal use of Chongqing's strategic land reserve

Chongqing has a limited developable land supply due to its mountainous topography. Despite its vast territory of 82,400 km^2, only approximately 2,300 km^2 are available and planned for development.

As the benchmarking reveals, Chongqing's recent development has been excessively land-intensive, with a land consumption rate much higher than in other Chinese cities. By 2015, only about 800 km^2 remained available for further development, including for industrial land use (Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016). This pattern is common across China (Box 3), but particularly pronounced in Chongqing.

Chongqing's high land consumption poses four major risks: emerging land shortfall, declining population density and economic density, reduced walkability and quality of life, and increased infrastructure costs.

Chongqing's available land could be depleted within the next 10 to 15 years. If the excessive conversion rate of 136 m^2 of land per new urban inhabitant continues, Chongqing will use all its developable land by 2030 to accommodate the 5.8 million new urban dwellers in central Chongqing, leaving no room for industrial uses and for further urbanization.

The current model of urban growth, which focuses on superblocks,[12] is leading to low population density, reduced economic density, and increased traffic congestion. Residential superblocks currently cover three-quarters of central Chongqing, but house only 36 percent of its population and thus represent a clear waste of land assets. Economic density is also 16 times lower in residential superblocks than in Chongqing's mixed-use walkable areas. Lastly, this urban form and its fragmentation in outlying areas of central Chongqing has resulted in 80 percent of residents and 65 percent of jobs being located in car-dependent areas with low or no pedestrian access to public transit—a figure well below global city benchmarks, and one that leads to a high level of traffic and, hence, congestion and pollution.[13]

Superblocks are also less connected and less walkable than other Chongqing urban forms, affecting the quality of life (Figure 4 and Figure 5). More street intersections reduce connection distances, increase urban interaction, and boost the quality of life. Conversely, a coarse urban fabric is pedestrian-unfriendly and car-oriented. In Chongqing's superblock areas, the density of street intersections drops below 10 per km^2, the length of streets falls to 5 km per km^2, and the average distance between intersections reaches 400 m.[14] Compared to other global cities, these are very low numbers.

BOX 3 Land Overconsumption Trends across China

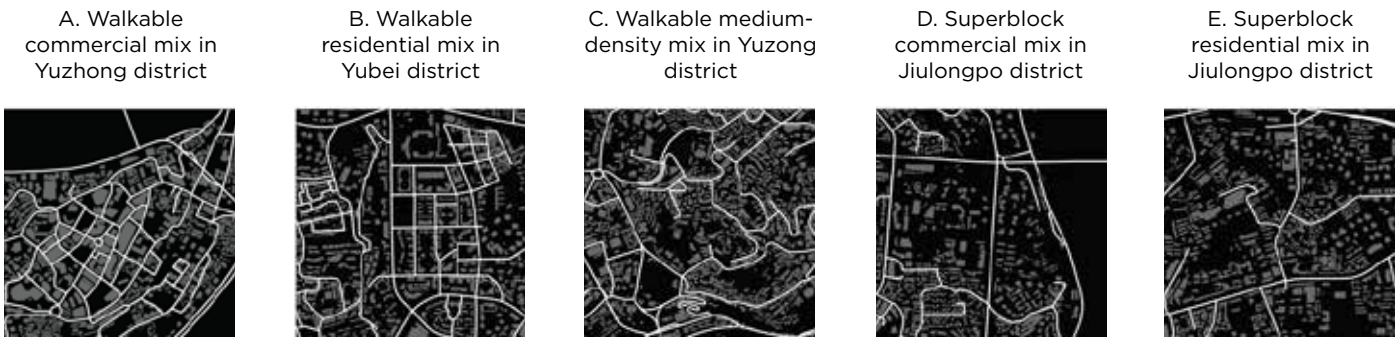
Chongqing construction. Photo: Wonri.

Chongqing's land overconsumption is not isolated; it is a general trend across China that is driven by local governments' desire for more land income. According to a report by the National Development and Reform Commission, the central planning agency of China, small and medium-size cities are planning more than 3,500 new areas that, taken together, could accommodate more than twice the current Chinese population of 1.4 billion people—or almost half of the world's population. The results were detailed in an analysis by Xinhua News Agency, which criticized the new development areas planned as impractical and leading to "ghost towns."

Source: Wu, Dong, and Xu 2016.

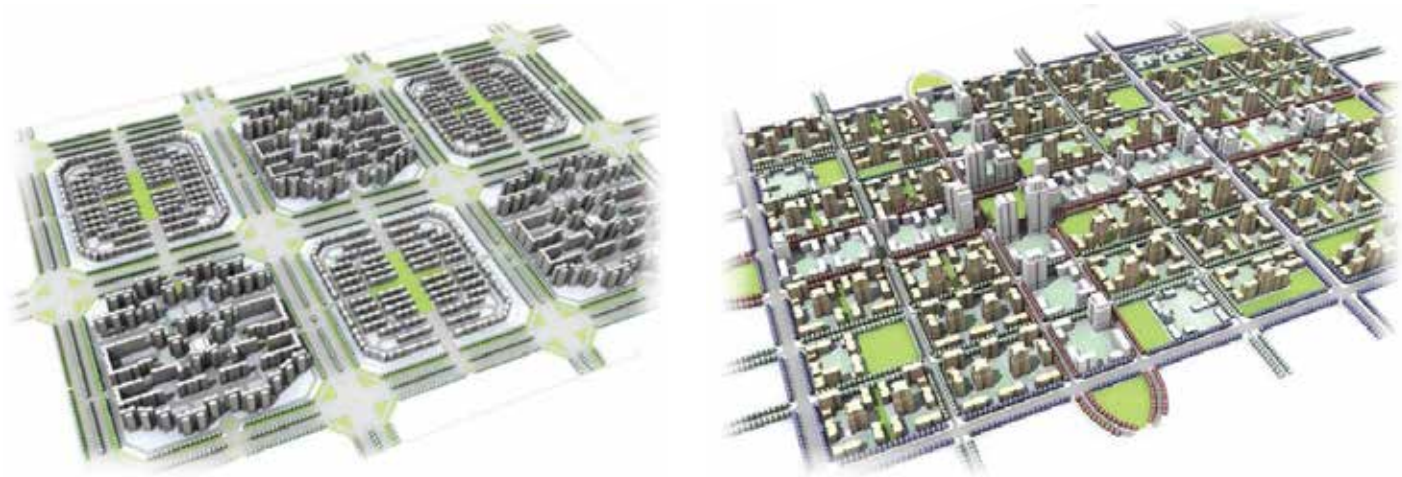
Lastly, superblocks result in increased infrastructure costs. The cost of street infrastructure per unit of GDP for superblocks increases up to 11 times compared with the Trend scenario. This implies that, relative to each unit of infrastructure, a smaller tax base is available to fund it.

FIGURE 4 **Chongqing's Urban Forms**



Source: Produced by China Sustainable Transportation Center (CSTC) for this report.

FIGURE 5 **The Urban Form of Superblocks (Left) and Walkable Development (Right)**



Source: Produced by Calthorpe Associates for *Chongqing 2035: Urban Growth Scenarios.*
Note: The diagrams are at the same scale.

Superblock development
Image credit: Calthorpe Associates. © Calthorpe Associates. Reproduced with permission from Calthorpe Associates; further permission required for reuse.

Transit service in a walkable development pattern
Image credit: Institute for Transportation & Development Policy (ITDP). © ITDP. Reproduced with permission from ITDP; further permission required for reuse.

Risk 2

Difficulty of managing drivers of Chongqing's development to ensure future success

The drivers of Chongqing's past achievements do not necessarily ensure future development and may even endanger the transition to a new growth model. Over the past two decades, Chongqing's transformation was driven by fixed-asset investment, automobile production, and IT manufacturing. While successful in the past, these drivers of growth cannot be relied on for continued success.

The fixed asset–driven growth modality is unsustainable. Chongqing's investment in fixed assets grew by 48 times in 20 years, and rapid infrastructure development increased the city's connectivity, improved urban services, and fueled GDP growth. However, investments in fixed assets may have peaked and are likely to decline going forward (Chongqing Municipal People's Government 2016), (Figure 6). As a result, the projection for GDP growth by 2020 is expected to fall to 9 percent.

Additionally, labor productivity growth has slowed down significantly in the past five years, a possible sign that Chongqing's economy has exhausted gains from first-generation policy reforms and the absorption of imported technologies (World Bank 2015a). Identifying new drivers for growth will be crucial for maintaining robust and sustainable economic growth.

Chongqing's two engines of growth—IT and automobiles—are beginning to plateau. Chongqing has successfully adopted an ecosystem approach for industrial transformation and cluster development. However, while its two core industries have been important drivers of growth, their rate of growth slowed significantly between 2010 and 2015, reflecting a shift in the market. Automobile production, in particular, seems to be reaching the end of a pronounced S-curve. While the annual growth rate of car production peaked at an average of 40 percent between 2006 and 2010, it fell sharply to an average of 5 percent between 2011 and 2015 (Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016). The expected slowdown in both production and sales could have

FIGURE 6 **GDP Growth and Investments in Fixed Assets** (Five-Year Average)

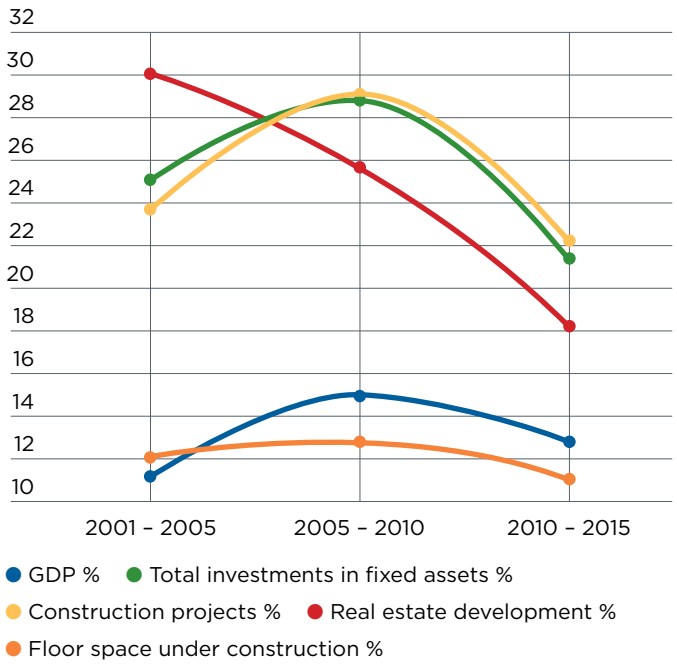
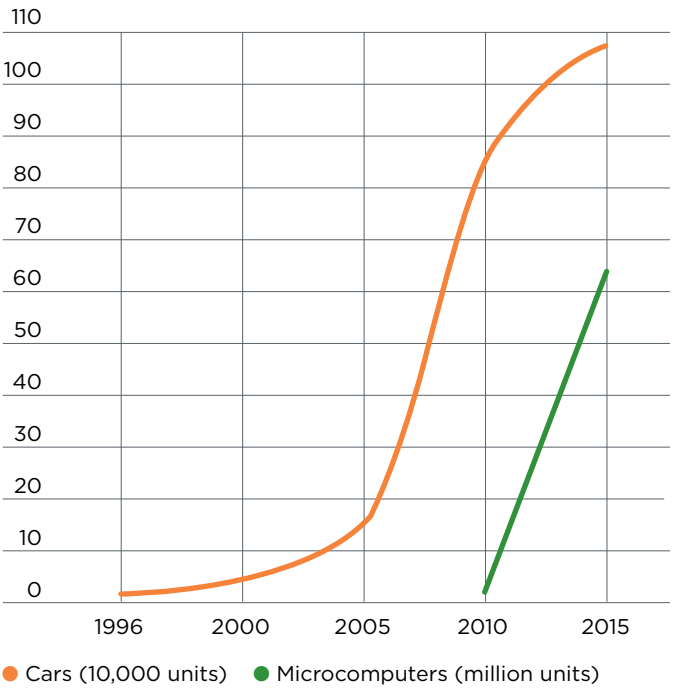


FIGURE 7 **Production of Automobiles and Microcomputers Since 1996**



Source: Produced by the Urban Morphology and Complex Systems Institute for this report, based on Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016.

associated effects on downstream and upstream raw materials and spare parts production enterprises.

This situation raises an important issue: the trade-off between specialization and diversification in the upgrading of Chongqing's real economy.[15] Going forward, Chongqing needs to review and continue to optimize its industrial structure to achieve the right balance between specialization and diversification (Box 4). Today, its two main industrial clusters, electronics and automobile manufacturing, account for a large share of the city's industrial output. They should be closely monitored to avoid the risk of a sudden collapse. Automobile manufacturing may suffer from lower growth rates going forward, as shown in Figure 7. Diversifying into electric mobility may be an excellent way to leverage Chongqing's industrial base, while at the same time securing future growth and employment.

BOX 4 **Benefits and Risks of Specialization and Diversification**

Chongqing main square crowd. Photo: URF.

Specialization brings a number of important benefits: well-oiled supply chains and deep local labor markets, for example, make it likely that new firms entering the relevant industries will choose Chongqing over other locations. The co-location of many firms facilitates learning by doing, promotes local innovation, and attracts industry talent to Chongqing in search of jobs. It also makes it likely that logistical links, both upstream to suppliers and downstream to distributors, will be strengthened and reliable, and that financing with the relevant industry expertise will be available. In sum, specialization supports the formation, retention, and growth of industrial clusters and product chains, making it more likely that a city becomes a central economic hub with a strong "center of gravity" effect.

However, from the perspective of diversification, if economic or employment growth is heavily concentrated in one or a small number of industries, hidden dangers may ensue. Chongqing has already learned this lesson once: the district of Dadukou, heavily reliant on iron and steel production, saw remarkable economic development for many years and was one of the main drivers of Chongqing's economy in the 1990s and early 2000s. However, a severe recession affected its core industry of iron and steel, and its economic growth fell off a cliff. To date, Dadukou's GDP is the lowest of central Chongqing's nine core districts, and the area continues to struggle with industrial development. In other words, overspecialization means tying the fate of the overall economy to the fate of a single sector or a small number of industries and carries the risk of sudden collapse. A certain degree of diversification is therefore beneficial for Chongqing's economic sustainability and economic development.

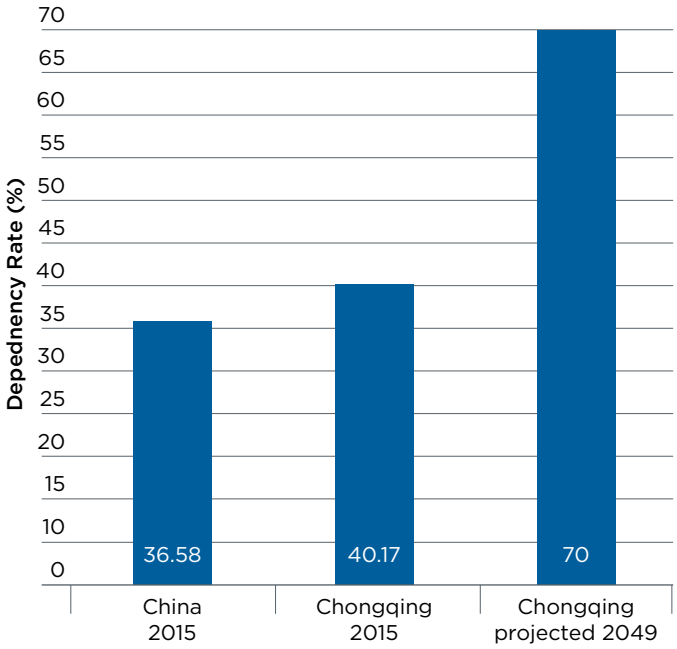
Source: Dadukou District Bureau of Statistics 2010.

Risk 3

Disappearing demographic dividends with an aging population

If China as a whole risks growing old before growing rich, the challenge facing Chongqing is potentially even more severe. In the past 15 years, Chongqing has become an aging municipality.[16] In 2015, Chongqing had a higher dependency ratio than the national level—that is, 40 percent compared to 37 percent for China overall. Chongqing's Municipal Statistics Bureau has projected the dependency rate in 2049 to be as high as 70 percent (Figure 8).

FIGURE 8 **Projected Evolution of Chongqing's Dependency Ratio Compared to China Overall, 2015–2049**



Source: Produced by the Urban Morphology and Complex Systems Institute for this report, based on information provided by Chongqing Planning Bureau.

In addition to an aging population and a high dependency rate, Chongqing remains a municipality with a net population outflow. Until 2016, about 5 million people left the municipality, while only 1.6 million people moved in, for a net loss of more than 3.4 million people to other regions (Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016).

To address this outflow, Chongqing needs to remain economically attractive. The majority of the outflow consists of young migrants or skilled workers who leave for better economic opportunities in other cities.

Risk 4

Reduced geographical advantages due to the increased connectivity of other cities in the region

Like Chongqing, **neighboring regions such as Chengdu in Sichuan Province have in past decades poured massive investment into transport to reduce geographical barriers** (Box 5). Chengdu's Shuangliu Airport handled 42.2 million passengers in 2015. In 2013, it was the fourth-busiest airport in China, the fifth-busiest airport in terms of cargo traffic in China, and the busiest airport in western and central China. A transcontinental rail link has also transformed Chengdu from a regional hub to an international port and investment center. Its rail link covers more than 10,000 km and reaches Germany in 14 days (HKTDC 2016).

As Chongqing strives to become a logistics hub for western China, a coordinated development strategy that creates win-win opportunities for development of the Chongqing-Chengdu corridor is becoming ever more important.

BOX 5 **How Increased Connectivity Has Reshaped the Strategic Significance of Cities**

In 1850, the population of Chicago was 30,000, one-quarter that of St. Louis, then the second-largest port in the United States after New York. However, the completion of the Illinois and Michigan Canal in 1848, which connected Chicago to the Mississippi River, diverted trade that previously went to St. Louis. Its strategic location at the heart of the Great Plains, in turn, meant that Chicago would grow exponentially during the railroad era. Chicago now has the largest number of American highways and highest volume of rail freight, while O'Hare International Airport is the second-busiest airport in the world.

Source: Dreyfus 1995.

As Chongqing strives to become a logistics hub for western China, a coordinated development strategy that creates win-win opportunities for development of the Chongqing-Chengdu corridor is becoming ever more important.

Multi-level overpass. Photo: pengpeng.

Chongqing railway station. Photo: vichie81.

3. A Strategy to Address Risks and Achieve Chongqing's Vision

Global cities actively envision their future and work toward realizing it through comprehensive and strategic planning. For example, New York's One NYC Plan is organized around principles of growth, equity, sustainability, and resilience. Singapore's land use plan for 2030 considers the country's land use demands comprehensively so that potential trade-offs between uses can be evaluated holistically for continued economic growth and the provision of high-quality living environments (Urban Redevelopment Authority 2012).[17]

To overcome the challenges and constraints outlined above, Chongqing needs to adopt a long-term strategy that systematically manages and mitigates key risks and creates a pathway toward achieving its vision of becoming a global city by 2035. While this report does not propose detailed, sector-level, or industry-level policies, it identifies five strategic pillars (shown in orange in Figure 9) aimed at creating a set of enabling conditions, in particular concerning the spatial dimension, for Chongqing to move forward.

This Overview, which gives the highlights for each of the five pillars, is supported by a series of policy briefings and a technical report. Each can be read independently. Complementing this Overview, these documents provide a more technical analysis to identify the ways in which Chongqing can achieve its global city ambition.

- The Supporting Reports briefings address spatial strategy, connectivity, innovation, and green and low-carbon growth. These policy notes are intended to serve as a basis for further analytical work. Social inclusiveness, though discussed in this Overview, will require a separate study before a report can be provided.
- The technical report on urban growth scenarios models the outcomes and land use scenarios of two different development paths: a Trend scenario, which continues past patterns of land development, characterized by continued centralization of high-level employment around the existing downtown core, and expansive superblock, office park, and industrial development throughout central Chongqing; and a Compact Growth scenario, which posits a polycentric regional structure created through focused, walkable, mixed-use development around existing and planned transit nodes.

FIGURE 9 **Chongqing's Vision**

Strategic pillar 1

A spatial strategy that increases efficiency and quality of life by promoting a compact and human-centered development

Cities can increase their efficiency and quality of life through compact urban development. Preserving and achieving economic density increases agglomeration economies and brings people closer to jobs, while reducing infrastructure costs and environmental impacts. Cities can also increase their quality of life and global appeal by building mixed-use neighborhoods with unique urban fabrics, high-quality public space, and dense patterns of streets.

As noted in the discussion of benchmarking and risks above, Chongqing is at high risk of losing its land use efficiency and unique urban form of "a city of mountains and rivers." **Further urbanization in Chongqing is an opportunity to reverse the trends of increasing fragmentation and falling density.**

The payoffs to a successful spatial transformation are significant. For example, Chongqing can potentially save up to 200 km² in land and RMB 34 billion in infrastructure costs by 2035. To illustrate the magnitude of the potential gains, the results of a scenario study are summarized in Box 8 following the three spatial transformations described below.[18]

Spatial transformation I: Pursue compact growth to reduce land consumption and increase economic density

Land should be managed as a scarce asset. This intervention implies two major reorientations**:**

- *Shifting from rural land conversion to development by infill.* Rather than filling all designated developable area in Chongqing's present master plan, compact growth would first consider the infill capacity of existing urban areas and limit the expansion beyond it. This would curb unsustainable trends in land conversion.
- *Managing land in a more flexible way.* The redevelopment of land must aim for a minimum density, allowing a higher density near public transit to make the lines profitable and increase the accessibility to jobs for the population. The land may be divided into parcels smaller than the current superblocks to allow more flexibility and adaptability to the future needs of the market.

A good opportunity for implementing this vision is presented by the Liangjiang New Area in the northern section of the core-adjacent area. If planned well, the Liangjiang New Area could accommodate a significant amount of the region's projected growth and potentially become a new engine of growth for the city (Box 6).

BOX 6 **Liangjiang New Area**

Established in 2010 and located in central Chongqing, Liangjiang New Area is the third state-level development zone established by the Chinese government.[a] With a total area of 1,205 km², it could accommodate a major portion of Chongqing's projected growth. Liangjiang New Area is a growth priority for the city and an opportunity to increase economic density and agglomeration.[b] The area already has a comprehensive multimodal transport network, including water, air, road, and railway transport. In addition, it has dedicated functional areas such as the China-Singapore Connectivity Demonstration Project, Port Area, Industrial Park, and Free-Trade Zone. As a result, growth has been fast, and according to the current development plan, the area's GDP is expected to exceed RMB 1 trillion by 2020, equivalent to doubling Chongqing's economy within 10 years.[c]

If planned well, Liangjiang New Area would allow the city to increase its land use efficiency and absorb a significant part of the expected population growth of 5.8 million.

Source: Tan and Gao 2017.

a. According to Rankings of Local Governments in China 2017, the comprehensive development potential of Liangjiang New Area ranks first among 163 development zones in China (including 137 national-level development zones and 26 provincial-level development zones).
b. According to the approval document issued by the State Council, Liangjiang New Area will become "the leader among national experimental zones of comprehensive complementary reforms for rural-urban integration, an important sophisticated manufacturing and modern services base in inland China, a financial center and innovation center in upstream Yangtze River, an important gateway of opening up in inland China and a demonstration window of scientific development."
c. The total GDP of Central Chongqing's nine districts was about RMB 703 billion in 2016.

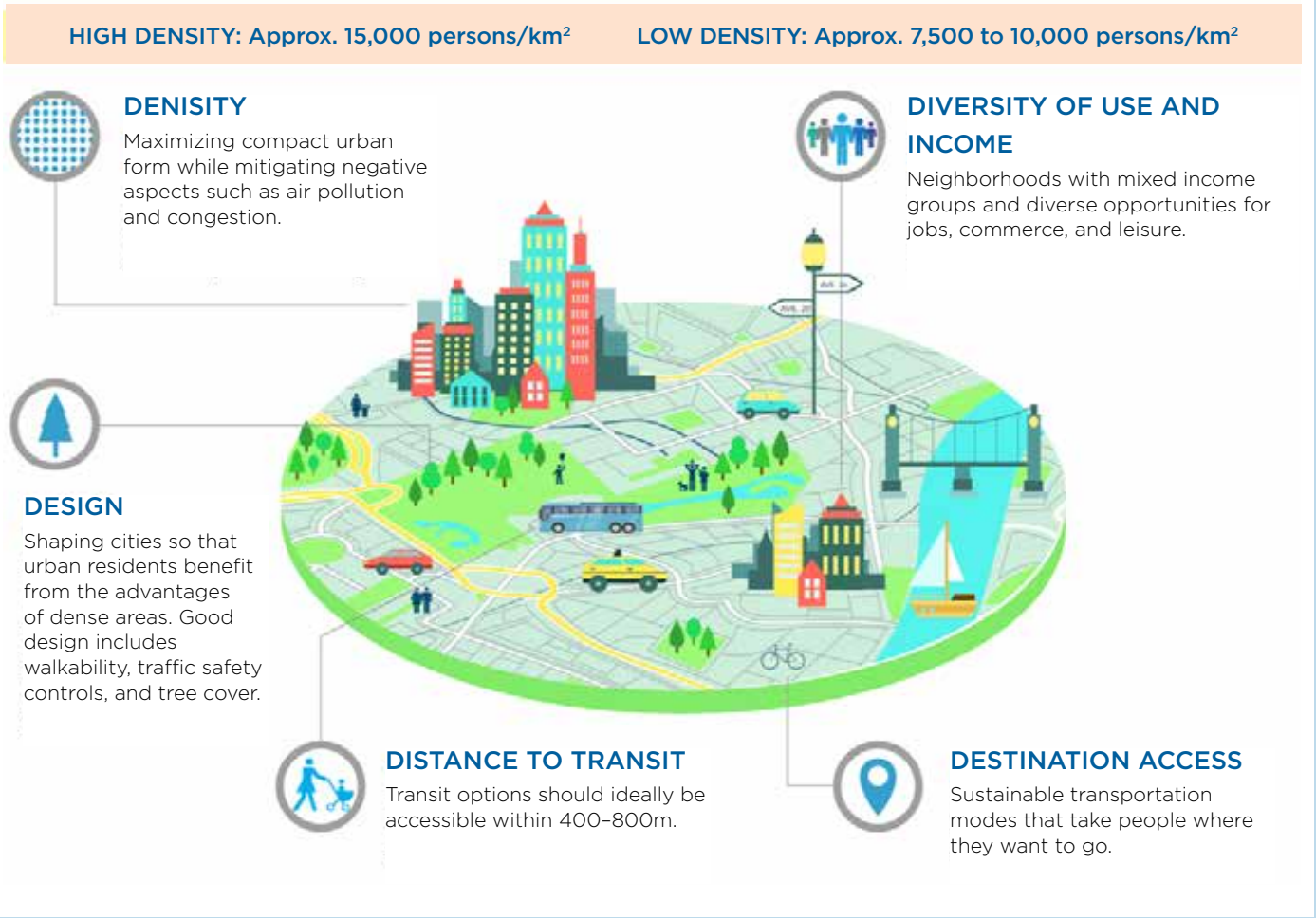
Spatial transformation II: Pursue transit-oriented development that integrates land use and transportation planning and articulates accessible densities

Integrating transport and land use planning will help reduce land needs, infrastructure costs, pollution, and congestion. Chongqing plans to expand its subway network fourfold to 820 km, with more than 480 stations—a length similar to the Seoul subway. This massive extension gives Chongqing the opportunity to shape its urban form efficiently, as other global cities such as Tokyo, Hong Kong SAR, and Seoul have done.

Average density is less important than articulated and accessible density (UN Environment 2018)**.** Articulated density is achieved by multi-use construction around transit nodes in street networks with human-scale blocks that facilitate walking and diverse travel modes. The 5D Compact City Framework (Box 7) is a helpful tool for planners seeking to develop compact, connected, and polycentric cities.

BOX 7 **The 5D Compact City Framework**

A city can combine multiple nodes of articulated density with a rich mix of housing, jobs, and amenities at the neighborhood level.



Source: UN Environment, GI-REC, International Resource Panel, "Building Better Cities: ASEAN Looks to the Future," https://citiesipcc.org/wp-content/uploads/2018/03/Fact-Sheet_-South-East-Asia_Future_Infrastructure-1.pdf.

Spatial transformation III: Design vibrant mixed-use neighborhoods as places for people based on Chongqing's unique landscape of mountains and rivers

This transformation consists of a reversal of Chongqing's current superblock approach to give identity and a sense of place to Chongqing's extensions. In particular, it requires the city to take the following steps:

- *Design neighborhoods that are sensitive to the unique mountain and river landscape of Chongqing.* Chongqing's urban landscape should incorporate the city's invaluable natural assets—the river, the mountains' undulating ridges, and landscaped parks. This is a tried and tested strategy: unique landscapes of mountains and water have positively shaped the identity of cities as diverse as Hong Kong SAR, Seoul, San Francisco, Zurich, Rome, and Porto.
- *Retrofit existing neighborhoods and increase their livability.* This mainly includes improving the connectivity and permeability of urban blocks, developing mixed-use spaces, and enhancing public spaces and public facilities.
- *Plan the city using a variety of small mixed-use blocks.* Small blocks of less than 1.5 ha provide a human-scale environment with greater variety in built form and street patterns. Small blocks also offer a variety of public spaces, architectures, and activities. They should be developed with active

BOX 8 Payoffs for Successful Spatial Planning

To highlight the stakes of getting spatial policy decisions right, two different urban growth scenarios were modeled and compared: a Trend scenario in which current patterns of development are extrapolated into the future, in particular the concentration of job growth in the urban core and the development of housing and single-use superblocks in the core-adjacent areas; and a Compact Growth scenario, in which development leads to a polycentric regional structure created through focused, walkable, mixed-use development around existing and planned transit nodes.[a]

The results are clear: land use, urban livability, household expenditures, infrastructure costs, and environmental sustainability are all strongly improved by the choice of compact growth. Specifically:

- **About 200 km² of land is saved, preserving a valuable asset for future expansion beyond 2035 and increasing economic density, agglomeration, and productivity.**
- **Cumulated expenditure on road, water, and sewage infrastructure to 2035 is reduced by 30 percent, achieving RMB 34 billion in savings and allowing, for example, the redeployment of public expenditure to R&D to improve competitiveness and extend social services such as education or health.**
- **Chongqing's affordability is improved. Household costs for transportation and home energy use will be reduced by 32 percent, achieving annual savings of RMB 5,100 per household.**
- **Central Chongqing becomes less car dependent, with a reduction of congestion and an increase in the accessibility of jobs with affordable transportation. The mode share of public transit increases by 9 percentage points, and total automobile travel is reduced by 40 percent.**
- **Air quality, which currently fails to meet critical thresholds and threatens human health, is significantly improved. CO_2 and air pollutant emissions from auto travel fall by 39 percent.**

This modeling exercise demonstrates that successfully implementing compact growth, transit-oriented development, and new livable neighborhood planning and design can make a major contribution to Chongqing's Vision 2035. The full details of the model are published in the technical report *Chongqing 2035: Urban Growth Scenarios*.

Source: Urban growth scenario modeling conducted by Calthorpe Associates for this report.

a. Both scenarios focus only on the area of central Chongqing and assume the addition of 5.8 million new residents and 4 million new jobs by 2035. To isolate the impacts of land use, both scenarios assume the same baseline factors for vehicle performance, energy efficiency, and fuel and energy emissions.

sidewalks and perimeter buildings to provide shared interior courtyards. UN-Habitat recommends that at least 40 percent of floor space should be allocated for economic use in any neighborhood and that land specialization should be limited to single-function blocks covering less than 10 percent of any neighborhood (UN-Habitat 2014).

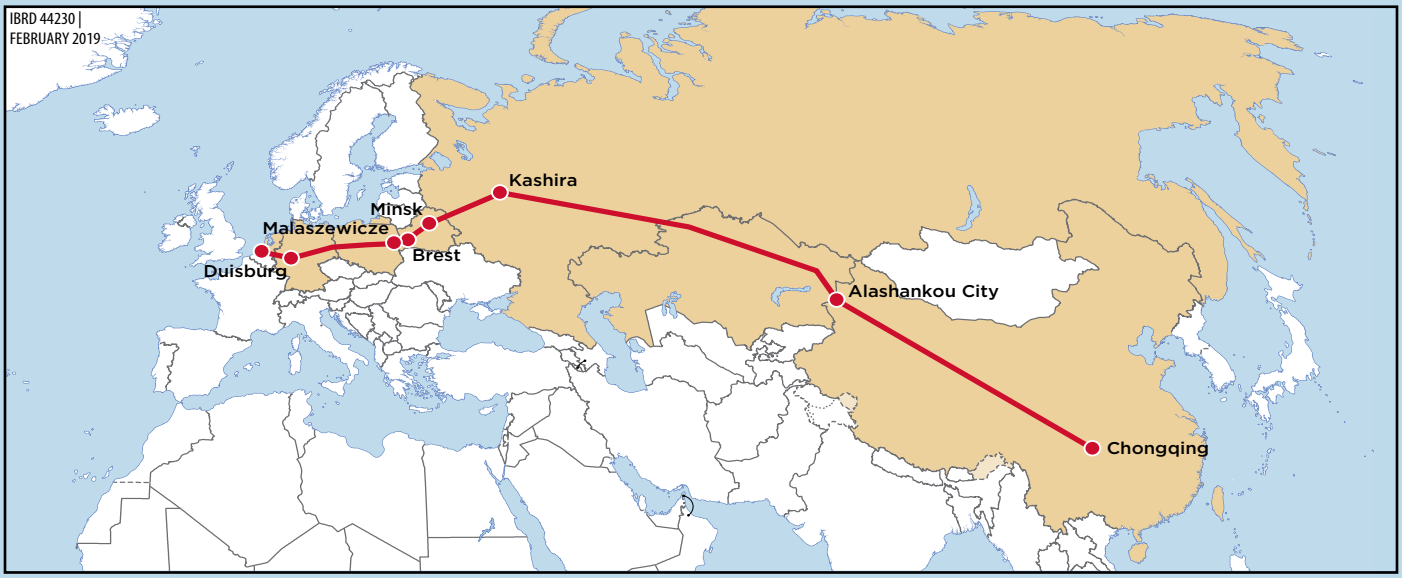
Strategic pillar 2
A regional strategy to increase connectivity and economic integration

Three kinds of connectivity boost economic growth and help cities become important hubs or gateways: physical (infrastructure) connectivity, digital connectivity, and economic integration. Integrating these three dimensions generates significant economic output and high-quality jobs, and helps cities accumulate knowledge, with positive spillover effects on the broader economy.

Chongqing stands out for its infrastructure and digital connectivity. By combining road, river, rail, subway, and air transport links, Chongqing has developed a world-class transportation system (Box 9). This will be further strengthened once the Southern Transport Corridor rail link to Singapore is complete. Digital infrastructure is also strong, with 70 percent of households having broadband Internet and the existence of a city-level partnership with Alibaba.

BOX 9 Chongqing's World-Class Transportation System

The Chongqing-Xinjiang-Europe Railway, a direct rail route from Chongqing to Germany, was established in 2010 and has brought Chongqing to the forefront of China's trade with Central Asia and Europe. The 11,179-km journey from Chongqing to Duisburg takes only 14 days, compared to 34 days by sea, and is safer, cheaper, and more reliable. Most goods transported using this route are from multinational computer companies in Chongqing, including the technology giant Foxconn, which is a major supplier of Hewlett-Packard, Acer, and Apple. By August 2016, over 2,100 trains had been dispatched via this rail route, which is currently providing regular rail services to more than 16 Chinese cities and 12 European cities (HKTDC 2016).



Rapid Expansion: China–Europe Freight Train Service

2011 – Aug 2015
More than 900 trains

→

Sep – Dec 2015
About 400 trains

→

Jan – Aug 2016
More than 900 trains
(annual growth rate: +130%)

Source: China Railway Corporation.

BOX 9 **Chongqing's World-Class Transportation System** (cont.)

Source: Chongqing Monorail. Photo: leezsnow

Chongqing's road and rail construction

By 2016, the total length of the municipality's road network—142,921 km, including 2,828 km of expressways—ranked 10th in China and 1st in the country's western region. The total length of railways in the municipality was 2,231 km, and the pace of railway construction has accelerated with the construction of the mi (米) high-speed railway network. This network allows any part of Chongqing to be reached within two hours, the capitals of the surrounding provinces in less than three hours, and Beijing, Shanghai, and Guangzhou in less than six hours.

In 2016, the length of high-speed railways in operation amounted to 356 km, with 184 km under construction. However, the city's railway development plan calls for significant growth and would bring the total length of the railway network to 5,800 km by 2030, including 2,032 km of high-speed railways. When complete, Chongqing will become an important transport hub connecting Europe and Asia with other parts of China.

Source: HKTDC 2016; Chongqing Municipal Government 2017.

However, Chongqing's physical and digital connectivity has yet to translate into regional economic integration: Chongqing and Chengdu are fiercely competing to be the logistics hub and gateway for China's southwest region, potentially leading to outcomes that are suboptimal for integrated regional development.

Chongqing may aim to become the region's "center of gravity" by retaining its role as a key national hub in land and water logistics. Chongqing can increase its economic growth and participate in global economic flows by acting as a gateway to regional corridors that are supported by three-dimensional connectivity.

Connectivity transformation I: Build a major logistics hub supported by integrated land, air, and water transportation networks

Chongqing should leverage its location at the confluence of land, air, and water transport networks. Inland waterway transport is a unique feature of Chongqing's freight transport system. Despite the constraints of Yangtze River transportation, Chongqing can focus on the intermodal capacity of its port as a transshipment center and as an inland link to major downstream ocean ports.[19] Moreover, linking Chongqing's ports to the rail route to Europe will strengthen Chongqing's role as a hub for container traffic between Chongqing and global export markets. Interventions that could promote Chongqing's development as a major logistics hub are shown in figure 10.

Connectivity transformation II: Promote regional economic integration, including through the Chengdu-Chongqing corridor

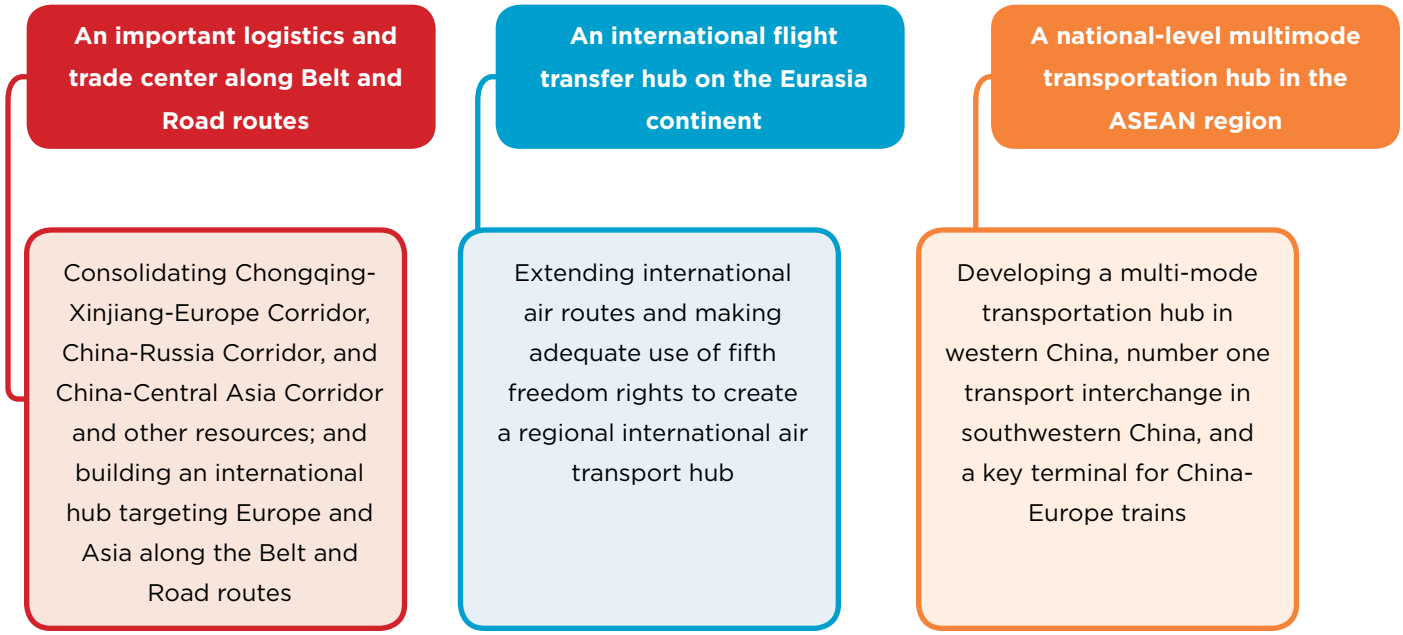
Moving away from competition to cooperation can produce win-win outcomes for both Chongqing and Chengdu. Both Chongqing and Chengdu can benefit from their integration into an economic corridor supported by efficient transportation systems; this will build a much stronger and broader base for the ASEAN region and beyond. Specific actions to promote cooperation may include the following:

1. Developing a joint development strategy encompassing economic planning, investment, spatial strategy, and transport
2. Establishing satellite cities along the corridor to promote the spatial agglomeration of industries, and to accelerate the flow of goods, population, and information
3. Strengthening high-level coordination between Chongqing, Sichuan, and Chengdu

Connectivity transformation III: Strengthen Chongqing's digital infrastructure

In today's world, physical connectivity is not enough. The exponential growth of data is transforming every aspect of the economy, including industrial and logistic processes. In global cities, firms move to where they can access high-speed broadband infrastructure. The digitization of industrial production will require Chongqing to massively invest in its digital connectivity and bring its broadband speeds up to the levels of global cities.

FIGURE 10 **Interventions That Enable Chongqing to Develop as an Integrated Multimodal Logistics Hub.**



Strategic pillar 3
An innovation strategy to climb the value chain and create the conditions for a skilled labor force

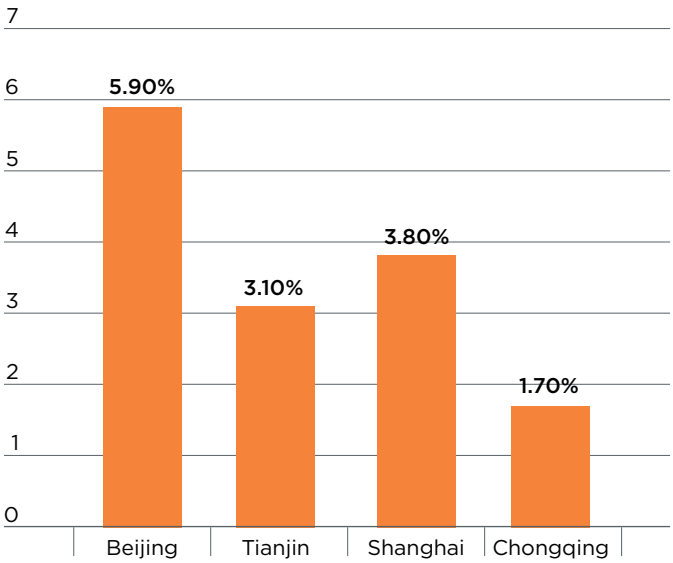
Spatial transformation and connectivity are important, but not enough, for Chongqing to achieve Vision 2035. The innovation economy, underpinned by talent and creativity, has become a driving force in transforming entire industries, often at an accelerated pace. Cities are making massive investments in innovation and R&D to support and attract technology-driven industries that are leading the digital revolution and disrupting established markets. To succeed in this transformation and attract digital industries, a strong skilled labor force is necessary. Human capital—the skills, knowledge, and experience of the labor force—will be central for future economic development and innovation (Quintini 2014).

Traditionally, Chongqing has been a city of production, focusing on the application of technology rather than its development and innovation. However, while this approach has served the city well in the past, benchmarking has shown that Chongqing has relatively low R&D expenditure (Figure 11 and Figure 12), both by the municipality and by industrial enterprises located in Chongqing. The latter is a cause of concern, given that much innovation is driven by private sector participation in the research space. In addition, Chongqing's lack of leading universities and research laboratories puts the city at risk of missing out on future economic opportunities (Box 10).

Innovation Transformation

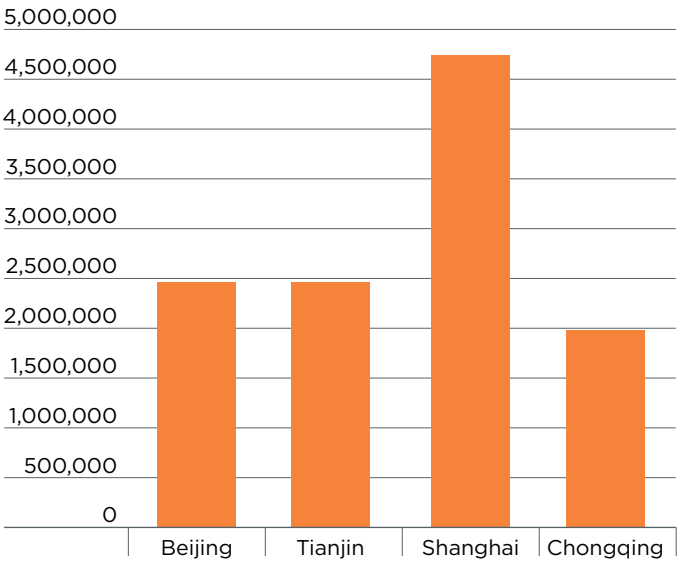
Chongqing should prioritize attracting and developing human capital to move from production to innovation. To support Chongqing's new path to growth, the Chinese government has made innovation a priority in economic planning through a number of large-scale initiatives. Made in China 2025, for example, is a plan announced in 2015 to improve and modernize China's manufacturing in 10 key sectors. This strategy aims at transforming Chongqing from a traditional city of production—one focused on the application of technology rather than its development—into a driving force of the innovation economy. Building on existing strengths, such as market size and well-developed supply chains, Chongqing should aim to become an attractive location for the development and manufacture of innovative products. To succeed in this transformation, a strong skilled labor force is necessary, and

FIGURE 11 **R&D Expenditure as a Portion of GDP**



Source: National Bureau of Statistics of China 2016.

FIGURE 12 **Internal R&D Expenditure of Industrial Enterprises above a Designated Size in 2015**
(10,000 RMB)



Source: National Bureau of Statistics of China 2016.

BOX 10 How Global Cities Exploit Synergies between Universities and Start-Up Ecosystems

Some of the best universities in the world, such as Harvard and MIT, are concentrated in Boston, which is also a world leader in biotechnology, with many start-ups developing applications from university research programs. Montreal has also developed an ecosystem of start-ups in artificial intelligence, thanks to the robotics program of the Université de Montréal. Other examples of cities exploiting the synergy between their universities and vibrant start-up ecosystems are San Francisco, Los Angeles, Toronto, and Chicago. These four cities have forged links between their universities of excellence and their innovative companies by offering multiple opportunities to entrepreneurs. Among the most innovative and high-tech global cities, Seoul has risen to prominence thanks to the synergy between its global giants of higher education and high technology. The city is ranked fourth globally for patent applications, after Tokyo-Yokohama, Shenzhen–Hong Kong, and San Jose–San Francisco. Seoul attracts more and more international investors and multinationals looking to tap into its highly skilled workforce, innovation culture, and momentum.

Source: Hales et al. 2017; Dutta, Lanvin, and Wunsch-Vincent 2017; Jones Lang LaSalle 2016.

BOX 11 Shenzhen's Strategy to Attract Innovative Companies and Talent

Shenzhen, a city of 12.5 million people, is one of the most innovative cities in China. However, as a "young" city, it has only two major universities and three key research centers, a low number compared to adjacent Guangdong Province, which has 83 universities and 40 research centers.[a] By finding a good balance between its urgent priorities and its long-term plan, Shenzhen has successfully created an ecosystem of creative industries and technological innovation.

First, the Shenzhen Municipal Government formulated a long-term plan for the development of higher education in science and technology. However, it acknowledged that the problem could not be solved through local education investment alone in the short term. With an open environment, the city made rapid progress in scientific and technological innovation by attracting and encouraging innovators such as institutions and talent from other regions.

Source: Lu 2016.

a. Shenzhen was a market town of 30,000 people in 1980 when it became China's first Special Economic Zone (SEZ). In 2017, after 37 years of sustained growth, it reached 12.5 million inhabitants and its GDP reached US$338 billion—surpassing the GDP of Guangzhou and Hong Kong SAR, and ranking third in China behind Shanghai and Beijing.

developing and attracting human capital—the skills, knowledge, and experience of the labor force—will be key to future economic development and innovation.

Innovation transformation I: Increase R&D expenditure

Chongqing should increase its R&D expenditure. Catching up with China's average of 2 percent of GDP invested in R&D should be a minimal goal; striving to reach levels similar to those of Korea (4.15 percent) or Japan (3.49 percent) could be an aspirational target.

Innovation transformation II: Implement a two-track solution to boost Chongqing's innovation capacity

Short-term and long-term strategies should be combined to ensure strong talent is abundant in Chongqing. In the short term, Chongqing should aim to attract existing talent through enhancing its talent-seeking programs. In the long term, the city should aim to grow its own talent by developing world-class universities to create the right skill mix. In this respect, Shenzhen is a good example to follow (Box 11).

Innovation transformation III: Build a large skilled workforce

Chongqing should aim to transform its workforce into one with the highly qualified human capital that high-end industries need. To achieve this goal, it must improve its vocational education. Chongqing can learn from Germany, whose dual education system has allowed the country to build a large technically skilled labor force. It must also build on the strengths that have enabled it to attract leading global companies like Apple to China (Box 12).

BOX 12 Why Apple Prefers to Make Its iPhones in China

At the Fortune Global Forum in Guangzhou in early December 2017, Apple CEO Tim Cook explained the three key reasons why Apple manufactures its iPhones in China: millions of highly skilled manufacturing workers, tooling engineers, and software developers; a unique ecosystem combining craftsmanship, robotics, and computers; and firms with capabilities in technological process co-development.

"The number one reason why we like to be in China is the people. China has extraordinary skills. And the part that's the most unknown is there's almost 2 million application developers in China that write apps for the iOS App Store. These are some of the most innovative mobile apps in the world, and the entrepreneurs that run them are some of the most inspiring and entrepreneurial in the world," Cook said.

For Cook, China offers a unique technological ecosystem: "China has moved into very advanced manufacturing, so you find in China the intersection of craftsman kind of skill, and sophisticated robotics and the computer science world. That intersection, which is very rare to find anywhere, . . . is very important to our business because of the precision and quality level that we like."

Lastly, companies like Apple are looking for co-development in engineering and development. As Cook states, there is significant interaction between Apple and the Chinese manufacturers: "The process engineering and process development associated with our products require innovation in and of itself. Not only the product but the way that it's made, because we want to make things in the scale of hundreds of millions, and we want the quality level of zero defects."

Source: Leibowitz 2017.

Innovation transformation IV: Take advantage of its large market and make the city an important base for the application of innovative products and technologies

Chongqing can leverage its sheer size and industrial base to become a laboratory for product development. Chongqing may not be a major cradle of innovation in the near future, but it could become an attractive location for the development and manufacture of innovative products. Chongqing can also rely on the sharing of innovations from other regions through transplantation and can create local value from them.

Innovation transformation V: Cultivate a creative industry and entrepreneurship spaces for the development of small and medium enterprises

The seeds of a start-up scene should be further cultivated. In recent years, about 600 entrepreneurial spaces (including those under construction) have opened in Chongqing (China Center for International Economic Exchanges 2017). Providing access to markets, professional services, and finance channels, they offer affordable, practical, comprehensive, and open services for innovation and entrepreneurship. It is important to note a common feature among the creative industries: the innovation players are mostly small and medium-size enterprises, whose size complements the structure of Chongqing's scientific and technological industry.

Strategic pillar 4

A strategy that addresses potential labor force shortfalls and creates equal opportunities for all

Inclusive growth opportunities are especially important for cities seeking to develop their knowledge economy. Human capital is an important base for economic development, particularly as economies shift toward advanced manufacturing and high-value-added services. Whether a city can attract high-caliber human capital depends on a number of factors, including opportunity, affordability, and quality of life.

Chongqing Municipality has had net population outflows in the past, but there are signs that the trend may start to reverse. Chongqing's affordability—especially low rental and housing prices—make it an attractive destination for migration.

However, inequality, between urban and rural residents, continues to be a challenge. The urban-rural income gap remains significant. On average, the per capita disposable income of Chongqing's urban residents is RMB 27,239, while it is only RMB 10,505 for rural residents. A significant urban-rural gap is also visible in education: in Chongqing as a whole, the average enrolment of young people (aged 0–17) in primary and secondary education is 67 percent, but in central Chongqing it is 98 percent, while in the municipality's northeastern and southeastern areas it is only 55 percent. There are similar differences in the number of schoolteachers, with about twice as many schoolteachers for each registered 0- to 17-year-old in central Chongqing as in other areas (Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016).

Becoming a global city entails the risk of even more extreme inequalities within the city, which must be carefully managed. Inequality in some global cities, such as London and New York (Box 13), is more extreme than in their respective national economies. To avoid the downsides associated with high inequality, and in particular the squandering of human capital that is often associated with it, close attention to social inclusiveness is required as Chongqing continues to grow.

Improving Inclusivity

This strategy aims to respond to population challenges as manifested on multiple fronts: looming labor shortages, an aging population, and fairness issues. Delivering affordability and a high quality of life for all its residents will be crucial for Chongqing to attract and retain a high-quality workforce, which will in turn enable high-productivity economic activity in both manufacturing and services and put the city in a strong position to weather the coming demographic shift. By encouraging the free movement of people and jobs, Chongqing can become a more inclusive city while gaining an edge over other cities by attracting skilled labor.

Improving inclusivity I: Ensure equality of opportunity across urban and rural districts with social services and a free flow of people

Mobility speeds up economic transformation. Labor mobility and the free flow of people will be essential to accelerate the transformation of surplus low-

BOX 13 **Social Inequity in New York and London**

Income inequality is high and increasing in New York City. In 2006, the poorest 50 percent of New Yorkers earned 7.4 percent of the city's total income. By 2014, this share had further fallen to only 5.6 percent. Manhattan has the most extreme income inequality in the United States. The top 5 percent of households earned US$864,394, or 88 times as much as the poorest 20 percent, according to the Census Bureau's American Community Survey. New York City also recognized in 2014 that "despite a rise in employment, nearly half of New York City's population is living near poverty levels, (Oh 2014)."

Income and wealth inequalities are also much higher in London than anywhere else in the United Kingdom. While income inequality has declined in the last five years, wealth inequality has increased. The situation can be summarized in a few striking figures: 50 percent of London's wealth is owned by the richest 10 percent of its households, while the bottom 50 percent own just over 5 percent of the wealth. The income of someone in the top 10 percent in London is eight times greater than that of someone in the bottom 10 percent. According to Trust for London (Tinson et al. 2017), wealth inequality is even more extreme—the wealth of someone in the top 10 percent in London is 295 times greater than someone in the bottom 10 percent. Moreover, in 2017, 27 percent of Londoners lived in poverty, down just slightly from 29 percent in 2011. Housing costs are the main factor contributing to London's high poverty rates.

Source: New York City Independent Budget Office 2017; City of New York 2014; Tinson et al. 2017.

productivity and low-income rural jobs into medium- to high-skill industrial jobs, as well as to equalize opportunities and make rural and urban wages converge.

Mobility must be supported by appropriate public policy. The profound transformation of the economic and social structure entailed by large-scale migration will have to be supported by policies providing basic social welfare for all citizens. All citizens, wherever their origin, should benefit from social protection system, as well as care services adapted to the aging population. The goal of equal opportunities and basic security is therefore important, both to create a more inclusive society and to support growth by strengthening human capital. By providing social protection and equal opportunities, Chongqing will promote a more efficient distribution of workers and hence increase labor productivity.

Improving inclusivity II: Invest more in education and eliminate spatial and social biases to expand opportunities for migrant workers and rural areas

Education investment can reduce outmigration and spatial inequalities. To reverse outflow migration trends and build a healthy, diverse economy that provides opportunities at all levels of income and skills, Chongqing should not only offer incentives to attract talents but also offer training and education to the low-skilled and poor, including migrant workers. To do so, Chongqing must follow other cities and increase its investment in education. Shanghai, for example, launched a policy to provide universal compulsory education for migrant children.

Improving inclusivity III: Maintain affordability and increase access to housing for migrants

To preserve its key competitive advantage, Chongqing should continue to ensure affordable housing and low costs of living. Relatively low production and living costs have become Chongqing's competitive advantages in building a thriving and inclusive economy. Chongqing Municipality needs to continue to strengthen the management of housing costs and improve the city's affordability to maintain these relative advantages. To simultaneously ensure housing affordability and good access to jobs, housing planning should be integrated with economic and transportation planning.

Strategic pillar 5

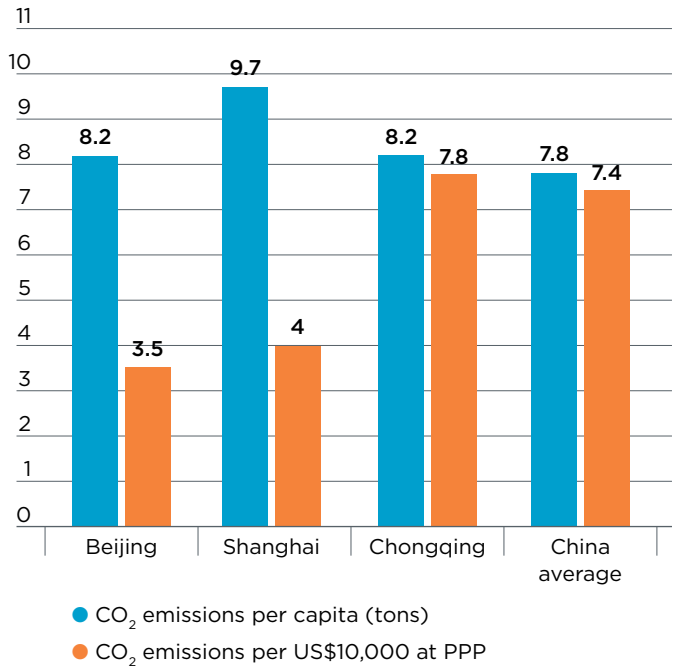
A green and low-carbon growth strategy to decouple economic growth from resource use

Cities can decouple their economic growth from environmental impacts by bundling policies that simultaneously create a compact urban form, enhance transit accessibility, and improve sectoral energy efficiency. **Chongqing is at a crossroads—it will soon reach levels of GDP per capita at which world cities typically decouple economic growth from energy and resource use and their associated carbon emissions and pollution.** However, decoupling does not happen automatically. It requires cities to adopt green growth policies.

The Chongqing economy is both energy-intensive and emissions-intensive. The city emits about twice as much CO_2 per unit of GDP as Shanghai and Beijing (Figure 13). These high emissions are driven by a large share of heavy industries, a large construction sector, and an energy mix dominated by fossil fuels (72 percent), with coal alone representing about 60 percent of total energy consumption (Figure 14) (Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016). This has resulted in poor air quality, with the average concentration of fine particulate matter well above WHO critical thresholds.

Chongqing's urban form and superblock-driven expansion pattern are material-intensive and energy-intensive. An urban form that encourages a car culture generates more greenhouse gas (GHG) emissions and threatens air quality. Superblock expansion entails significant increases in energy embodied in infrastructure, infrastructure costs, energy use, and CO_2 emissions.[20] Moreover, research in Jinan has shown that households living in superblocks use at least twice as much energy for transportation, heating, lighting, water, and the built environment as those living in any other Chinese urban form (Massachusetts Institute of Technology and Tsinghua University 2010).

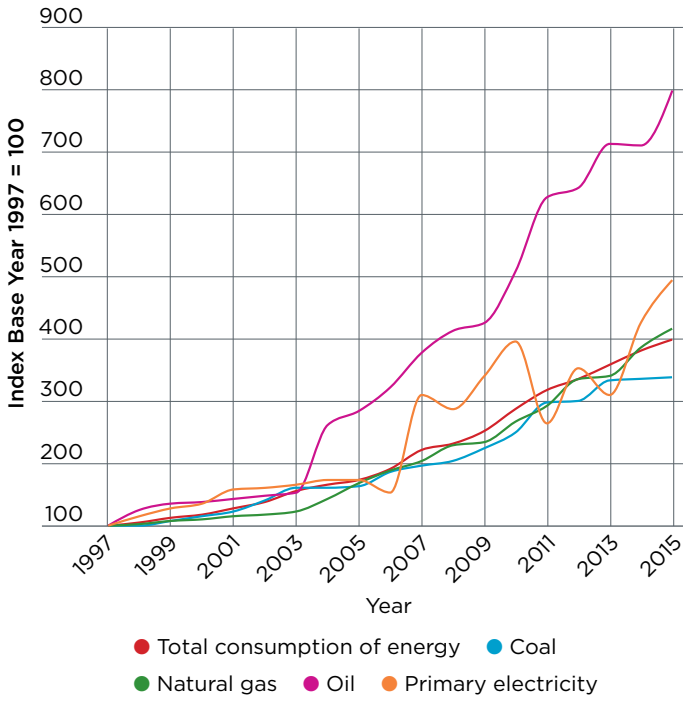
FIGURE 13 CO_2 Emissions Per Capita and CO_2 Emissions Per Unit of GDP



Source: Produced by the Urban Morphology and Complex Systems Institute for this report, based on Brookings Institution 2015, Economist Intelligence Unit 2011, and International Carbon Action Partnership 2014.

Note: PPP = purchasing power parity.

FIGURE 14 Energy Consumption Trend by Type of Energy



Source: Produced by the Urban Morphology and Complex Systems Institute for this report, based on Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016.

Note: All values indexed on a base of 100 in 1997.

Green and Low-Carbon Growth

To decouple economic growth from energy consumption and emissions, Chongqing should push for green and low-carbon growth transformations in energy, urban form, buildings, and transport.

Green and low-carbon growth I: Reduce the energy intensity of the economy and decarbonize the energy mix by increasing the share of renewables

The emission intensity of Chongqing's economy can be reduced through two levers: reducing the energy intensity of GDP and reducing the emissions intensity of energy use. The first is primarily structural and requires Chongqing's industry to move up the value chain toward high-end manufacturing. Improving the energy and resource efficiency of the building and construction sectors with efficient buildings and districts will be important contributions to bringing down energy intensity. Concerning the second, deploying technological solutions to improve the technological efficiency of energy conversion and use will be crucial. This step is in line with China's national energy and environmental priorities, which include decarbonizing the energy mix and increasing the share of renewables. China intends to raise the share of nonfossil energy in primary energy consumption to about 20 percent by 2030, so that nonfossil energy supplies by 2030 will be seven to eight times those of 2005.

Green and low-carbon growth II: Reduce transport emissions by planning for a compact urban form

Urban compactness, which facilitates development of car-light cities, can decrease transportation energy use, emissions, pollution, and congestion. Compact city policies are an important lever to reduce transport environmental impacts and deliver significant carbon and pollutant emissions reduction. In the urban growth scenario conducted for this report (Box 8), the GHG and pollutant emissions associated with automobile use are reduced by 40 percent compared to the Trend scenario. Like Singapore, Chongqing should systematically move toward becoming a car-light city through a combination of carrot and stick approaches, whereby driving private vehicles is

made more difficult (through the reduction of parking facilities and increased toll charges, for example), while public transit, walking, and cycling are encouraged or subsidized.

Green and low-carbon growth III: Improve the energy and resource efficiency of the building sector with efficient buildings and districts

The building sector can be an important driver of improved environmental performance in Chongqing. In 2009, building heating accounted for 8 percent of Chongqing's emissions, more than road transport, at 7 percent (Liu 2016). Energy efficiency measures—such as insulation, renewable micro-generation, conversion of heating energy into electricity (through air- and ground-source heat pumps), and district heating from renewable energy sources—can contribute significantly to the reduction of emissions. These policies are already deployed in cities around the world and can have significant impacts. For example, Stockholm has experienced a 33 percent reduction in greenhouse gas emissions from heating and electricity in recent decades, with emissions falling from 3.8 tCO_2e to 2.3 tCO_2e per person between 1990 and 2010 (LSE Cities 2013).

Green and low-carbon growth IV: Leverage Chongqing's automobile base to develop the fast-growing electric mobility sector

Chongqing can secure a double win by doubling down on electric mobility. Greening urban transport through electric mobility can simultaneously reduce emissions and serve as a potential driver of growth in Chongqing's automobile industry. Leveraging Chongqing's existing automobile base, Chongqing can become a global leader in producing and using electric cars.

Photo: URF.

Conclusion

Chongqing's large administrative territory and population, thriving economy, and increasing integration into the global economy are huge assets in its bid to become a global city. Chongqing can manage looming risks and shape its growth trajectory to mirror that of other successful global cities by (1) shaping its spatial structure in a compact form; (2) increasing its connectivity and integration in the ASEAN region; (3) becoming a center of innovation with a highly skilled workforce; (4) managing the demographic transition and urban-rural integration, and creating a free-flowing large labor market; and (5) following a low-carbon growth pathway. The five major transformations highlighted in this report define short-, medium-, and long-term goals and provide an overall strategic direction to achieve Chongqing's Vision 2035. A successful outcome requires strong leadership and commitment, careful sequencing, smooth and determined implementation, and close coordination among all relevant agencies. With the right strategy and careful implementation, Chongqing, already considered a fast-growing emerging global gateway, can achieve its goal of becoming one of the world's most competitive cities by 2035.

Chongqing Hongyadong. Photo: jimmyan.

Annex 1
Key Indicators Used for Benchmarking Chongqing with Global Cities and the Region

Chongqing presents two distinct scales:

- **Chongqing Municipality** is comparable to a country in terms of administrative area and population. The size of Chongqing Municipality is 80 percent that of Korea, and its population is 60 percent of Korea's population. Chongqing's urban population can also be compared to that of huge metropolitan regions. Chongqing Municipality's urban population is half that of the Greater Tokyo Area (38 million),[21] two-thirds that of Seoul Capital Area (25.5 million),[22] and 90 percent that of the New York metropolitan area (20.32 million).[23]
- **Central Chongqing** has a huge administrative area of 5,473 km^2 in its nine districts (equivalent to the entire Shanghai municipality, 3.7 times the size of Greater London, and seven times the size of New York City). However, only 10 percent of central Chongqing's administrative land is built up (545 km^2). In 2014, central Chongqing had a resident population of about 8.2 million, which is comparable to that of the Big Six global cities.

Depending on the dimensions, indicators used in this benchmark are at the scale of the municipality or central Chongqing, or both when relevant. For some indicators, such as social inclusiveness and some connectivity indicators, international data are available at country scale only and are used as a proxy for data at metropolitan region scale. This approach is justified by the fact that (for example) Seoul Capital Area comprises half the population of Korea, while the Tokyo metropolitan area has 30 percent of Japan's population. Environmental indicators are mostly compared at municipality and metropolitan region scales.

The benchmark analysis in this report is based on 30 indicators, grouped under 15 headings and four dimensions.

I. Spatial Structure and Urban Fabrics

Indicator	Chongqing	International benchmarks
Land expansion		
Additional land per new urban resident, 2000–2009 (m^2)	136[a] (central Chongqing)	Hong Kong SAR: 40[b] Singapore: 38[b]
Density (people/km^2)		
Population density (built-up area)	12,129[c] (municipality)	Seoul Capital Area: 11,880[b] Greater Tokyo Area: 8,062[b]
	13,248[c] (central Chongqing)	Hong Kong SAR: 37,100[d] Seoul Special City: 29,100[e] Singapore: 18,248[b] Tokyo 23 wards: 15,346[f]
Economic agglomeration		
Job density (number of jobs/km^2 of urban built-up area)	6,800[c] (municipality)	Hong Kong SAR: 14,340[d] Singapore: 13,000[g]
GDP density (GDP/km^2 of built-up area in billion US$/$km^2$ at current prices)	0.166[c] (municipality)	Greater Tokyo Area: 0.31[g] Seoul Capital Area: 0.34[g] New York metropolitan area: 0.23[g]
	0.180[c] (central Chongqing)	Hong Kong SAR: 1.18[h] Singapore: 1.07[g] Seoul Special City: 0.78[i] Greater London: 0.6[g] New York City: 0.94[j]
Mixed-use and local jobs		
Job/resident ratio	36 percent of central Chongqing's population lives on residential superblocks with only 0.3 jobs per resident[k]	UN-Habitat recommendation: 0.7 jobs per resident[l]
Accessibility of transit and alignment of densities with transit accessibility		
Percentage of people within walking distance to transit (less than 1 km in global cities)	20 percent[k] (central Chongqing)	London: 53 percent[m] New York: 48 percent[m] Hong Kong SAR: 75 percent[m]
Percentage of jobs within walking distance to transit (less than 1 km in global cities)	35 percent[k] (central Chongqing)	London: 67 percent[m] New York: 58 percent[m] Hong Kong SAR: 84 percent[m]
Urban fabric (assessed on comparable samples 1 square mile in size)		
Average block size (ha)	6 (superblocks in central Chongqing)[n]	London (City): 0.7[o] Lower Manhattan: 0.65[o] Hong Kong SAR Central: 0.34[p] Singapore: 0.9[p] Seoul: 0.36[o] Tokyo Nihonbashi: 0.26[o]
Density of intersections (number/km^2)	6 to 10 (public streets only)[n] 50 (including inner superblock streets)	London (City): 188[p] Lower Manhattan: 132[p] Hong Kong SAR Central: 459[q] Singapore: 109[q] Seoul: 333[p] Tokyo Nihonbashi: 386[p]

Indicator	Chongqing	International benchmarks
Average distance between intersections (m)	400[n]	London (City): 86[p] Lower Manhattan: 83[p] Hong Kong SAR Central: 53[q] Singapore: 115[q] Seoul: 33[p] Tokyo Nihonbashi: 43[p]
Street linear density (total length of streets in km per km^2)	12[n]	Manhattan: 22.7[r] Hong Kong SAR Central: 36[q] Singapore: 17[q] Tokyo Nihonbashi: 30[q]

a. Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016.
b. Angel et al. 2016.
c. Calculated from Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016.
d. Based on data from Government of Hong Kong Planning Department 2018.
e. Calculated on the built-up area from Seoul Metropolitan Government data.
f. Calculated from Tokyo Metropolitan Government data.
g. GDP at current price and built-up area from Angel et al. 2016.
h. Based on GDP at current price and on data from Government of Hong Kong Planning Department 2018.
i. Calculated on GDP at current price and on the built-up area from Seoul Metropolitan Government data.
j. Calculated on GDP at current price and administrative land.
k. Based on an assessment made by Calthorpe Associates for this report.
l. UN-Habitat 2014.
m. Based on calculations by LSE Cities in Rode et al. 2013.
n. Calculations made by China Sustainable Transportation Center for this report.
o. Based on data in Jacobs 1995.
p. Jacobs 1995.
q. Calculations made by the Urban Morphology and Complex Systems Institute for this report.
r. Salat, Labbé, and Nowacki 2011.

II. Economic Competitiveness

Indicator	Chongqing	International benchmarks
Economic performance & structure		
GDP per capita (at current prices)	US$8,908[a] (municipality 2016)	New York metropolitan area: US$69,915 (2015)[b] Greater Tokyo Area: US$43,664 (2015)[c] Seoul Capital Area: US$34,355 (2015)[d] Singapore: US$54,940 (2015)[e] Hong Kong SAR: US$42,431 (2015)[e]
GDP growth rate	9.3 percent[a] (municipality 2017)	New York metropolitan area: 1.1 percent (2017)[b] Tokyo Prefecture: -0.6 percent (2017)[c] Seoul Capital Area: 3.1 percent (2017)[d] Singapore: 3.6 percent (2017)[f] Hong Kong SAR: 3.8 percent (2017)[g]
Percentage of secondary industry in GDP	44.2 percent[a] (municipality 2016)	New York metropolitan area: 8 percent[b] Tokyo Prefecture: 11.5 percent[c] Singapore: 26 percent[f] Hong Kong SAR: 7.7 percent[h]
Labor force		
Labor productivity (GDP/worker) in US$ at current prices	15,720[a] (municipality)	Singapore: US$66,406[i] Hong Kong SAR: US$61,485[i]
Share of college graduates in the labor market	27 percent by 2030 (projection for China as a whole)[j]	Korea: 58 percent[k]
Innovation capacity		
R&D expenditure as a share of GDP	1.57 percent[a] (municipality)	Korea: 4.15 percent[e] Japan: 3.49 percent[e]
Connectivity		
High-speed rail network length	2,032 km at municipality scale (when mi [米] railway network is complete)[l]	Japan: 2,765 km[m] Korea: 1,048 km[m]
International passenger annual air traffic[n] (2017)	5 million (2020 target)[o]	Greater London: 110 million[p] New York JFK: 32 million Seoul Capital Area: 57 million Tokyo Narita: 32 million Hong Kong SAR: 70 million Singapore: 58 million
Digital connectivity Peak connection speed (IPv4) (Mbps)	45.9 (China)[q]	New York metropolitan area: 98[q] Korea: 121[q] Hong Kong SAR: 129.5[q] Singapore: 184.5[q]

a. Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing 2016.
b. Based on data from New York statistics.
c. Based on data from Tokyo Metropolitan Government.
d. Based on data from Seoul Metropolitan Government.
e. Based on data from the World Bank.
f. Based on data from Singapore Government.
g. Based on data from Census and Statistics Department, Hong Kong SAR.
h. In 2016, manufacturing accounted for 1.1 percent of GDP for Hong Kong SAR. Electricity, gas and water supply, and waste management accounted for 1.4 percent. Construction accounted for 5.2 percent. Services accounted for 92.2 percent of the economy, with financing and insurance representing 17.7 percent.
i. Calculated from employment and GDP data.
j. Yue 2016.
k. Lee 2017.
l. Chongqing Municipal Government 2017.
m. Migiro 2018.
n. ACI 2018.
o. Based on data from Chongqing Planning Bureau.
p. Figures for London include Heathrow and Gatwick.
q. Akamai 2017.

III. Environmental Sustainability

Indicator	Chongqing Municipality[a]	International benchmarks[b]
CO_2 emissions and energy		
CO_2 emissions per capita (tons)	8.22	Greater Tokyo Area: 4.8 Seoul Capital Area: 3.7
CO_2 emissions per unit of GDP (US$10,000 at PPP)	7.8	Greater Tokyo Area: 1.1 Seoul Capital Area: 1
Energy consumption per unit of GDP (MJ/US$1,000 at current prices)	12	Greater Tokyo Area: 1.2 Singapore: 3 Hong Kong SAR: 1.5
Water		
Water consumption (daily per capita in liters)	720	New York metropolitan area: 262
Air quality		
$PM_{2.5}$ concentration	61	New York metropolitan area: 9 Greater Tokyo Area and Greater London: 15 Singapore and Paris: 18

Note: PPP = purchasing power parity.

a. Data for Chongqing Municipality are calculated for this report from Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing (2016).

b. Data in this column are from Economist Intelligence Unit (2011).

IV. Social Inclusiveness

Indicator	Chongqing Municipality[a]	International benchmarks[b]
Education		
Public government spending on education as percentage of GDP	3.21 percent	Korea: 6.26 percent Japan: 4.43 percent
Public government spending on education as share of public expenses	13 percent	Korea: 14.5 percent Singapore: 19.9 percent
Public education expenditure per student	US$1,337	Korea: US$19,900 Japan: US$27,960
Health care		
Total health care expenditure per capita at PPP	US$256	Singapore: US$3,578 Japan: US$3,741
Government health care expenditure as a share of GDP	1.72 percent	Japan: 8.6 percent

Note: PPP = purchasing power parity.

a. Data for Chongqing Municipality are calculated for this report from Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing (2016).

b. International benchmarks are based on data from the World Bank.

Traditional alley in Chongqing. Photo: stockinasia.

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Chongqing Municipality. Photo: 4045.

Endnotes

1. This refers to the "*hukou*-registered" population. The actual resident population in 2016 was 30.48 million according to Chongqing Municipal Bureau of Statistics and NBS Survey Office in Chongqing (2016).
2. First-tier Chinese cities include Beijing, Shanghai, Guangzhou, and Shenzhen.
3. In 2011, China's State Council set out the vision for several major Chinese cities, including Chongqing, to become international metropolises whose influence could radiate to the region and play a leading role globally.
4. See President Xi Jinping's report at the 19th National Congress at http://www.xinhuanet.com/english/special/2017-11/03/c_136725942.htm. During the first stage, from 2020 to 2035, the country is meant to achieve modernization and become a leader in innovation. During the second stage, from 2035 to 2050, it is meant to become a global power.
5. The real economy refers to the part of the economy concerned with actual produced goods and services, as opposed to the part of the economy concerned with buying and selling on the financial markets.
6. Currently, Chongqing's tertiary sector contributes to 48.9 percent of GDP, with financial services accounting for only 8.9 percent.
7. The per capita disposable income of Chongqing's urban residents is RMB 27,239, while it is only RMB 10,505 for rural residents.
8. See United Nations, "Goal 11: Make Cities Inclusive, Safe, Resilient and Sustainable," https://www.un.org/sustainabledevelopment/cities/.
9. In the leading global indices, six cities stand out. They include the traditional megacities of London, New York, Paris, and Tokyo, as defined by JLL's Commercial Attraction Index (Jones Lang LaSalle 2014); and this quartet has been more recently joined by Hong Kong SAR and Singapore. The cities in this group, known as the "Big Six," are often described as the "command and control centers" of the world economy (Clark, Moonen, and Couturier 2015).
10. In the age of globalization, the activities of production are scattered globally. These complex, globalized production networks require new forms of financial and production services to manage them. These services are often complex and require highly specialized skills. Thus they are subject to agglomeration economies, and tend to cluster in a limited number of cities (Sassen 2005).
11. Populations and areas are as follows: Tokyo's 23 wards that form the city's core—9.37 million in 2016; 619 km^2; Seoul Special City—9.84 million in 2018; 605 km^2; Singapore—5.6 million in 2018; 719.9 km^2; Hong Kong SAR—7.347 million in 2016; 2,754 km^2; Greater London—8.778 million in 2016; 1,569 km^2; and New York City—8.538 million in 2016; 789 km^2.
12. Superblocks are large blocks served by wide arterial streets; they are characterized by single-use zoning that separates residential and commercial areas and are oriented primarily to cars rather than pedestrians.
13. The finding is according to an assessment made by Calthorpe Associates for this report.
14. UN-Habitat (2014) recommends at least 80 to 100 intersections and 18 km of streets per km^2.
15. The two dimensions can be defined as follows: specialization refers to the proportion of employment or output of Chongqing's most important industry or industries; diversification refers to the number of different industries and their size in relation to the economy's total size. Together, these indicators thus reflect the variety or balance of Chongqing's industrial base.
16. An aging society is generally understood as one in which 10 percent of the population is over the age of 60, or 7 percent of the population is 65 and above.
17. Singapore developed from a third world to a first world country, ranked among the top six global cities, in a span of less than 50 years. Singapore has built on its favorable geographical location and has established a strong network of air and sea routes, supported by a conducive and

cosmopolitan business environment. Singapore has also developed innovative solutions to overcome its land and resource constraints and has made itself a livable and multicultural city.

18. The full study is published separately as *Chongqing 2035: Urban Growth Scenarios*.

19. Using river transport in the Yangtze River for shipping is cost effective. By combining river and sea modes, this route has the lowest total cost of transportation among all multimodal routes. To fully reap this cost advantage, interregional cooperation along the Yangtze River is needed to improve efficiency throughout the Chongqing-Shanghai waterway. Goals should include increasing the efficiency of the current service networks and the handling capacity in some intermediate ports.

20. As a proxy for the cost of infrastructure, the length of streets per unit of generated GDP increases significantly between (for example) Yuzhong walkable mixed-use areas and Jiulongpo superblocks. Studies on road networks (Ingram and Liu 1997) and urban water and wastewater networks (Müller et al. 2013) suggest that per capita network length and material stocks tend to increase with lower urban density. Müller et al. (2013) computed data on a representative sample of about 40 cities, which have been mathematically analyzed by the Urban Morphology and Complex Systems Institute (Salat 2016; Salat, Bourdic, and Kamiya 2017) to calculate the elasticity of water, wastewater, and street network lengths and costs per capita with regard to average residential density. Reducing the density by half generally increases water network costs per capita by 72 percent and street networks costs per capita by 117 percent.

21. The Greater Tokyo Area is the most populous metropolitan area in the world, consisting of the Kantō region of Japan, which includes the Tokyo Metropolis, as well as the prefecture of Yamanashi in the neighboring Chūbu region. In Japanese, it is referred to by various terms, one of the most common being National Capital Region.

22. The Seoul Capital Area (SCA) is the metropolitan area of Seoul, Incheon, and Gyeonggi-do located in northwest Korea.

23. The New York metropolitan area, also referred to as the Tri-State Area, includes New York City, Long Island, and the mid- and lower Hudson Valley in the state of New York; the five largest cities in New Jersey—Newark, Jersey City, Paterson, Elizabeth, and Edison—and their vicinities; and six of the seven largest cities in Connecticut—Bridgeport, New Haven, Stamford, Waterbury, Norwalk, and Danbury—and their vicinities.

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