

# *China National Human Development Report 2013*

*Sustainable and Liveable Cities:  
Toward Ecological Civilization*



*Empowered lives.  
Resilient nations.*

CHINA NATIONAL HUMAN DEVELOPMENT REPORT 2013

## **Sustainable and Liveable Cities: Toward Ecological Civilization**

The preparation of this report was a collaboration between UNDP China  
and Institute for Urban and Environmental Studies, Chinese Academy of Social Sciences

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# FOREWORD

In 2011 the Chinese National Bureau of Statistics announced that China's urbanisation rate had surpassed 50 percent. For the first time in China's long history, there were more citizens living in cities than in rural areas.

Asia as a whole has not yet reached the 50 percent mark but is expected to do so by 2020, and Africa by 2035. According to UN estimates, the total number of urban dwellers worldwide is due to increase by 75 percent between now and 2050, when 68 percent of the world population will be city dwellers. Most of this urban growth will occur in Asia and Africa.

China's urbanisation process is of particular importance for two main reasons: speed and scale. It took 6 decades for China's urbanisation to expand from 10 to 50 percent. This same transition took 150 years to occur in Europe and 210 years in Latin America and Caribbean.

China's rapid urbanisation is characterized by massive internal migration. In 2011, the migrating population reached 260 million. During the next two decades, nearly 310 million more people are expected to migrate from rural to urban areas. Such speed and scale in migration is unprecedented in human history.

The majority of China's major objectives and endeavours will thus be won or lost in its cities. The battle against climate change, the fight against inequalities, and the response to a rapidly ageing population – to mention a few – will depend on measures taken within the context of China's burgeoning cities.

As China urbanises, both challenges and opportunities will arise. Pressures on multiple fronts will increase; the use of natural and energy resources, employment competition, transportation, housing, access to basic social and other public services will all expand. The way China addresses these challenges will shape not only the country's urban landscape, but also that of the entire nation. Because big parts of China's future cities have yet to be built, huge urban and national challenges, along with huge costs, can be avoided if the right care and the right decisions are taken now.

With the urban population growing at such rapid pace, China needs to develop smart city planning and a strong network of clean energy, public mass transportation, implement strict standards of energy efficiency for buildings, and promote voluntary green actions by citizens and businesses. Given the long life span of city infrastructures and buildings, impacts of China's decisions now will be felt for next several decades. Urbanisation also provides an opening to increase equal access by all to opportunities and social services and to address some of the current inequalities that are emerging as the country transitions to an economy where market mechanisms play a greater role. Cities are centres of economic and cultural development, and increasingly, culture and creativity are being recognized as essential for vibrant, liveable cities.

The urgency and significance of the urbanisation process in China prompted UNDP to focus its National Human Development Report on Sustainable and Liveable Cities: Toward Ecological Civilization. The report focuses on two main questions: how can we make China's cities more liveable, and how can we ensure that citizens better enjoy the potentials associated with urban growth? To answer these questions, the report explores the current urban transformation in China from the perspective of human development. It looks at international practices and makes recommendations and projections into the future, based on the key areas of China's urban transformation that will directly affect people.

We are aware that there have been numerous insightful studies on urbanisation in China in recent years focusing on subjects such as low carbon cities, urban planning, and so on. The current report does not attempt to replicate them. Rather, it explores a range of topics - health, employment, housing, social services, culture, as well as cross-sectoral issues like inequality, rural-urban linkages, the natural environment, through a sustainable human development lens.

China's political commitment to a successful urban transformation is unambiguous. The country's leadership has placed urbanisation on top of its political agenda. The government of China is fully aware of the need to turn its attention to making sure that its cities are more liveable, more humane, and sustainable for its people. Premier Li Keqiang stated in March 2013 that the new model of urbanisation should be human-centred, and should ensure the prosperity of the people, and the quality of urbanisation.

The country's leadership adopted the policy of Ecological Civilization and is aiming to green its development trajectory as well as to nurture the countries evolving social and cultural creativity. President Xi Jinping stated in April 2013 that China will focus more on the quality and efficiency of economic development, to build a "Beautiful China", and will strengthen the ecological civilization construction with more efforts toward green development, circular development and low-carbon development and to balance industrial development and green, sustainable development.

Since urbanisation stands at the intersection diverse economic, social, political, cultural and environmental policy streams, guiding the urbanisation process requires good governance - good policies, good division of labour and coordination - horizontally across sectors and vertically across levels of government. It also requires good cooperation between government, private sector, social organisations and citizens.

This Report is a collaboration between the UNDP China and Institute for Urban and Environmental Studies of the Chinese Academy of Social Sciences. It was compiled by a distinguished team of Chinese and international experts. I would like to extend my sincere thanks and warmest congratulations to all the authors and particularly Professor Pan Jiahua's team for their outstanding work. I would also like to take this opportunity to express my appreciation and gratitude to the Royal Norwegian Embassy, the Peace and Development Foundation, Leighton Asia, Tianyan Green Energy Corporation, Stora Enso and Veolia Group for their generous donations that have made this report possible, and to the many colleagues in the United Nations System who provided valuable insights and assistance.



Renata Lok-Dessallien

Resident Coordinator of UN China

Resident Representative of UNDP China

# PREFACE

From 1978 to 2012, China's urbanisation rate has increased from 17.9 percent to 52.6 percent, with an average annual addition at 1.02 percentage points. Urbanisation in China has occurred not only at a rapid rate, but also on an unprecedented scale. Such rapid and large scale urban growth has profound impact on contemporary China and the world. Urbanisation has provided space for industrialization, changed the population distribution and industrial structure of China, promoted the development of productivity and facilitated the accumulation of wealth.

The fact that over 50 percent of the entire population lives in cities and towns marked the beginning of a new urban era in which urban society has replaced rural society as the main feature of Chinese society. Today, over 710 million Chinese people live in cities and towns, and advanced manufacturing and modern service industry gathered in cities and towns which have become driving forces supporting China's rapid economic growth.

However, China has taken an extensive path towards urbanisation since its opening up and reform. On the one hand, China's urbanisation focused on velocity instead of quality, the level of citizenship for those migrated rural population is relatively low and the rapidity of urbanisation is inconsistent with its quality. On the other hand, China's urbanisation is characterized by high consumption, excessive emission, over-expansion, low efficiency of resource allocation and enormous resource and environmental costs. Accelerated urbanisation goes with high consumption and excessive emission. Some local governments and sectors seek to create bright image, put emphasis on growth, cut social welfare spending, and ignore the qualities of cities and towns. As a result, huge gaps are created between urban and rural areas, cities and towns become unnecessarily homogeneous with regard to urban form, the urban system is not scientifically structured, big cities grow rampantly, and cities are facing more and more social, resource and environmental problems. The consequential problems of inconsistency, unsustainability, disharmony and non-inclusiveness seriously hinder the progress of ecological civilization.

Currently China's urbanisation has entered into an important strategic transformation period. The report to the 16th National Congress of the CPC (Communist Party of China) pointed out that China should "take the path to urbanisation with Chinese characteristics." The report to the 17th National Congress of the CPC further incorporated the "path to urbanisation with Chinese characteristics" into the five basic elements of "path to socialism with Chinese characteristics". The report to the 18th National Congress of the CPC proposed that, "we should keep to the Chinese style path of carrying out industrialization in a new way and advancing IT (Information Technology) application, urbanisation, and agricultural modernization. We should promote integration of IT application and industrialization, interaction between industrialization and urbanisation, and coordination between urbanisation and agricultural modernization, thus promoting harmonized development of industrialization, IT application, urbanisation and agricultural modernization." This progress illustrates the deepening, widening and quality improvement of China's urbanisation process.

In December 2012, the Central Economic Work Conference proposed that we should establish a scientific and reasonable urban structure. Large, medium and small cities, as well as small towns and city clusters, should be distributed scientifically, and their layout should be closely linked with regional economic development and industrial distribution, and should be compatible with the carrying capacity of resources and environment. Systematically increasing the level of urban citizenship for migrant rural population shall be treated as an important task and shall be enforced vigorously. The vision and principle of eco-civilization should be fully integrated into the whole process of urbanisation, and we should take a new type urbanisation path which is intensive, smart,

green and low-carbon. In early 2013, Premier Li Keqiang pointed out that the core of new type urbanisation is people's urbanisation, the key to its success is to improve the quality of urbanisation and the purpose of urbanisation is to benefit the people and enrich the farmers. We should make efforts to improve cities' intrinsic carrying capacity and should not build "man-made" cities. Industrial development should be integrated into urban construction, and migrant workers shall be gradually integrated into cities and towns.

Urbanisation is a historic task for China's modernization, and has the greatest potential to boost domestic demand. In 2030 China's urbanisation rate would reach around 70 percent, and nearly one billion people will live in cities. How can China's cities cope with such enormous population pressure? We must, in accordance with the requirements of ecological civilization, take the right path towards sustainable and livable cities.

We would like to express our gratitude to UNDP China Office. A very unique subject has been chosen for the China National Human Development Report 2013 - Sustainable and Liveable Cities: Toward Ecological Civilization. This topic has grasped the greatest concern for human development in present-day China.

We are also very grateful to the research team represented by Professor Pan Jiahua and Mr. Luis Gomez-Echeverri. With global vision, you have successfully integrated the two major themes of urbanisation transformation and ecological civilization construction, and have demonstrated your excellent academic attainment and constant contemplation on problems of contemporary China.

China's cities will surely make our lives better.

The image shows a calligraphic signature in black ink, consisting of three characters: 王伟光 (Wang Weiguang).

Wang Weiguang  
President  
Chinese Academy of Social Sciences

# ACKNOWLEDGMENT

China National Human Development Report (NHDR) 2013 is now accomplished as a result of collaborative research efforts and production to which many partners have contributed their wisdom. We shall attribute the successful completion of this report to the devotion and hard work of every member of the development project team.

China's urbanisation transformation has brought enormous opportunities and challenges. China's leadership has made great efforts to promote urbanisation as a priority for economic development. Obviously, the potential for extensive industrial expansion is very limited, and urbanisation shall be a strong and lasting driving force to boost China's economic growth in the future. The "intensive, smart, green and low-carbon" new path towards urbanisation which China is to explore and pursue has become a focus attracting wide attention within and outside China. In this context, UNDP China Country Office decided to choose a unique subject for the China National Human Development Report 2013 - Sustainable and Liveable Cities: Toward Ecological Civilization. Based on existing studies, the NHDR takes into account the human development aspect in the process of building sustainable, liveable cities, carrying out ecological civilization practice and achieving urbanisation transformation.

The compilation of the China National Human Development Report 2013 formally began in March 2012. The inception workshop was held on April 9 in the Chinese Academy of Social Sciences (CASS). At the workshop and in the process that followed, a number of experts and scholars have actively participated in the discussion of the report both for the framework and contents and provided many constructive suggestions. Chen Boping, Chen Huai, Feng Changchun, Gu Shengzu, Lei Hongpeng, Li Yang, Liu Yanhua, Qiu Aihua, Sun Cuihua, Xia Guang, Wang Wenyuan, Wang Zhongyuan, Zhang Gengtian and Zou Ji, a few among many who have made valuable contributions. During the initial stage of this study, UNDP China Country Office and the Institute for Urban and Environmental Studies of the Chinese Academy of Social Sciences jointly held a number of workshops to solicit advice, which have been reflected in the final version. We are very honoured to have renowned national and international scholars and government officials to participate in this project and serve as senior advisors to the China National Human Development Report 2013, including Wang Weiguang, Xie Zhenhua, Qiu Baoxing, Liu Yanhua, Rajendra Pachauri, and Hans Joachim Schellnhuber. Their rich research and management experience, and their solid theoretical background and practical knowledge have contributed greatly to this report.

The Institute for Urban and Environmental Studies (IUE) of the Chinese Academy of Social Sciences commissioned background papers from outstanding experts. These include: Li Tie (China's urban area and urbanisation), Fu Chonglan (China's urban culture during transition period), Ye Yumin (Challenges facing the development of cities and towns in China), Wei Houkai (China's urban transformation strategy during the new period), Ding Chengri (International experience on urban development), Mohan Peck (Culture and Sustainable Cities), Goerild Heggelund, Wang Dong and Liu Zhe (Economic challenges facing sustainable and liveable cities), Henny Ngu and Matthias Kaufmann (the governance of China's liveable and sustainable cities). All these background research reports have deepened our understanding of China's urban development, and provided important source of ideas and data for this report. Moreover, I wish to thank Inga Fritzen Buan, Feng Jinlei, Harris Tiddens, Jonathan Woetzel, Maxie Chopard, Omar Siddique, Omer Ertur, Sujala Pant, Weimin Lee, Seo Yean, Loh Ka Leung, Victor Yuan and Josie Zhou for their inputs to the report.

The first draft of the China National Human Development Report 2013 was completed in February 2013 and was followed by several consultation meetings. The first draft was sent to national and international experts for peer review, we are very grateful to the peer reviewers of this report: Bishwa Tiwari, Burke Taylor, Elena Borsatti,

Hamid Sharif, Huang Xiaojun, Khoo Teng Chye, Rohini Kohli, Scott Standley, Tasneem Mirza, Tim Scott, Thangavel Palanivel and Zhou Ji.

In December 2012, during the United Nations Framework Convention on Climate Change (UNFCCC) climate summit in Doha, UNDP China, the Counsellors' Office of the State Council, and the Institute for Urban and Environmental Studies (IUE) of the Chinese Academy of Social Sciences jointly held a side event at the China Pavilion to discuss China's green transformation and the construction of sustainable and liveable cities, and to present the key findings of the China National Human Development Report 2013. UN Resident Coordinator and UNDP Resident Representative in China, Renata Lok-Dessallien attended the side event. About 80 representatives from Europe, America, Africa and China participated in this special event. Distinguished panelists were invited to share their expertise and views with audience, including Liu Yanhua, Wei Houkai, Wu Zongxin, Zhang Yantong and Luis Gomez-Echeverri. This Doha event received support, and with our gratitude to, China's Chief Negotiator, Su Wei, and the event coordinator for China Pavilion, Huang Wenhong.

As in previous years, the successful completion of this report also benefited from the great support from the UNDP China. I would like to take this opportunity to express our thanks to the UN Resident Coordinator and UNDP Resident Representative in China, Renata Lok-Dessallien, the UNDP China Country Director, Christophe Bahuet, and the Deputy Country Director, Patrick Haverman. They have offered inspirational ideas and strong support in choosing the subject and establishing the framework for this report, and their outstanding leadership skill and strategic insights contributed greatly to the writing of this report.

Our special appreciation also goes to the team at UNDP China: Goerild Heggelund and Wang Dong, their substantial input both content-wise, technically and operationally throughout the production process assured the quality of the NHDR. In addition, I would like to thank all other UNDP China staff for their full support to facilitate this project, including among others, Maria Chen, Jackie Cheng, Adam Ertur, Ge Yunyan, Carsten Germer, Silvia Morimoto, Napoleon Navarro, Henny Ngu, Steven Sabey, Song Qi, Gu Qing, Hou Xinan, Hou Yanfang, and Zheng Qingtian.

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As the Chief Editor of the report, I would also like to express my thankfulness to the President of CASS, Wang Weiguang, and the Vice President of CASS, Li Yang for their support and guidance which ensured mobilization of resources from CASS.

The China National Human Development Report 2013 also received support from various institutions and companies that care about China's development, including the Norwegian Government, the Peace and Development Foundation, Leighton Asia, Tianyan Green Energy Development Co., Ltd., Stora Enso and Veolia Group. Their funding ensured consistent progress in drafting of this project.

Finally, I would like to take this opportunity to thank everyone else who has offered direct or indirect assistance for the composition of this report. My special appreciation goes to Luis Gomez-Echeverri, Senior Research Scholar of the International Institute for Applied Systems Analysis (IIASA), principal author of the Introduction and Conclusion, who travelled frequently between Austria and China, and made tremendous contribution to the report's framework and content. I also thank our copy editor, Gretchen Luchsinger, for her excellent, valuable and timely advice on the English version. Finally, I would like to express my gratitude towards main team of report authors for their hard work, including Wei Houkai, Li Xuefeng, Li Meng, Lou Wei, Zhang Ying, Zhou Yamin, Liao

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# ABBREVIATIONS

ADB	Asian Development Bank
AQI	Air Quality Index
CASS	Chinese Academy of Social Sciences
CNWCA	China National Working Commission on Ageing
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
COD	Chemical Oxygen Demand
CPC	Communist Party of China
EU	European Union
FYP	Five Year Plan
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GIS	Geographic Information System
HDI	Human Development Index
IEA	International Energy Agency
IUE	Institute for Urban and Environmental Studies
IIASA	International Institute for Applied Systems Analysis
IPCC	Intergovernmental Panel on Climate Change
IT	Information Technology
KWh	Kilowatt Hours
MMS scenario	Moving more slowly, maximizing livability Scenario
MOHRSS	Ministry of Human Resources and Social Security
MP scenario	Moderate Pace with Increased Investment Scenario
NAAQS	National Ambient Air Quality Standards
NBS	National Bureau of Statistics
NDRC	National Development and Reform Commission
NGO	Non-Governmental Organization
NHDR	National Human Development Report
NO <sub>x</sub>	Nitrous Oxide
OECD	Organization for Economic Co-operation and Development
PM	Particulate Matter
PPP	Purchasing Power Parity
R&D	Research and Development
RMB	Renminbi
SAR	Special Administrative Region

SEZ	Special Economic Zone
SG scenario	Speed, with gaps Scenario
SO <sub>2</sub>	Sulfur Dioxide
TCE	Tonnes of Coal Equivalent
TPGSO	Tehran Parks and Green Space Organization
UK	United Kingdom
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
US	United States
WHO	World Health Organization
WWF	Worldwide Fund for Nature

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# INTRODUCTION

China had more urban than rural residents for the first time in 2011. The urbanisation rate reached 52.6 percent in 2012,<sup>1</sup> a major milestone with significant implications. In the midst of this urban transformation, China's leaders have increasingly emphasized the quality of development, moving away from a narrow focus on economic growth. Concepts such as the ecological civilization, the circular economy, the low-carbon economy, quality of life and social concerns appear more frequently in the statements of political leaders. The shift is also evident in the 12<sup>th</sup> Five-Year Plan (2011-2015).

These developments prompted UNDP's decision to explore urbanisation in its *National Human Development Report 2013*. The report builds upon the series of previous National Human Development Reports, which have addressed issues such as public services, inequalities and low-carbon economies.

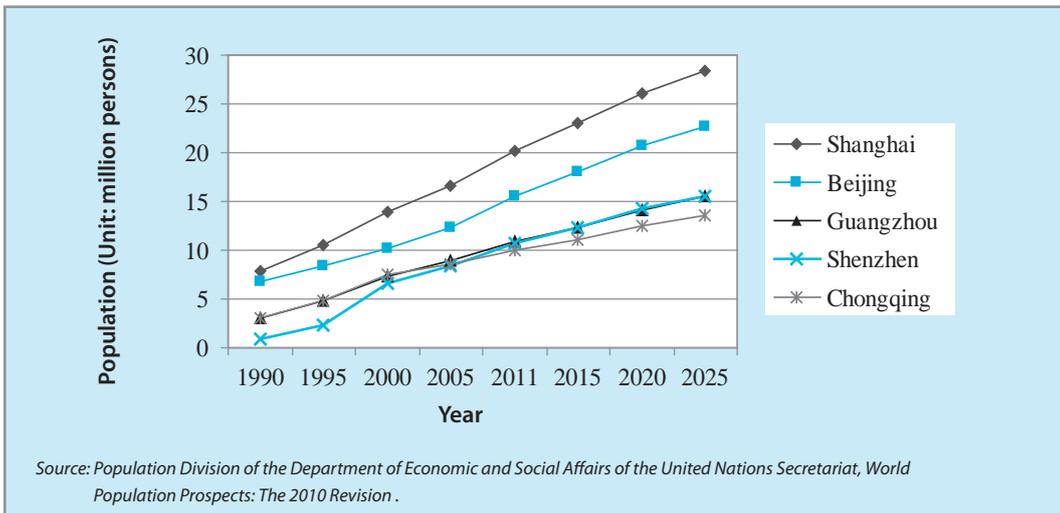
The report examines urban trends, but unlike many others that assess the macroeconomic and environmental dimensions, it primarily considers impacts on people and human development. It selects some issues that pose the greatest challenges to China's future, and are of particular relevance and interest to policy makers.

## *An Urban Future*

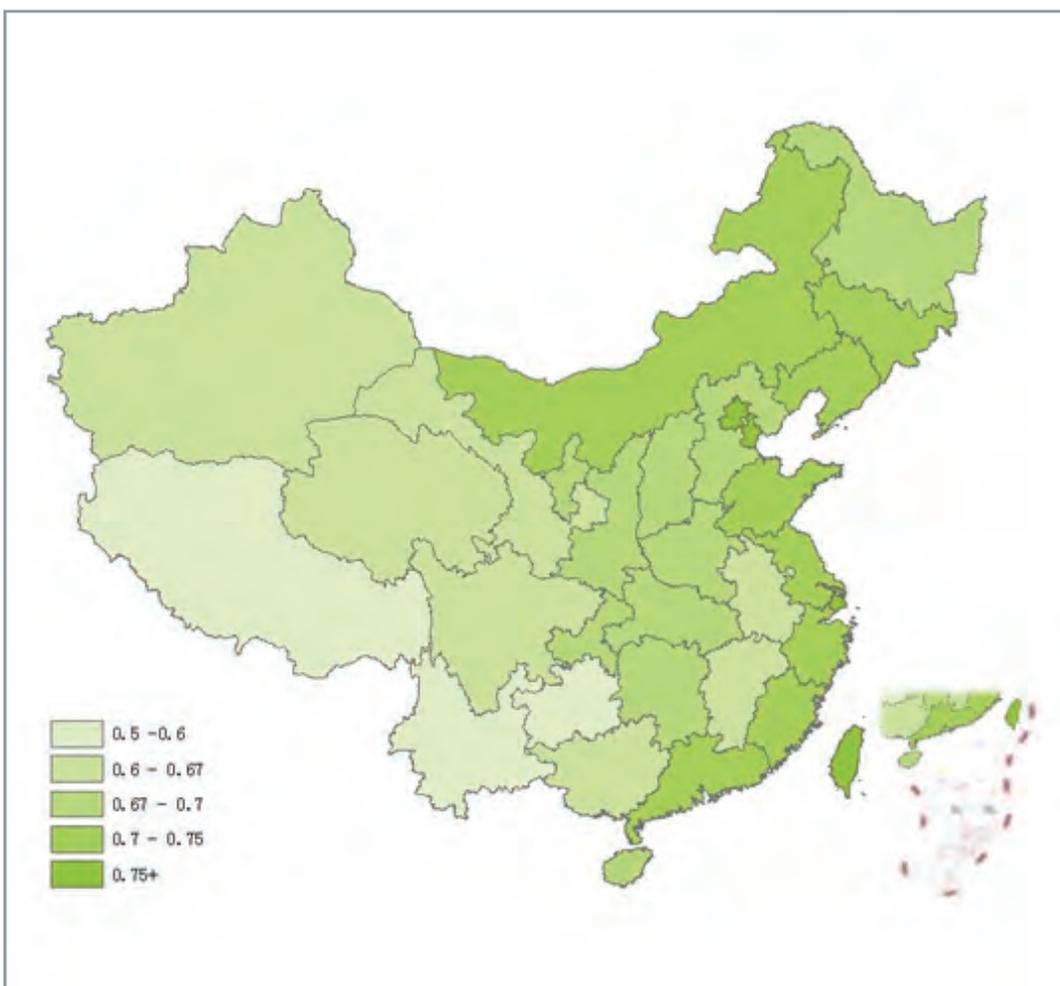
China's 12<sup>th</sup> Five-Year Plan and many recent political statements underscore a determination to embrace more balanced development. What happens in cities, how well they are managed and governed, and how effectively they address the increasing needs of urban populations will dictate to what extent this aspiration succeeds or fails. China's urbanisation is a way for the country to accelerate modernization, and it is also the strategic focus in changing the development mode, adjusting the economic structure, and expanding domestic demand. During this process, issues related to agriculture, the countryside and farmers can be partly solved, the coordinated development of urban and rural areas can be promoted, and the living standards of citizens can be improved. This report considers both current and projected trends, and how these may broaden or limit the choices of people in cities. It explores what needs to be done to mitigate some of the problems of urbanisation in order to make cities more sustainable, liveable and responsive to human needs.

Urbanisation in recent years has been immense and rapid (see figure 0.1). In the early 1980s, China had

**Figure 0.1** Population trend of the top five most populous cities in China<sup>2</sup>



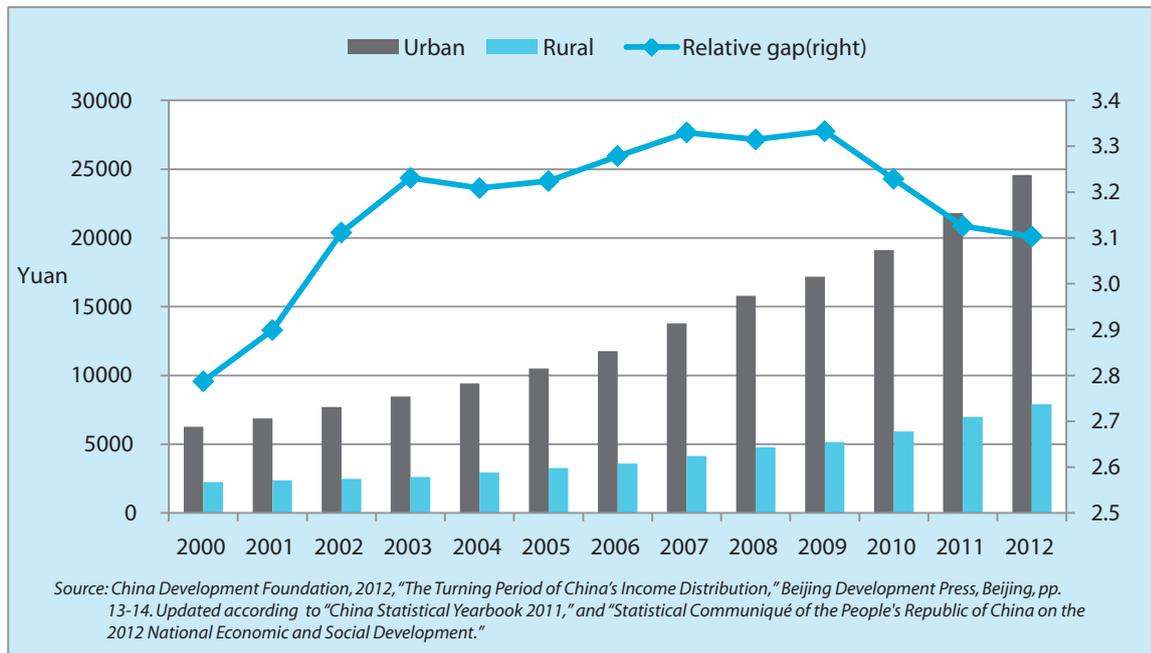
**Figure 0.2** Human Development Index in Chinese provinces in 2010



Source: Data from the China National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing, adapted by the authors, IUE-CASS.

Note 1: The 2010 Human Development Index (HDI) score of Hong Kong, China (Special Administrative Region) is 0.862, based on the global 2011 Human Development Report; the 2010 HDI of Taiwan, Province of China is 0.868, based on data from the Directorate General of Budget, Accounting and Statistics Department, Taiwan authority; the 2010 HDI of Macao, China (SAR) is 0.944, based on data from the Government of Macao Special Administration Region Statistics and Census Service. °

Note 2: The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its

**Figure 0.3** Absolute and relative gap of China's urban and rural residents' per capita income, 2000-2012

191 million city residents. Today this figure has shot to 700 million, and is currently increasing by more than 20 million inhabitants each year. China's transition from being predominantly rural to having a majority of its populace in urban areas occurred in 2011. The portion of people in cities rose from 13 percent to 40.4 percent between 1950 and 2005, and to 52.6 percent in 2012. It is predicted to rise to 70 percent by 2030, with an additional 310 million new city dwellers in the next 20 years.

China's major economic success, including in pulling hundreds of millions of its people out of poverty, could never have been achieved without its cities' vibrancy and dynamic economic growth. In the last two decades, cities have been major drivers of growth, and are expected to continue to be so in coming years. In 2010, municipal districts of China's prefecture and above level cities accommodated 28.6 percent of total population and generated about 56.3 percent of total gross domestic product (GDP); by this report's estimation, the proportion of the latter is expected to rise to around 75 percent by 2030.<sup>3</sup> According to research by the McKinsey Global Institute, cities in 2025 will offer an estimated 450 to 500 million jobs, compared with around 290 million in 2005.<sup>4</sup> This helps explain why urban areas will continue to be a magnet for millions of migrants from

rural areas.

At the same time, causes for concern are growing. Not all Chinese are reaping the benefits of economic growth, as evidenced by recent increases in social and economic inequality within cities, between urban and rural areas, and across regions (see figures 0.2 and 0.3). The Government has sought to address these gaps, but the accelerated growth of cities and the mass movement of rural migrants to and among cities pose major challenges.

Economic processes and increasing energy demand in cities have put growing pressures on people and the environment. Lethal air pollution, for example, may now be the main cause of death in China.<sup>7</sup> Carbon emissions, mostly from industry and the power sector, have grown considerably.<sup>8</sup> Urban buildings and transportation systems make rising contributions. The unsustainable use of resources has degraded the environment, and depleted water and other reserves. Water pollution is also a cause of concern, with negative health impacts.

Looking forward, China today has many opportunities to shift the course of its urbanisation onto a more balanced path. In this regard, urban governance will

**Figure 0.4****Cities as problems and as solutions**

have a fundamental role in making policy choices and implementing funding measures to leverage the benefits of urbanisation, while reducing negative aspects. China's cities could aim to become thriving centres of innovation, efficiency and productivity. They could learn from many existing examples, such as that of Singapore and other cities around the world (see the appendix for more information). Urban areas could be oriented around the long-term, sustainable use of resources, and guarantees that all citizens have equitable access to services and opportunities to have long and decent lives. In sum, they could either be the 'problem' or the 'solution' in terms of China's future sustainable development (see figure 0.4).

The evolution of cities in China also has links to the rest of the world. How China develops its urban centres has immense global implications, considering the sheer magnitude of resources needed—energy, materials, finance and others—as well as the consequent environmental impacts.

## Connecting Issues

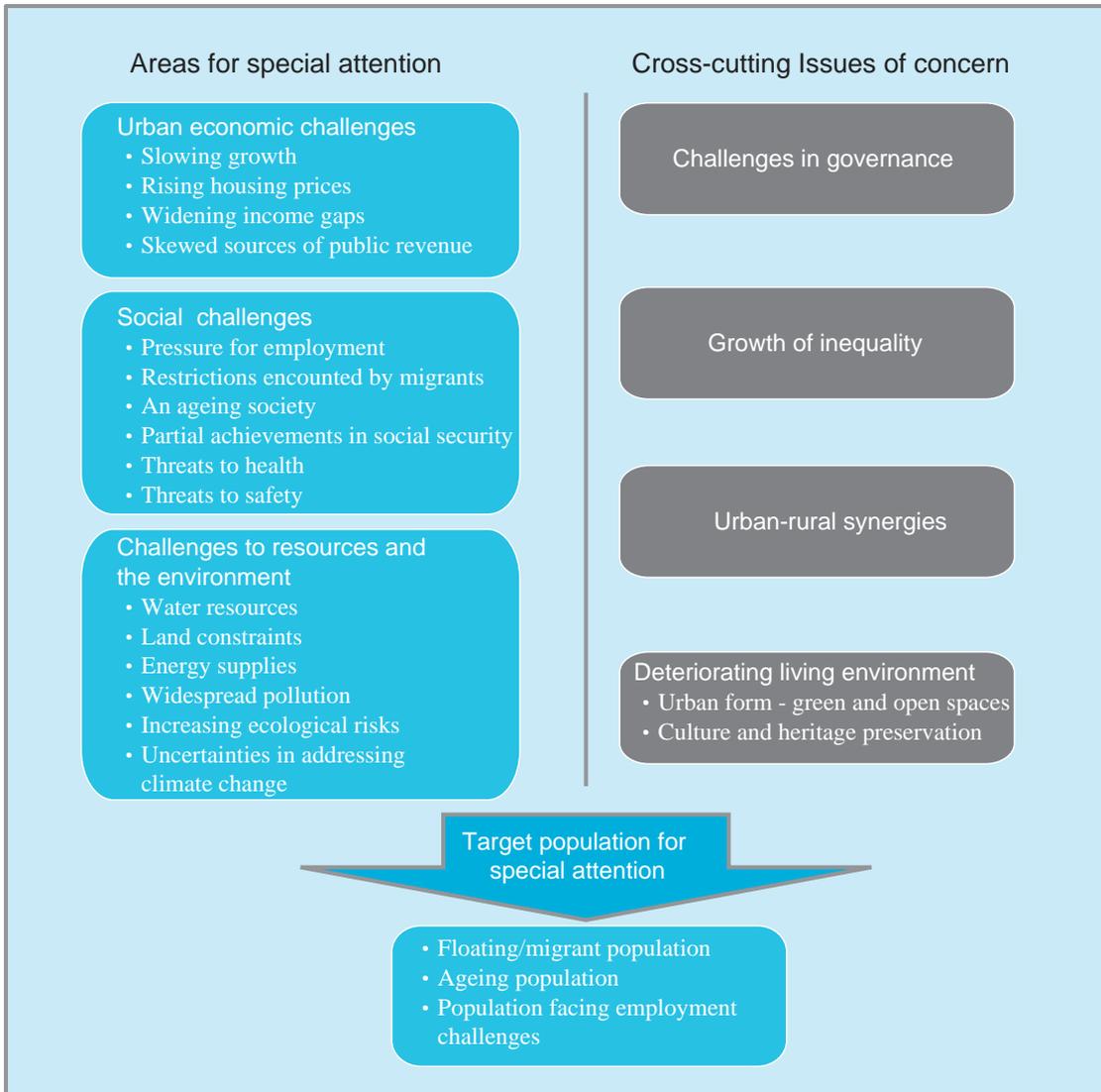
It is difficult, if not impossible, to make generalizations about cities in China, given wide-ranging di-

versities in size, region and composition. This report, therefore, aims only to provide some useful insights into the magnitude of current challenges and possible options to address some of those mentioned.

A few areas receive special attention. These not only pose major challenges today, but also will increasingly do so in the next two decades as the number of additional urban residents grows to approximately one billion. Four cross-cutting issues that could be more carefully addressed are suggested—comprising governance, inequalities, urban-rural links and a deteriorating urban environment. The report pays special attention to vulnerable groups such as migrants who will play critical roles in the future success or failure of China's urbanisation process.

Using available data, the report makes some projections and offers possible future scenarios. These are useful for mapping potential options and investments to guide urban growth and respond to human needs.

Broadly speaking, the report is rooted in the concept of human development and the three pillars of sustainable development—economic, social and environmental. Each pillar is examined in terms of major trends and impacts on the lives of people in urban areas.

**Figure 0.5** Key areas and target populations of the report

## ECONOMIC AND HUMAN DEVELOPMENT LINKS

Even as cities generate much of China's GDP, a huge population size and demographic shifts are spurring increased demand for jobs and services. While many additional jobs will be created, especially in larger cities, there are questions about whether or not job availability will meet the supply of labour in terms of location, training and so on. Matching talent and need will become more complex as China shifts to an economy based on economic activities requiring more diverse and advanced skills.

In many cases, migrants will continue filling labour

needs that cannot otherwise be met. But migrants may also compete with other population groups coming into the labour market, an issue that needs further research to determine its impact and potential policy options.

Economic inequalities continue to widen, driven by a variety of factors. Most small cities are at the low end of the industrial process, for example. Compared to larger cities, they face greater challenges in expanding and improving the structure of their economies. As a population group, migrants are still often excluded from basic services and equal opportunities. In some cases, multiple inequalities compound each other (see figure 0.5).

## SOCIAL AND HUMAN DEVELOPMENT LINKS

The success of China's response to urbanisation will be largely influenced by how it deals with migrants. This factor adds to the many other pre-existing human development concerns in cities such as urban poverty and inequalities, an increasingly ageing population, pressure on services, a deteriorating urban environment, and so on. The effects of mass movements of people on housing, social services and social safety nets will test the capacity and resolve of government authorities.

Increased pressures on social services and safety nets will clearly come from China's ageing population. By the end of 2011, some 9.1 percent of Chinese were older than 65; according to this report's estimation, this figure will rise to 18.2 percent by 2030, higher than in most industrialized countries, which are better prepared to afford the costs.

Shelter in cities, a basic human need, is under increasing pressure from explosive growth in demand. The Government has taken some measures to dampen prices and speculation. New programmes are already in place to expand low-cost housing, but there are questions around whether or not these will consistently reach those most in need.

## ENVIRONMENTAL AND HUMAN DEVELOPMENT LINKS

Accelerated urbanisation has caused environmental deterioration, often exacerbated by poor management of resources, with major health impacts in some cases. Other pressures come as more people demand better quality and affordable services.

China has made major strides in introducing clean energy technologies, but demand for energy is still intensive. Application of new technologies remains in a nascent stage. Despite intensified efforts to control air pollution, nearly half of urban residents live in cities with lower standards than those recommended by the WHO (Level II Standard for Air Quality).<sup>9</sup>

Severe water shortages in some parts of the country combine with deficiencies in quality linked to

pollution. Industrial effluents and domestic sewage most commonly degrade groundwater, the source of drinking water of some 70 percent of the total population.<sup>10</sup>

## Defining Terms

Many of the terms in this report are widely used, but with variable meanings. The report applies the following definitions, with consideration for the Chinese context.

## HUMAN DEVELOPMENT

Human development, a concept that has emerged through UNDP's series of Human Development Reports, is the foundation of the analysis in this report. It is based on the premise that development is best measured by its impacts on people's lives and choices. Human development expands people's opportunities to live long, healthy and creative lives; to advance other goals they have reason to value; and to engage actively in shaping equitable and sustainable development on a shared planet.<sup>11</sup>

While choices vary, three basic elements are essential at all levels of development; without them, choices and opportunities are inherently limited. They include the ability of people to lead long and healthy lives, to acquire knowledge and to access resources for a decent standard of living.

Measures of these three are brought together in the Human Development Index. It integrates a calculation of life expectancy at birth; the adult literacy rate, and combined enrolment rates at the primary, secondary and tertiary levels; and GDP per capita (purchasing power parity). In 2010, UNDP adjusted the formula and indicators for calculating the HDI at the country level. The new methodology used mean and expected years of schooling in place of the adult literacy rate, and combined enrolment rates, and employed gross national income (GNI) per capita in place of GDP per capita. The *National Human Development Report 2013* for China adopts the new methodology and indicators to calculate national and provincial HDI values (see the appendix for more in-

formation on the HDI methodology).

Additional work has refined and adapted the index since it first appeared in 1990. One refinement includes disaggregation, which allows for the index to be used across different groups defined by income, geographical location, urban and rural residence, gender, and other features. Many countries have also made small refinements to the HDI to suit particular national needs and particularities.

## SUSTAINABILITY

Sustainable development rests on three pillars: economic, social and environmental. The report views each of these in terms of impacts on human lives.

It considers the economic pillar, for example, in terms of quality, balanced growth. The evolving structure of the economy and issues such as employment are given close examination. Issues of equity are highlighted.

The social pillar encapsulates issues such as those pertaining to China's large and growing migrant population, demographic shifts that further strain an already burdened social security system, and discontent that may arise from unsatisfied demands.

The environmental pillar entails understanding how a healthy environment supports people's health, quality of life and human development opportunities. Consideration of resource demands and use extends beyond simple availability to assess the consequences of depletion and negative impacts of use (such as with coal). It encompasses both domestic and global issues, as in the case of climate change and the possibilities for sustainability.

More recently, some have argued for a fourth pillar—culture. More and more, culture is being recognized as essential not only for sustainability, but also for liveability and societal success. Cities are being seen as centres for culture and tradition, and/or cultural and heritage preservation. Issues of culture are also important to city liveability and the sustainability of the urban social fabric.

## THE LIVEABLE AND SUSTAINABLE CITY

The term 'liveable and sustainable city' denotes urban areas managed to provide for people's basic needs and comfort, in the short and long term. Some indicators include sound urban planning and design, urban form, the availability of well-maintained public spaces, adequate and widely available services, the preservation of culture and tradition, the promotion of cultural services and infrastructure and cultural industries, clear sky and clean water, and efficient use of natural resources. Whenever possible, these are woven into the analysis of the report.

Issues that are particularly crucial to achieving liveable and sustainable cities, and that are explored in the report, include housing, employment, resource availability, environmental stewardship and financial investment. All of these are part of broader economic, environmental and social challenges faced by most cities in China, and are often in urgent need of attention. The report also examines cross-cutting issues related to equity, efficiency, innovation and safety.

## URBAN

The terms 'urban' and 'city' have a variety of meanings in China; these often differ from global definitions, which themselves can be variable. This makes analysis of cities and urban development more challenging in China. The categorization of cities, whether by size or location, has common as well as official definitions.

The most general categorization of China's urban system is the division between cities and towns. Cities in turn are classified into four levels or categories—municipality, vice-provincial, prefecture and county. As towns are also part of the urban system, the total urban structure is composed of five levels—cities at municipality, vice-provincial, prefecture and county levels, and towns. An added complexity is that not all people in urban areas are considered urban residents, as some cities contain rural areas. A system of classification based on the length of residence in one of the lowest administrative units (residents' and vil-

lagers' committees) allows for some of this population group to be considered urban inhabitants.<sup>12</sup>

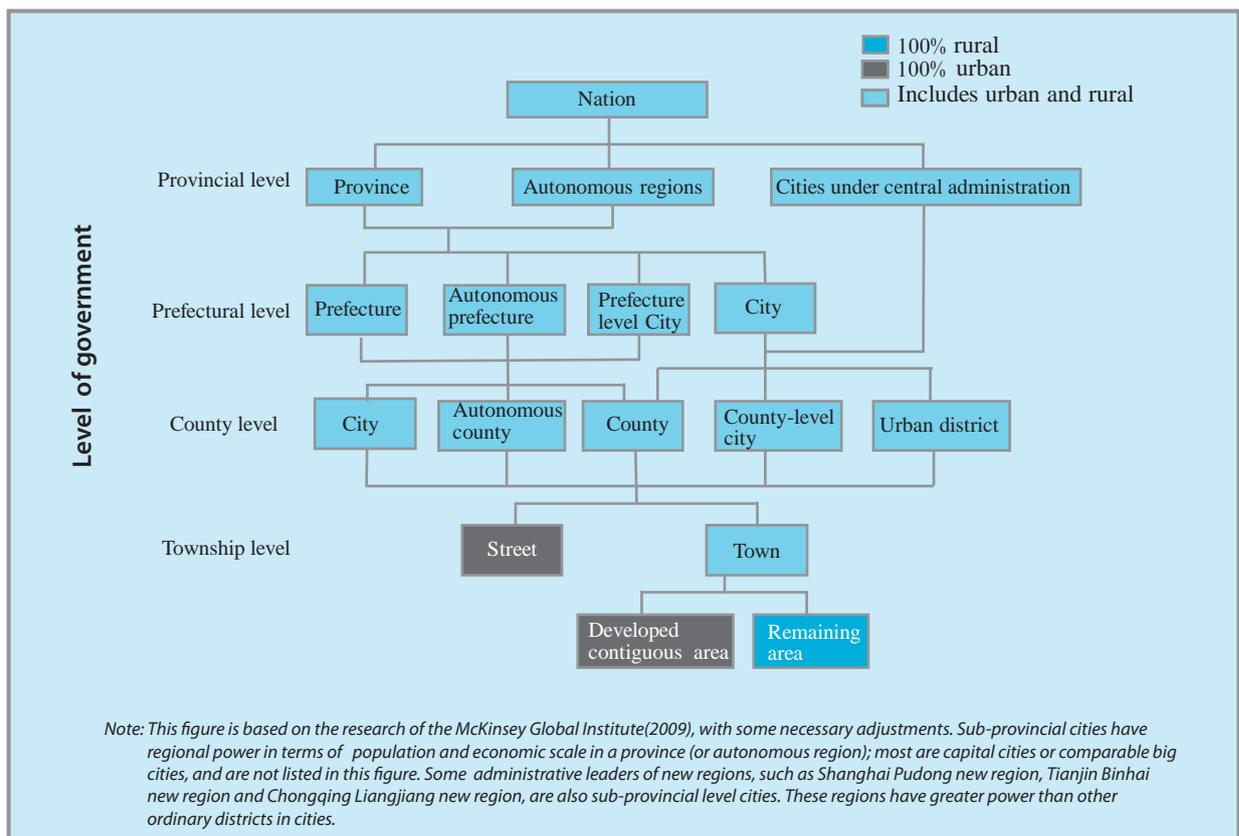
China has a set of regulations and standards in place for classifying cities and towns. This was first issued in 1954 by the State Council, and has been modified three times (figure 0.6 shows the current classification of China's urban system). Today's standard factors in total population, population density, economic scale, fiscal income and infrastructure.

An additional categorization of China's urban system is by population size. In the past, cities that exceeded 500,000 inhabitants were considered large. Medium-sized cities were those that had from 200,000 to 500,000 inhabitants. Cities with less than 200,000 were considered small. As the population and particularly urban population have grown considerably, this categorization was questioned; it was argued that large cities were only those with populations larger than 1 million.<sup>14</sup> Some scholars proposed changing the population thresholds for different city categories: cities with populations below half a million should be considered small cities,

and those with populations above 1 million should be considered large cities.<sup>15</sup> This proposal was made as a result of changes by the National Bureau of Statistics to the definition of urban population. Whereas urban population was previously determined based on the system of household registration, in which only residents with urban household registration were included in the official urban population, the current definition of urban population comprises all residents in cities, regardless of their household registration. The changed definition—along with the fact that the urban population has grown considerably and a sizeable rural population has migrated into cities during the past decades—has resulted in an expanded urban population, rendering current population thresholds too low to differentiate cities from each other.

As there are no official criteria for division of city sizes for urban planning and management in China, a seven-level system with specific criteria can be defined as follows: (1) towns: county capital towns and non-county capital towns that are administrative areas within counties; (2) small cities that are administra-

**Figure 0.6** China's urban system: definition and structure<sup>13</sup>



tive cities with a population below half a million residents; (3) medium cities with between half a million and 1 million residents; (4) large cities with between 1 and 2 million residents; (5) super-large cities with between 2 and 5 millions residents; (6) super-super-large cities with between 5 and 8 million residents; and (7) gigantic cities with over 8 million residents.

Under the current urban scale system, some cities' categorization lags far behind their population-gathering capacity. The system cannot meet the needs of urban planning and management anymore. Some towns may have a large population or even more than 1 million. According to the draft version of the Medium-term and Long-term National Planning of New Urbanisation, some revisions are being made to the standards of urban classifications by scale. In this new planning, the classification criteria would no longer be restricted by the administrative level of cities, and all cities can be classified into four groups: small cities (with populations of less than half a million residents), medium cities (with populations between half a million and a million), large cities (with populations between a million and five million) and megacities (with over 5 million residents).

## GOVERNANCE

Governance in this report refers to formal national, regional and municipal structures that manage urban areas. It also includes, whenever possible, informal structures that have emerged spontaneously to address specific needs and circumstances. Governance is fundamental to steering future urban growth, particularly where urbanisation is complex and multi-tiered. But potential benefits are lost if governance structures are weak.

Local government in China has three levels: provinces, counties and town villages. There are also three levels of administrative hierarchy: the municipal government (*shizhengfu*), urban districts (*shiqu*) within the municipality and street offices (*jiedaobanshichu*). A fourth level of management units, residents' committees (*juminweiyuanhui*), are not officially considered government institutions; they comprise extensions of administrative and management structures at the lowest level in the hierarchy.<sup>16</sup>

Decentralized decision-making was introduced in response to poor government performance in managing resources under a centrally planned economy.<sup>17</sup> Since the early 1990s, however, the central Government has played a more active role, particularly in mediating differences between stakeholders—the CPC, the Government and social groups.<sup>18</sup> A stumbling block to decentralized decision-making is a lack of resources to execute local decisions.

Rapid urbanisation is spurring multilevel governance and giving new actors importance. There are evolving collaborative agreements among different levels of government, which is particularly critical in urban clusters described later in the report. The importance of urban districts in local governance has risen, and players with growing powers in decision-making have emerged, such as investors and developers, and property and business owner associations. Civil society organizations, and volunteer and community groups are increasingly engaged in providing social services.

The issue of governance is also crucial for another important reason, which is often forgotten. China's continued future urban growth can take many forms. The Government can choose to promote different urbanisation types, but challenges from weak governance structure impose severe limitations. The most common types are the concentrated form, the hub-and-spoke, and the super-cities/urban agglomerations. Each poses different governance challenges and needs. A concentrated type of urbanisation, which can be the most effective and resource efficient, with great advantage in the delivery of higher economic growth, requires a very advanced level of management in order to fully reap the benefits. The hub-and-spoke clusters form requires developing urban economic clusters that can act efficiently and cohesively. The Chinese Government has proposed that future urbanisation should be based on urban clusters, with large cities as the basis, and medium and small cities as a focus. Big urban clusters could have great impacts on neighbouring areas, and promote the coordinated development of large, medium, small cities and small towns. But to be effective, this model requires significant governance collaboration. The super-city and agglomeration model al-

ready exists in several instances in China, where the lessons learned and governance challenges of delivering services to a large and growing population are well known.

## MIGRANT POPULATION

There is no precise definition of the migrant population. The four criteria used by most researchers include: estimates of migration based on the movement of people from one locale to another, length of stay to qualify as a migrant, *Hukou* household registration or non-*Hukou* registration, and lastly, the categorization of urban versus rural. For this report, the definition includes the following criteria: those who have moved from rural to urban areas as per the definitions above for more than half a year, coupled with non-registration in the *Hukou* system, given that the report focuses on the lack of services and entitlements that this group faces.

China's household registration system is a key definer of the quality of life of migrants. When a citizen moves from one administrative region to another, the migrant is not entitled to the same rights and social services as local citizens if the migration was not part of an official organized arrangement (even if he or she has a permanent address and employment in the new place). What complicates the definition, however, is that official statistics identify a person as a local resident as soon as the person completes six months of residence in an administrative region. There are thus two categories of urban residents: those with and those without an urban household registration record. Those without a record are variously called peasant workers, the floating population or shifted populations from agricultural sectors,<sup>19</sup> as these are mainly people from rural areas. Rural migrants do not enjoy the same rights as native urban citizens, in terms of voting, equal employment opportunities, education, medical care, social security and other social services.

The Chinese Government is aware of and concerned with this inequality and rising urban-rural duality, and taking steps to address them. The central Government, together with municipal governments, has initiated a gradual removal of household registration

prerequisites so that all residents can eventually enjoy the same rights and access to services. This process of breaking down duality is referred to as urban 'citizenization'. Similar to urbanisation, it will be gradual and take some time because of the magnitude and complexity of the problem. In 2012, according to official statistics, with the level of urbanisation at 52.6 percent, approximately 260 million urban residents lacked urban registration records.<sup>20</sup> Doing away with the duality created by the registration system will be achieved only with the full citizenization of these 260 million people.

## ECOLOGICAL CIVILIZATION

Ecological civilization is a new concept proposed by Hu Jintao as General-Secretary of the Central Committee of the CPC and coined by the Party (see box 0.1). The term denotes a departure from the past emphasis on economic construction as the core of development, to one based on development that is more balanced between man and nature.<sup>21</sup>

### *The Report in Brief*

The five chapters of the report take readers through a discussion of the recent history of China's cities, some key challenges today, projections for the future, and measures that could guide urbanisation towards the goal of liveable, sustainable cities.

Chapter 1 traces the recent evolution of cities, the unleashing of capital and trade, and various dividends released by the gradual institutional reform related to rural-urban migration. It illustrates why urbanisation is one of the most significant transformations occurring today in China, with profound impacts on economic and social development, as well as the environment. Large cities are at the forefront of change. Urban clusters facilitate cooperation across municipalities, and foster greater, more diverse economic activity. The chapter highlights some major recent trends, and the economic, social and environmental challenges that these pose for China.

Chapter 2 delves into the economic, social and environmental challenges to liveable, sustainable cities.

## Box 0.1 Embracing an ecological civilization

An ecological civilization encompasses all material, spiritual and institutional achievements in easing the increasingly intense conflicts between humans and the environment. It includes mitigating ecological crises and disasters, relieving pressures on natural resources, and improving the balance between the environment and economy, and between individuals and society.

Since the concept was put forward at the end of the last century, there has been systematic research on it by experts in relevant disciplines, members of government departments and environmental preservationists. The results show connections with Chinese traditional culture as well as a modern environmental ethic and the sustainable development model. The idea of the harmony of heaven and man in Chinese traditional culture focuses on the unity of human nature and heavenly laws, an important cultural basis for the development of an ecological civilization in China.

Policy makers have increasingly adopted the notion. It was dubbed one of five major goals of a well-off and well-rounded society by the 17th Party Congress in 2007. In 2010, the State Council issued the National Plan for the Main Functional Areas, which provided an important basis for optimizing national spatial development patterns and cultivating an ecological civilization in all parts of the country.

By 2012, at the 18th Party Congress, construction of an ecological civilization was incorporated into the overall plan for promoting economic, political, cultural, social and ecological progress, and written into the Party Constitution. The Congress stated that “promoting ecological progress is a long-term task of vital importance to the people’s well-being and China’s future.” Key principles entail “conserving resources, protecting the environment and promoting its natural restoration.” The objective is to “work hard to build a beautiful country, and achieve lasting and sustainable development of the Chinese nation.”

Today, China aims to improve development based on its geographical space, promote resource conservation, and intensify protection of ecosystems and the environment. An ecological civilization is a governing idea and national strategy, promoted to the whole society.

Various departments of the State Council have carried out activities focusing on an ecological civilization, including those related to eco-agriculture, land and water conservation, and a forest city. These have received positive responses. By the end of 2012, Hainan, Zhejiang, Jiangsu and 15 other provinces (autonomous regions and municipalities) had carried out similar projects. The Ministry of Environmental Protection has launched national ecological civilization pilot demonstration activities in 371 cities, counties and regions.

In 2011, a non-profit organization, the China Ecological Civilization Research and Promotion Association, formed to provide research and policy advice, raise public awareness and showcase achievements.

The speed and magnitude of the urban transformation make these particularly noteworthy for China, given widening income gaps, an increasingly ageing population, environmental burdens and other issues. The chapter describes, for example, the continued heavy dependence on manufacturing and the underdevelopment of service industries. With limited options for financing, municipalities face constraints on service provision, even as continued population growth—mostly through migration—increases demands. Extensive urban development has damaged the environment, reduced resources and contributed to climate change.

Chapter 3 explores China’s urban future, including

through a series of scenarios that look at how to balance the speed of urbanisation and quality of life. It establishes some of the foundations of liveability and sustainability, namely, when cities become socially equitable, economically dynamic and environmentally friendly. Key areas for making cities work include employment, housing and health. Considerable investments will be required, but these could yield significant benefits through environmental protection, social services and appropriate infrastructure. A compromise between the speed and quality of urbanisation is feasible, and can be aligned with making cities liveable and sustainable, including through greater participation in decision-making.

Chapter 4 presents options for addressing some of the challenges of urbanisation, including snapshots of solutions adopted in China and elsewhere in the world. It stresses how quality urbanisation involves transforming rural-urban relations, industries and the living environment, with planning that accounts for needs now and in the future. As urbanisation accelerates, a critical entry point for managing its course will be municipal governance. Local governments will need to become more open to public participation and regularly disclose information related to the well-being of their citizens. Performance monitoring of urban governance could move from emphasis on economic growth to incorporate indicators for resource conservation, environmental protection and social development.

A concluding chapter offers selected key findings on issues calling for greater attention due to their impacts in the decades to come. The urban transformation in China is a transition in progress with many opportunities for guiding its future. However, its complexity urgently requires integrated policies and approaches that can address emerging challenges simultaneously. As China looks at its future, compromise between speed and quality of urbanisation appears to be the most desirable and viable option. Since some challenges are more urgent than others, taking decisive actions on these can significantly impact China's human development. Innovative and strong governance mechanisms and institutions need to be in place to implement necessary policies. Finally, during China's transition to more sustainable development, new perspectives and a comprehensive understanding of the interrelationships between economic, social and environmental costs and benefits are urgently required.

## Conclusion

The challenges for China in the coming years and decades are daunting. The decision of the authors of the report to focus on only a few issues does not mean that others are not important or of equal importance. The ones selected are of particular interest to the topic of human development in China and also of great concern to government authorities.

The magnitude and scope of the issues addressed calls for a thorough look at governance, the source of much of the success in implementing and funding solutions. One key issue is that China today has a system of multilevel governance with decentralized decision-making that is not always accompanied with the resources to execute local decisions.

Accelerated urban growth and extensive economic activity, more dynamic in certain regions than others, are fuelling rising inequality, particularly the rural and urban divide. Could a closer examination of rural-urban links provide some insights into solutions to address this phenomenon? Rural and urban issues are part of a larger system that needs closer examination to determine factors that can be managed more effectively in order to influence migration, demand on resources and overall synergy.

Could a more liveable environment with greater attention to urban form, with green and open spaces, and an increased emphasis on the preservation of tradition and culture help stem the alienation that big agglomerations normally bring? The report touches on all of these issues in order to provide some recommendations on criteria for determining the 'liveability' of a city and the well-being of its citizens.

- 1 "Statistical Communiqué of the People's Republic of China on the 2012 National Economic and Social Development," released by the National Bureau of Statistics of China, 22 February 2013. It says that by the end of 2012, urban population accounted for 52.6 percent of total population (available at [http://news.xinhuanet.com/politics/2013-02/23/c\\_114772758.htm](http://news.xinhuanet.com/politics/2013-02/23/c_114772758.htm), last accessed April 2013).
- 2 Total population ranking is based on the 2011 population data of municipal districts. The data come from the Population Division of the United Nations Department of Economic and Social Affairs, and vary somewhat from China's government statistics.
- 3 According to research of the McKinsey Global Institute, currently, 75 percent of China's GDP comes from urban areas. Here we use statistical data of municipal districts in cities from China City Statistical Yearbook 2011; by 2025, this ratio is expected to rise to around 95 percent. This report maintains that these numbers may be too high. McKinsey's research did not explain the definition of urban GDP and data sources in detail (available at [http://www.mckinsey.com/insights/urbanisation/preparing\\_for\\_urban\\_billion\\_in\\_china](http://www.mckinsey.com/insights/urbanisation/preparing_for_urban_billion_in_china), last accessed August 2012).
- 4 Jonathan Woetzel, Lenny Mendonca, Janamitra Devan, Stefano Negri, Yangmei Hu, Luke Jordan, Xiujun Li, Alexander Maasry, Geoff Tsen, and Flora Yu, 2009, "Preparing for China's Urban Billion," McKinsey Global Institute.
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- 6 Government of Macao Special Administrative Region Statistics and Census Service, "Macao in Figures 2010" (available at [http://www.dsec.gov.mo/getAttachment/6ba9054b-39ed-4a06-95fa-be5fdc961af1/E\\_MN\\_PUB\\_2010\\_Y.aspx](http://www.dsec.gov.mo/getAttachment/6ba9054b-39ed-4a06-95fa-be5fdc961af1/E_MN_PUB_2010_Y.aspx), last accessed June 2013).
- 7 Mun S. Ho and Chris P. Nielsen (eds), 2007, "Clearing the Air: the Health and Economic Damages of Air Pollution in China," The MIT Press, Cambridge, Massachusetts.
- 8 Axel Baeumlner, Ede Ilijasz-Vasquez, Shomik Mehndiratta (eds), 2012, "Sustainable Low-Carbon City Development in China," World Bank, Washington, DC.
- 9 See endnote 4.
- 10 Lu Wen-Qin, Xie Shaowa, Zhou Wen-Shan, Zhang Shao-Hui and Liu Ai-Lin, 2008, "Water Pollution and Health Impact in China," Open Environmental Sciences, 2, pp. 1-5.
- 11 United Nations Development Programme (UNDP), 2011, Human Development Report 2011: Sustainability and Equity: A Better Future for All, New York.
- 12 Zhang Juwei and Cai Yifei, 2012, "Urbanisation in China Today," Redefining Urban: A New Way to Measure Metropolitan Areas, chapter 3, OECD.
- 13 Based on information and figures from China's Census in 2000 and the McKinsey Global Institute's report (see endnote 4).
- 14 Zhou Yixing and Yu Haibo, 2004, "Restructure of China's Urban Population," City Planning Review, 28(6).
- 15 Wang Xiaolu, 2010, "China Urbanisation Pathway and Economic Analysis of Urbanisation," Journal of Economic Research, 10.
- 16 UNDP China Poverty, Equity and Governance Team, 2012, "Governance of Liveable, Sustainable Cities," commissioned paper, UNDP China.
- 17 Zhang Tingwei, 2007, "Innovation in Chinese Urban Governance: The Shanghai Experience," Governing Cities in a Global Era, Robin Hambleton and Jill Simone Gross(eds), Palgrave, United Kingdom, pp. 113-124.
- 18 BBC News, undated, "How China is Ruled" (available at [http://news.bbc.co.uk/2/shared/spl/hi/in\\_depth/china\\_politics/government/html/7.stm](http://news.bbc.co.uk/2/shared/spl/hi/in_depth/china_politics/government/html/7.stm), last accessed March 2013).
- 19 Prior to the 18th Congress of the CPC, they were widely called peasant workers in government reports, which means they are registered in rural areas, but work in cities. In Hu Jintao's report on the 18th Congress, they were called the "shifter population from the agriculture sector."
- 20 See endnote 1. The total number of migrant workers in 2012 was 262.61 million.
- 21 China Daily News, 24 October 2007, "Ecological Civilization" (available at [http://www.chinadaily.com.cn/opinion/2007-10/24/content\\_6201964.htm](http://www.chinadaily.com.cn/opinion/2007-10/24/content_6201964.htm), last accessed July 2013).



# CHAPTER 1

## A HISTORIC TRANSFORMATION

### Key Messages

- Urbanisation in China has occurred on an unprecedented scale, driven by reforms unleashing capital and trade, and various dividends released by the gradual institutional reform of rural-urban migration.
- Industrialization and the development of non-agricultural industries are the engines of urbanisation, accompanying with large scale of migrant workers entering into the cities, who are still not fully integrated in urban life.
- Large cities take a leading role in urbanisation.
- China's urban clusters facilitate cooperation across municipalities, promote urban development and enhance economic diversification.

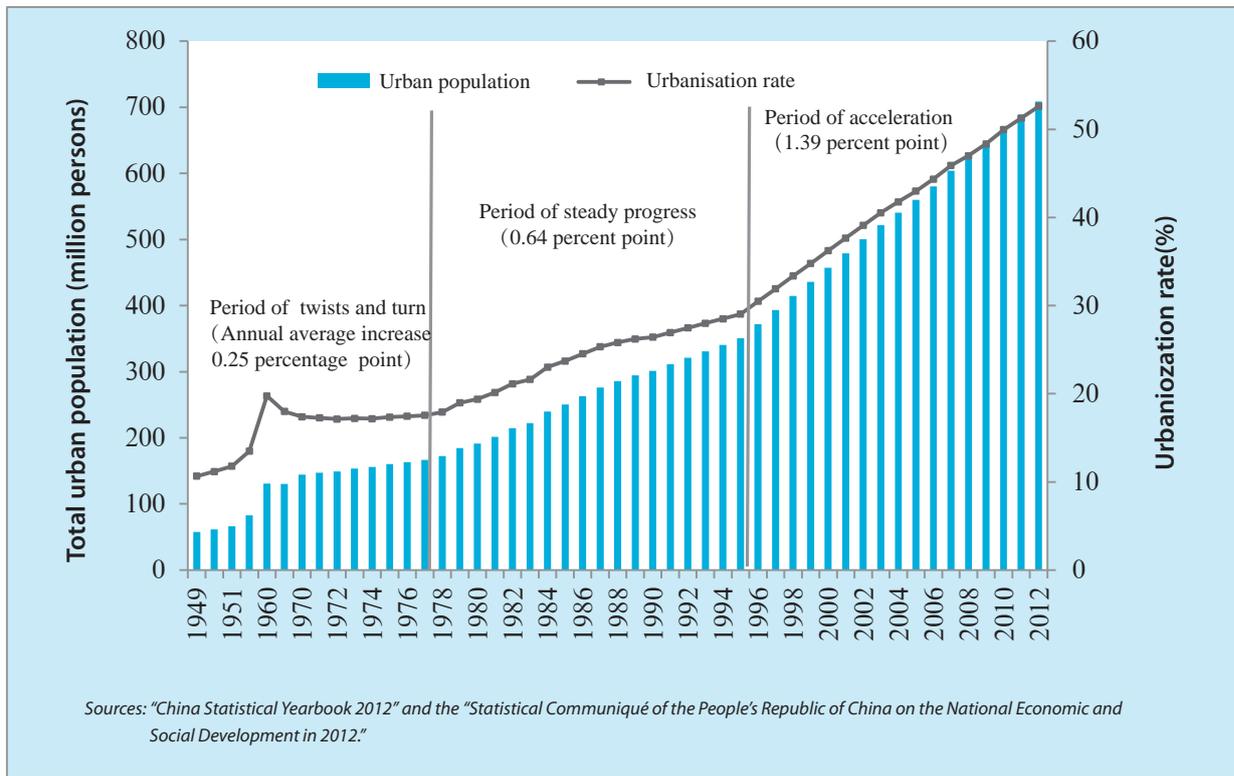
China's large-scale urbanisation over the past three decades has been unprecedented in human history. Nearly half a billion people have moved into cities, adding to a total of 700 million urban residents (see figure 1.1). In 1949, only around 11 percent of Chinese lived in cities.<sup>1</sup> By 2012, the proportion of China's urban population had exceeded 52 percent.<sup>2</sup>

The change continues—the country's scale of urbanisation remains one of the greatest in the world (see

table 1.1). Between 1980 and 2010, China's share of the world's total urban population grew from 10 percent to nearly 19 percent.<sup>3</sup> In the next 20 years, about 310 million additional Chinese people are expected to move to cities.

Based on international experiences, urbanisation increases with the growth of GDP per capita for most countries (see figure 1.2). Compared with other countries, China's urbanisation process was relatively slow before its period of reform and opening up

**Figure 1.1** Stages of China's urbanisation



**Table 1.1: Comparison of China's urbanisation speed in different periods**

Period	Year	Annual average growth of urban population (millions of people)	Annual average growth of urbanisation rate (percentage point)
6th Five-Year Plan period	1981-1985	11.91	0.86
7th Five-Year Plan period	1986-1990	10.20	0.54
8th Five-Year Plan period	1991-1995	9.96	0.53
9th Five-Year Plan period	1996-2000	21.46	1.44
10th Five-Year Plan period	2001-2005	20.61	1.35
11th Five-Year Plan period	2006-2010	21.53	1.39
12th Five-Year Plan period	2011-2012	21.02	1.33

Sources: "China Statistical Yearbook 2012" and the "Statistical Communiqué of the People's Republic of China on the National Economic and Social Development in 2012."

began in the 1970s. After that, the speed increased rapidly (see figure 1.3). China's national urbanisation level is currently lower than the average in East Asia and the Pacific, and it lags behind levels in Europe, North America, the Middle East and North Africa. But based on experiences elsewhere in the world, the portion of Chinese living in cities is eventually expected to stabilize at between 70 and 80 percent.<sup>4</sup>

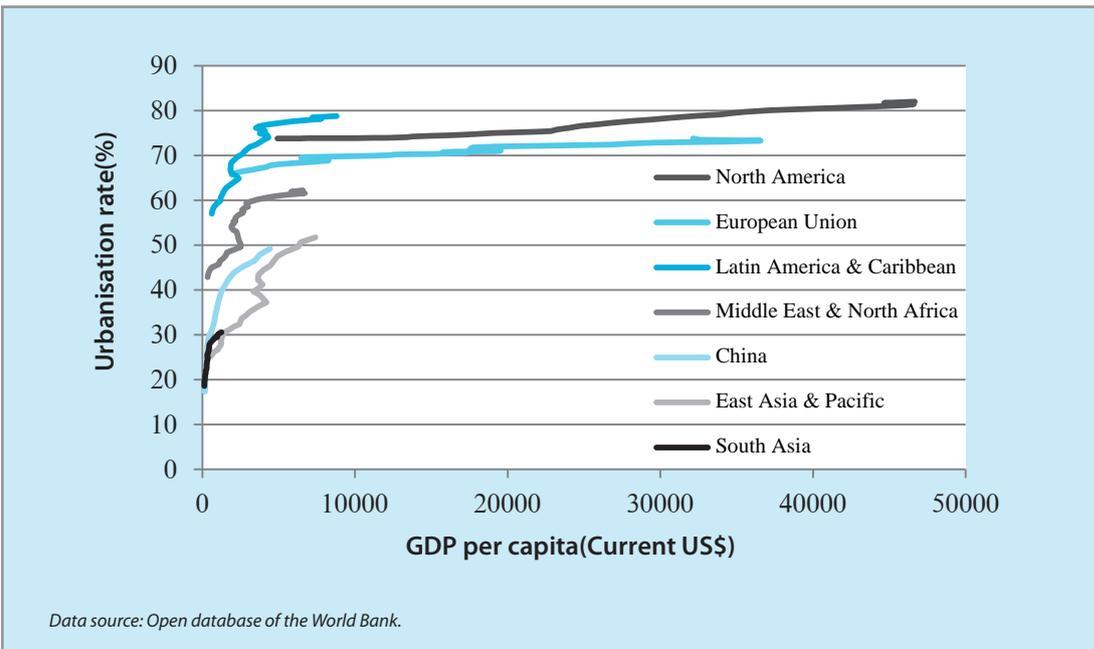
## China's Urbanisation Evolution

While China's rapid urbanisation in the past 30 years has garnered much attention, it in fact has a long history of urban development that spans centuries. A well-structured urban system—one that includes a national capital, several regional centres and provincial capitals, and a network of county seats and

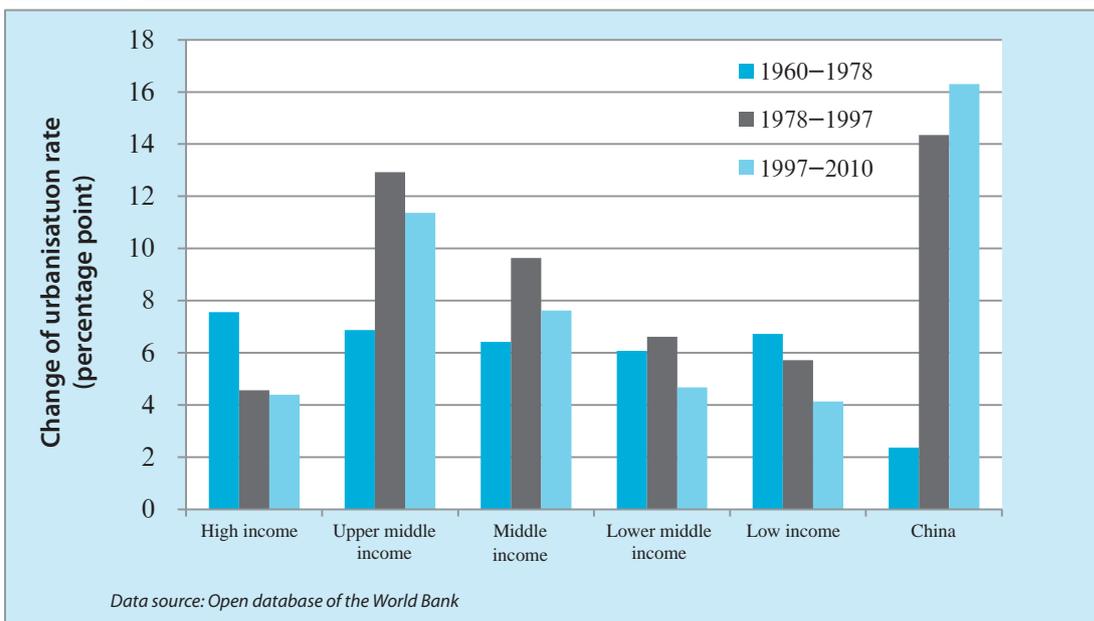
commercial towns—was being put in place more than 2000 years ago. In the early days, traditional Chinese cities served as political and administrative centres, with limited commercial functions.<sup>5</sup> The situation changed when commercial activities started to expand during the late 10th Century, especially in the port cities.<sup>6</sup> Traditional cities grew to become multifunctional hubs, where military, transportation, communication, religious, cultural and intellectual activities took place.<sup>7</sup>

But China’s massive urban transformation did not take off until the founding of the People’s Republic of China in 1949. Such transformation stems from public policies that unleashed the economy and urban growth. It evolved through three stages with varying rates of change (see figure 1.4 for some major policies and events that influenced urbanisation in China over the past 60 years).

**Figure 1.2** Comparison of urbanisation in different regions, 1970-2010



**Figure 1.3** International comparison of urbanisation speeds by country type, 1960-2010



## SLOW CHANGES, INITIALLY

The first stage, which the Chinese refer to as the period of ‘twists and turns’, extended from 1949 to the process of reform and opening up that began after 1978. Initially, after the establishment of the People’s Republic of China, as the national economy gradually recovered and industrialization began, urbanisation moved steadily forward. But progress was offset by the Great Leap Forward,<sup>i</sup> natural disasters<sup>ii</sup> and the Cultural Revolution.<sup>iii</sup> Between 1956 and 1960, urbanisation was fast, annually increasing by 1.25 percentage points. From 1966 to 1977, it was in serious stagnation and decline, at a rate that fell annually by 0.16 percentage points.

The second period of urbanisation, from 1978 to 1995, unfolded after the 1978 decision to reform the economy, and to invite foreign investment and trade. These open-door policies led to an uptake in rural migration to cities, and the incorporation of rural areas within cities as they began to expand. The urban population grew steadily, from 18 percent of all Chinese in 1978 to 29 percent by 1995.

Four special economic zones <sup>8</sup> (including Shenzhen, Zhuhai, Shantou and Xiamen) were created in 1980, and eight years later Hainan Province was included. The ‘opening-up’ policy <sup>iv</sup> was introduced to 14 coastal cities in 1984 (Tianjin, Shanghai, Dalian, Qinhuangdao, Yantai, Qingdao, Lianyungang, Nantong, Ningbo, Wenzhou, Fuzhou, Guangzhou,

i The Great Leap Forward was an economic and social campaign of the CPC, reflected in planning decisions from 1958 to 1961. It aimed to use China’s vast population to rapidly transform the country from an agrarian economy into a modern communist society through rapid industrialization and collectivization.

ii The Three Years of Great Chinese Famine, referred to by the CPC as the Three Years of Natural Disasters or Three Years of Difficult Period by the Government, occurred between 1958 and 1961. The period was characterized by widespread famine. Drought, poor weather and government policies contributed, although their relative contributions are disputed in light of the Great Leap Forward.

iii The Great Proletarian Cultural Revolution, commonly known as the Cultural Revolution, was a social-political movement that took place in the People’s Republic of China from 1966 through 1976. Set in motion by Mao Zedong, then Chairman of the CPC, its stated goal was to enforce communism in the country by removing capitalist, traditional and cultural elements from Chinese society. The movement paralysed China politically and significantly affected the country economically and socially.

iv The Chinese economic reform (literally ‘reform and opening up’) refers to the programme of economic reforms called “Socialism with Chinese Characteristics” that started in December 1978, driven by reformists within the CPC led by Deng Xiaoping.

Zhanjiang and Beihai), and extended to 5 cities along the Yangtze River (Wuhu, Jiujiang, Yueyang, Wuhan and Chongqing) and 14 cities on national borders in 1992. Eighteen inland provincial capitals were granted the privileges of coastal cities.<sup>9</sup>

Initially, the emphasis was on controlling the scale of large cities and developing small towns, as noted in a national urban planning conference in 1978. In 1979, the CPC’s Central Committee outlined a programme to facilitate the development of small cities and aid rural areas. In 1980, the National Urban Planning Conference proposed controlling the development of big cities, rationally planning the development of medium cities and actively encouraging the development of small cities.

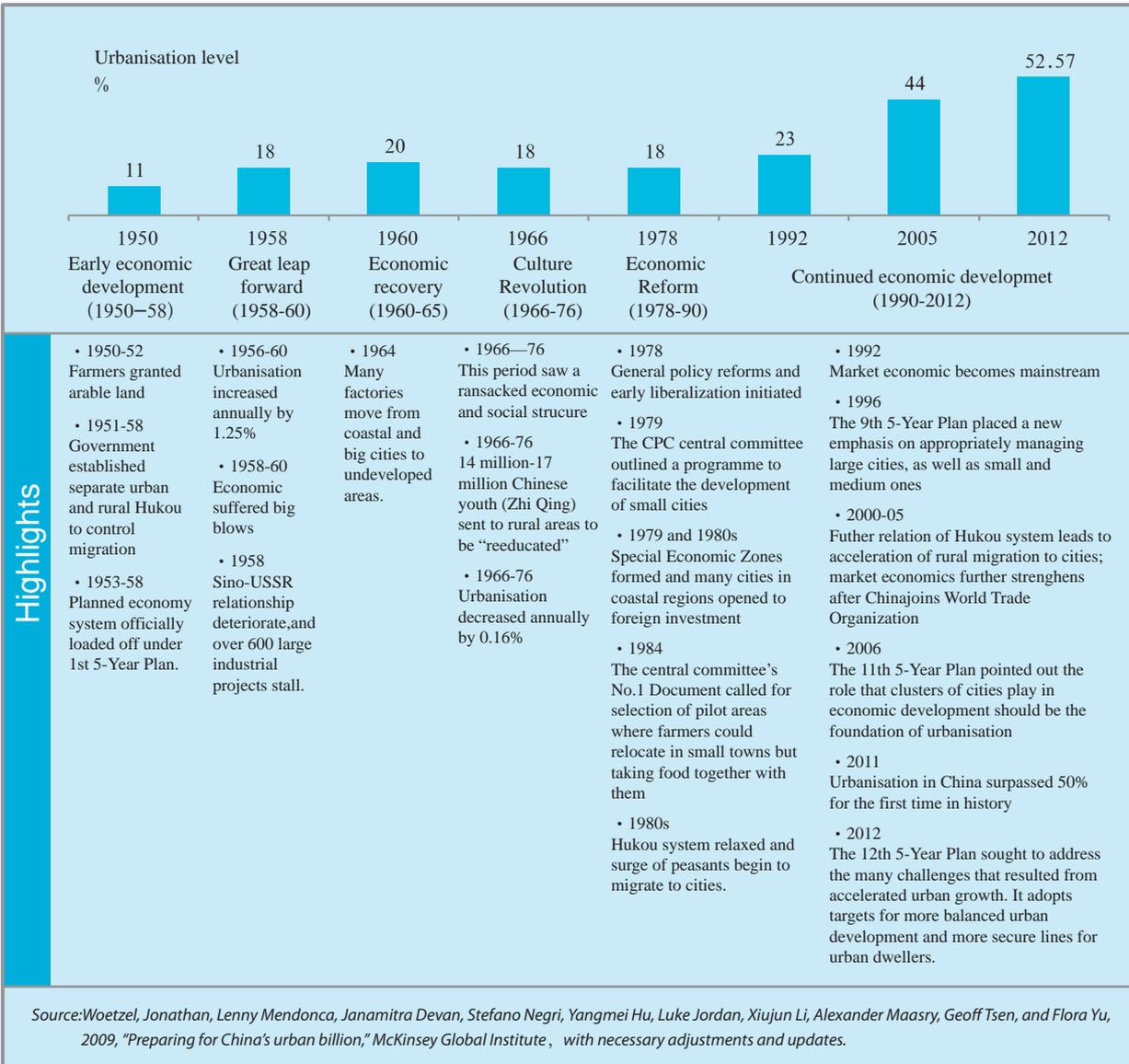
The 6th Five-Year Plan (1981-1985) reiterated these notions, emphasizing efforts to establish new large and medium-scale industrial projects in medium and small cities as well as suburbs rather than in large cities.

As aims for urbanisation began to shift, so did some guiding policies. Most notable was a move towards looser regulations on migration and reduced criteria for residency in townships. In 1982, the No. 1 Document from the CPC Central Committee formally recognized the feasibility of the ‘contract out’ policy,<sup>v</sup> which greatly stimulated the rural economy. The No. 1 Document of 1983 permitted “capital, technologies and labour [...] to flow in rural areas to a certain degree.” As township and village enterprises grew there, they absorbed surplus labour and contributed to flourishing small cities.

In January 1984, the Committee’s No. 1 Document called on provinces, autonomous regions and municipalities to select several pilot areas where farmers could relocate in small towns by taking their food production together with them. In November 1984, the State Council published the “Report of Readjust-

v The ‘contract out’ policy (contract responsibility system or household responsibility system) was a practice in China first adopted for agriculture in 1981 and later extended to other sectors of the economy. It involves holding local managers responsible for the profits and losses of an enterprise. The system partially supplanted the egalitarian distribution method, whereby the state assumed all profits and losses.

**Figure 1.4** Major policies and events that influenced urbanisation in China over the past 50 years



ing the Criteria on Townships from the Ministry of Internal Affairs," which further aided the development of rural areas, regions of minority ethnic groups, under-populated areas, mountainous regions, small mines, small ports, scenic places and provincial border crossings.

### THE RUSH TO THE CITY

The third period of urbanisation, still at work, began in 1996 as China's growth shot upward. During this time, ongoing reforms and strong industrial demand have been the two major driving forces. The latter combines with lower demand for agricultural products to hinder rural development and sustain the

movement of rural people into urban areas. External capital has gathered firstly and most intensely in coastal urban areas, acting as a tremendous pull for surplus rural labour.

As a result, urban governments have begun to face population and resource pressures, the need for rapid investment in municipal construction, and the required transformation of industrial structures as part of China's continued economic expansion. All of these elements impact human development now and in the future, as this report shows.

The 9th Five-Year Plan (1996-2000) commenced in 1996, placing a new emphasis on appropriately

managing large cities, as well as small and medium ones. Since then, China has loosened controls on the growth of big cities, recognizing their contributions to development and their potential role as hubs of innovation. It has sought to foster synergies between big and small cities, and started to pay greater attention to emerging urban challenges.

During the rapid urbanisation process, central government realized the importance of the scientific planning for guiding the urban construction and put forward urbanisation strategy in the 10th Five-Year period for the first time. The first national urbanisation planning was also released at this time.

The role that urban clusters play in economic development has been increasingly evident. The 11th Five-Year Plan of 2006 pointed out that these should be the foundation of urbanisation. It called for reciprocal cooperation among cities to improve the competitiveness of different clusters, and plans to assist core big cities with sufficient population density in attracting the most appropriate industries, reducing land use, providing more employment opportunities, developing urban clustering capacities and achieving a reasonable population distribution.

Starting in 2011, the 12th Five-Year Plan seeks to address the many challenges that China is facing, including those resulting from accelerated urban growth. It adopts targets for more balanced urban development and more secure lives for urban dwellers. For example, it aims at creating more than 45 million jobs in cities, and keeping the urban registered unemployment rate below 5 percent. It calls for improved social services as well as better governance and judicial systems.

Environmental targets are geared towards boosting use of non-fossil fuels, and raising efficiency in energy and water use. Towards a target of increasing the lifespan of people by one year, there are provisions for extending pension schemes for all rural residents and some 357 million urbanites, and constructing and renovating 36 million apartments for low-income populations. Increased investments in

research and development are expected to lead to new national patents, a more competitive local business environment, improved education and other advantages.

The plan emphasizes the continued importance of the internationally competitive urban cluster in the east of China, and the cultivation of several urban clusters in the central and western regions. It stresses developing small and medium cities with advantages in terms of geography, resources and environment. There are numerous references to urban-rural links, including as growing cities radiate outward.

Given recent history, it is easy to conclude that in years to come, what happens in cities will dictate whether this Five-Year Plan and subsequent ones will realize their ambitions. Cities, in other words, pose challenges to achieving expectations-and offer possible solutions.

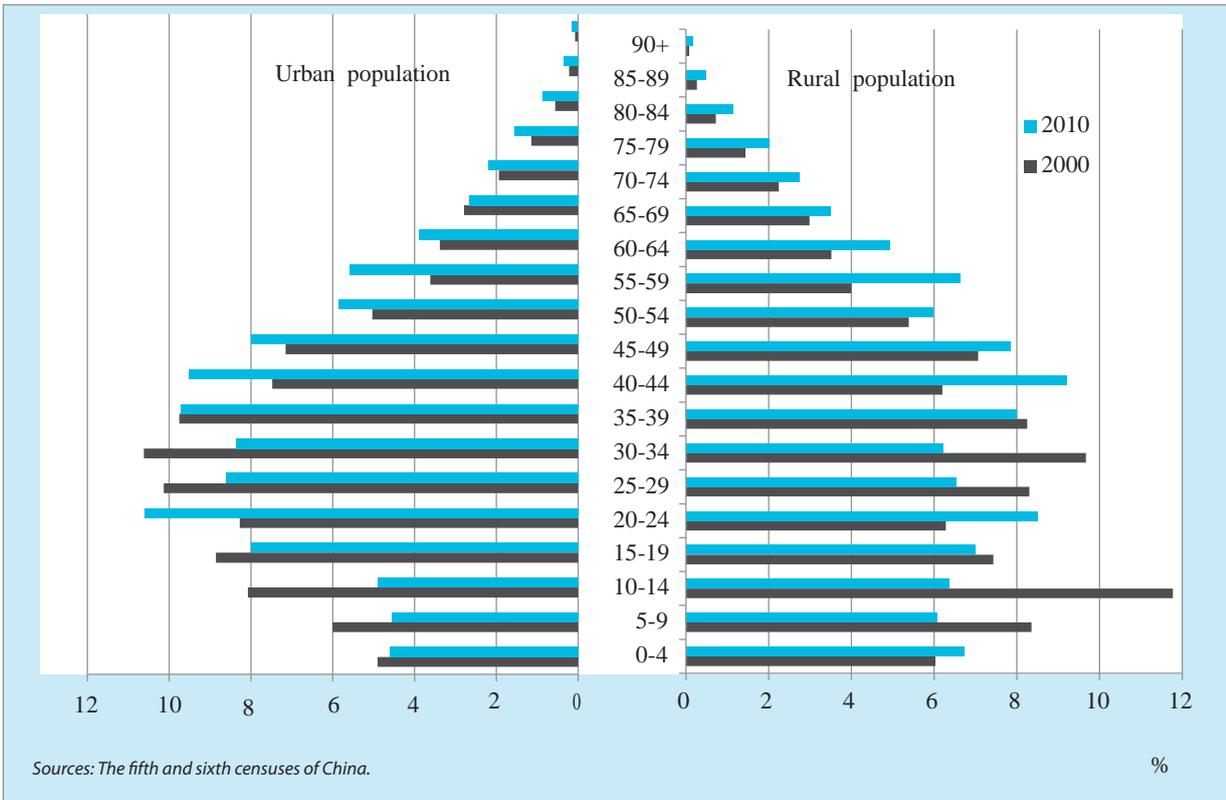
## WHO IS ON THE MOVE?

During the gradual evolution of China's urbanisation strategies, policies and systems restricting population flow, such as the household registration system<sup>10</sup>, have gradually loosened. With the removal of restrictions requiring farmers to remain in rural areas, for example, rural inhabitants have flooded into cities. Since 1995, rural migrants have become the main source of urban population expansion. By 2010, they comprised 31.2 percent of urban residents.<sup>11</sup>

Rural-urban movement will likely continue for several decades. According to McKinsey's research, by 2025, China will have some 221 cities with populations over one million. In the area of new construction alone, by some estimates, 40 billion square metres of floor space will have to be built to satisfy the needs of industries and businesses, and for individual housing.<sup>12</sup>

The demographic profile of internal migrants and the new urban population will have an immense impact on demands for employment, education and other social services (see figure 1.5).<sup>13</sup>

**Figure 1.5** Urban and rural population age structure in 2000 and 2010



Some indications may lie in current statistics. Based on an in-depth analysis of census data on migrants in 2010, there are some salient characteristics of this group that could foster deeper understanding of the challenges facing cities.

**Large in scale:** The migrant population comprised 229 million people in 2010; 156 million of them had travelled to cities to find jobs or run businesses. The rest, or 72.8 million people, had migrated for other reasons; they account for 31.8 percent of the total.

**Younger in age:** The average age of migrants was 27.3 years. Children under 14 made up 19.8 percent of the total. Those at an age to work, between 15 and 59 years old, comprised 79.7 percent.

**Low-income:** The average monthly income of an urban worker was 3,096 yuan, while for migrants it was only 2535 yuan.

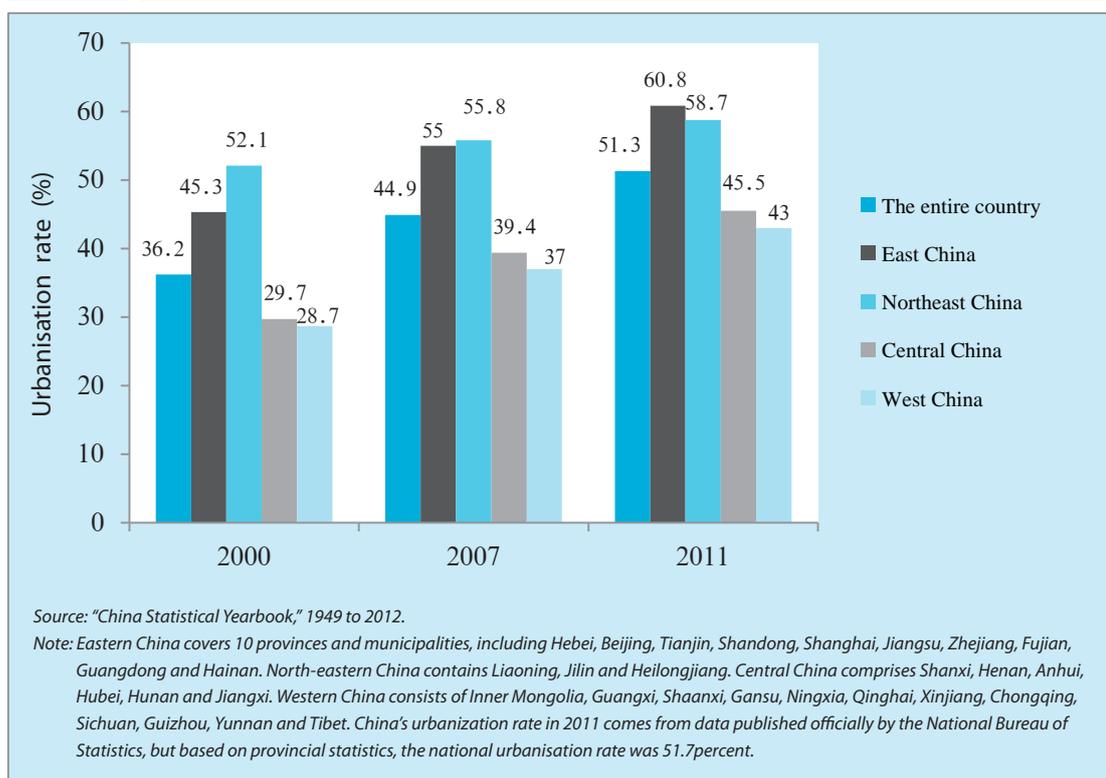
**Lack of social welfare:** Among all migrants, 65.3 percent rented private houses; 19.8 percent rented pub-

lic houses provided by their employers, some free of charge; 9 percent bought houses; 3.8 percent lived where they worked and 2.1 percent fell into other categories.

**Labour-intensive work as main employment type:** 37.4 percent of migrants were employed in manufacturing industries, and 37.8 percent in other labour-intensive sectors, such as wholesale and retail trade, hotels and catering, and social services sectors. In terms of employment categories, 66.2 percent were employees.

Since many migrants are young and working in labour-intensive jobs, cities may face huge challenges in sustaining their employment. Other challenges come from providing full coverage of public services to this group, as they have lower incomes and insufficient social welfare. The 31.8 percent of migrants moving for reasons other than employment could prove restless over time. Continuously improving systems for managing migrants may be a top priority for city governance.

**Figure 1.6** Variations in China's regional urbanisation rates



Another issue was raised by the All-China Women's Federation in 2013, when it released 'The Study on China's Rural Left-behind Children and Migrant Children'. The study indicated that the male-female ratio of migrant children was 1.16, almost the same as those for children nationally, rural children and children left behind by migration. However, the sex ratios of migrant children varied when divided by different age groups, especially when compared with those of left-behind children. For children at the age for kindergarten and compulsory education, the proportion of boys is higher in migrant children than in left-behind children. For children who were at a post-compulsory education age, normally older than 15, the proportion of girls was greater among migrant children. These statistics reveal that migrants have gender preferences in selecting children to take with them.<sup>14</sup> Boys tend to have more opportunities for education.

## URBANISATION DEPENDS ON WHERE PEOPLE LIVE

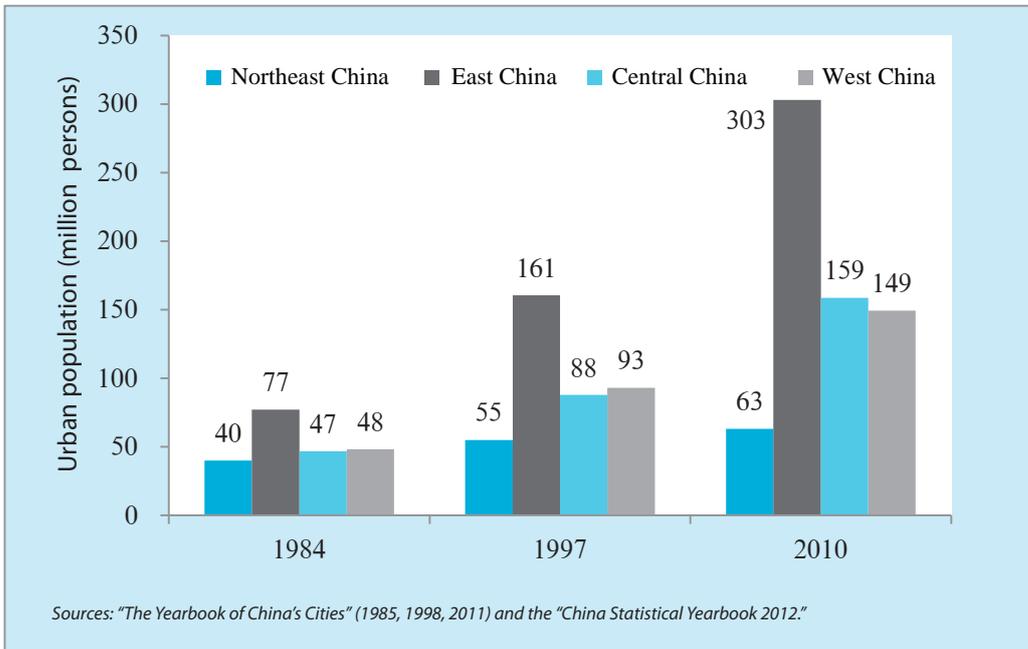
For people in China today, the extent of urbanisation depends on where they live. In general, the level is

higher in the east and north-east, and lower in the centre and west. The shift to urban areas is currently accelerating faster in the eastern and central regions, however, and slower in the north-east (see figures 1.6 and 1.7). Resource and environmental constraints in some eastern urban clusters have increased, while the urbanisation potential of the central and western regions, with strong resources and environmental carrying capacities, needs to be tapped.

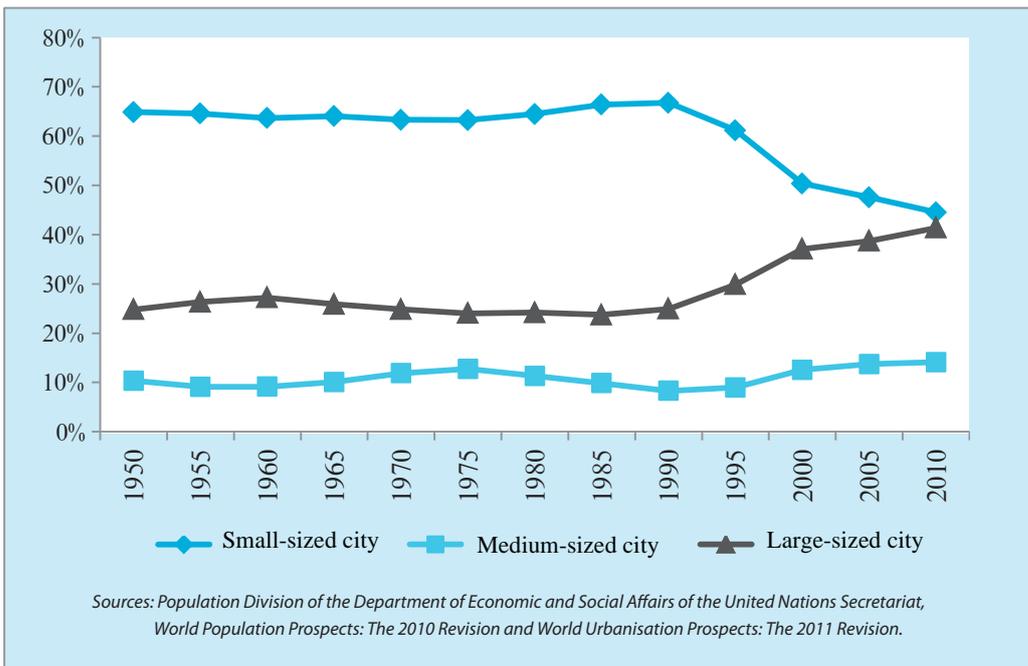
Among 481 million new urban residents from 1984 to 2011, around 49 percent ended up in eastern cities, 24 percent in cities in the centre, 22 percent in the west and 5 percent in the north-east. Among all urban residents, the proportion in the north-east decreased from 19 percent to 9 percent, compared to an increase from 36 percent to 45 percent in the east. The proportion in central and western cities remained around 22 percent.

Differences in regional urbanisation have resulted from economic disparities. The decline in the north-east, for example, stems from the longstanding industrial base there, formed by large-scale investments during the period of China's planned econo-

**Figure 1.7** Distribution of the urban population in different regions



**Figure 1.8** Proportion of the urban population in different city sizes



my. The concentration of state-owned enterprises imposed a heavy burden in the process of reform. The region lacked economic vitality, and its economic development rate fell behind that of the coastal area.

Urbanisation in the east has been driven by a vibrant commercial economy. Since the mid-1990s, more resources for infrastructure investment have gone to

the central and western regions, narrowing gaps in economic development and promoting a balance in regional urbanisation.

### LARGE CITIES LEAD THE WAY<sup>15</sup>

Around the world, the pursuit of efficient economic growth has spurred the expansion of large cities, with their capacities to concentrate human, industrial and

other resources, and with the potential for more efficient management of resources and services. China is no exception. Large cities were bastions of China's urban system early in the reform period, despite restrictive policies at some points, especially to control large cities from the 1980s to the mid-1990s. By 2000, the central Government had confirmed the importance of 'harmoniously' developing small, medium and large cities.

Before the reform and opening up, the development pattern of China's large, medium and small cities was quite stable. The population of large cities accounted for around 25 percent of the total urban population, the share of medium cities was about 10 percent, and small cities had the remainder or 65 percent (see figure 1.8).

From the reform and opening up to the 1990s, China's urbanisation was mainly driven by the development of small cities and towns. The urban population increased by 11.84 million people from 1980 to 1990; 71 percent went to small cities and towns (see figure 1.8). Two reasons help to explain this phenomenon. First, after the reform and opening up, the rural economy became more dynamic. Rural township enterprises and private business boomed, providing jobs to rural residents and increasing the prosperity of small cities and towns. Second, the reform of China's household registration system gradually relaxed controls on rural migrants, even as loosened standards on town building and replacement led to an increased number of small towns. The lag in urban economic reforms and continuing controls on the growth of medium and large cities, by contrast, slowed their development. The share of the urban population in medium cities dropped from 11 percent in 1980 to 8 percent in 1990.

After the 1990s, China's large cities began to grow rapidly. The proportion of the urban population in large cities increased dramatically, and the average population size of large cities expanded as well. From 1990 to 2010, the proportion of urban residents in large cities increased from 25 percent to 41 percent, and the number in medium cities increased from 8 percent to 14 percent, while the share in

small cities declined from 67 percent to 45 percent. Furthermore, the average population size of big cities increased from 2.3 million to 2.98 million people from 1990 to 2010, a growth of 30 percent. At the same time, the average population size of medium cities declined from 700,000 to 680,000 people, a fall of 3 percent.

The increase in the number of cities with populations of more than 5 million people led the expansion of large cities. From 1990 to 2010, the number of cities in this category increased from 3 to 15, and average population rose from 6.79 million to 8.74 million people, a 29 percent increase. Two reasons help explain this development. First, the central Government gradually realized the importance of large cities starting in the mid-1990s, and began to relax the controls on them. It put forward the urban cluster as the major form of urbanisation. Second, after the 1990s, with the establishment and improvement of China's socialist market economic system, the large cities took advantage of rich human resources, mature markets, and good communication and infrastructure systems to expand aggressively.

In some Chinese megacities, however, the urban population pressure has become too large; their overall carrying capacity is near the limit. The ability of medium and small cities to attract industries and population is insufficient, with their potential not yet fully realized. There are many small towns, but they have few residents and weak service functions. The spatial distribution and size structure of cities and towns has not been well planned, which has increased economic, social and environmental costs.

## *The Emergence of Urban Clusters*

Urban clusters spawned by large cities, especially ultra-large and giant ones, have been important to urbanisation and national economic development. They combine large populations with the greatest economic and urban density, and have a number of advantages. With growing markets, extensive talent

Table 1.2: China's 10 large urban clusters

Name of urban cluster	Geographical scope	General situation
Yangtze River Delta	Shanghai, Nanjing, Suzhou, Wuxi, Changzhou, Zhenjiang, Yangzhou, Taizhou, Nantong, Hangzhou, Huzhou, Jiaxing, Shaoxing, Ningbo, Zhoushan	7.6 percent of cities and 5.1 percent of towns are located in this area, which is 100,700 square kilometres in size. The Yangtze River Delta city group is the most comprehensive economic centre in China, an important international gateway in the Asia-Pacific region, and an essential advanced manufacturing base for the world.
Pearl River Delta	Guangzhou, Shenzhen, Dongguan, Huizhou, Zhuhai, Zhongshan, Foshan, Zhaoqing, Jiangmen	2.6 percent of cities and 1.7 percent of towns are in this area, covering 55,200 square kilometres. The Pearl River Delta urban cluster has some of the greatest population flows, highest proportions of migrants and most dynamic economic development.
Beijing-Tianjin urban cluster	Beijing, Tianjin, Shijiazhuang, Langfang, Baoding Tangshan, Qinhuangdao, Cangzhou, Zhangjiakou, Chengde	4.1 percent of cities and 5.1 percent of towns are in this area of 182,500 square kilometres. Beijing and Tianjin are the core of the cluster, which features rich intellectual resources, and leads in high-tech research and development, as well as offering modern high-end services to the world.
Shandong Peninsula	Jinan, Qingdao, Yantai, Weihai, Zibo, Rizhao, Dongying, Weifang	4.6 percent of cities and 2.5 percent of towns are in this area of 73,800 square kilometres. Shandong Peninsula is the most rapidly growing urban cluster in the Yellow River basin, and also the fourth largest urban cluster. It has made great contributions to national economic development.
Eastern Liaoning Peninsula	Shenyang, Anshan, Fushun, Benxi, Fuxin, Panjin, Dandong, Dalian, Liaoyang, Tielin, Huludao, Jinzhou, Yingkou	The Eastern Liaoning Peninsula urban cluster spans 127,700 square kilometres. The area was China's largest industrial base under the planned economy. It is the core urban cluster in the revitalization of the old industrial bases in north-east China. As the fifth largest urban cluster, it makes significant contributions to national economic development.
Chengdu-Chongqing	Chengdu, Deyang, Mianyang, Guangyuan, Yibin, Leshan, Luzhou, Nanchong, Zigong, Dazhou, Meishan, Neijiang, Suining, Guang'an, Ya'an, Ziyang, Bazhong, Chongqing, Wanzhou, Fuling	This area includes 20 cities and 1,793 towns across 193,400 square kilometres. Chengdu and Chongqing, the two core cities, are super-metropolises. They accumulated some industrial base in the 'three-line construction' period and are pivotal to the western development strategy.
Ha-Da-Chang urban clusters	Changchun, Jilin, Songyuan, Harbin, Tsitsihar, Daqing	The Ha-Da-Chang urban clusters encompass 17 cities and 356 towns, and covers 185,500 square kilometres. They are key to the revitalization of the old industrial bases in north-east China, as well as the avant-garde urban cluster for China's participation in the Northeast Asia Cooperation Dialogue.
West Coast Cities	Fuzhou, Xiamen, Zhangzhou, Quanzhou, Putian, Ningde	The West Coast Cities, lying on the western side of the Taiwan Strait, are important to China's coastal economic belt. At the same time, the cluster is significant in promoting peaceful reunification through exchanges and cooperation.
Central Plain	Zhengzhou, Luoyang, Kaifeng, Xinxiang, Jiaozuo, Xuchang, Jiyuan, Pingdingshan, Louhe	This cluster includes 23 cities and 365 towns in an area of 58,700 square kilometres. It is an important fulcrum of the national strategy of developing central China, but the level of development needs to be further improved.
Jianghuai urban cluster	Hefei, Chaohu, Wuhu, Tongling, Ma'anshan, Chuzhou, Liu'an, Huainan, Bengbu, Chizhou, Anqing	There are 14 cities and 523 towns in this cluster, covering 86,200 square kilometres. Located in central China, it facilitates eastern industrial transfers, and is influenced by the economies of the Yangtze River Delta urban clusters.

Note: In 2011, the State Council issued the "Revocation of Consent Anhui Chaohu City and Part of the Prefecture-level Administrative Division Adjustment Approved" (letter No. 84, 14 July 2011), which announced the revocation of the prefecture-level city of Chaohu, and established the Chaohu County City, including part of the former administrative regions owned by Hefei, Wuhu and Ma'anshan city.

Source: Based on related materials from Fang Chuanglin, Yao Shimou, Liu Shenghe et al., 2011, "2012 China Urban Cluster Development Report," Science Press; and Niu Fengrui et al., 2008, "Urban Introduction," Social Sciences Academic Press. Chapter XIII (Song Yingchang, Author of the chapter)

pools, developed and diverse industries and services, and strong supply chains, urban clusters have favoured the establishment and growth of enterprises, and become a primary engine of China's rapid economic growth, and platform for participating in international economic cooperation and competition.

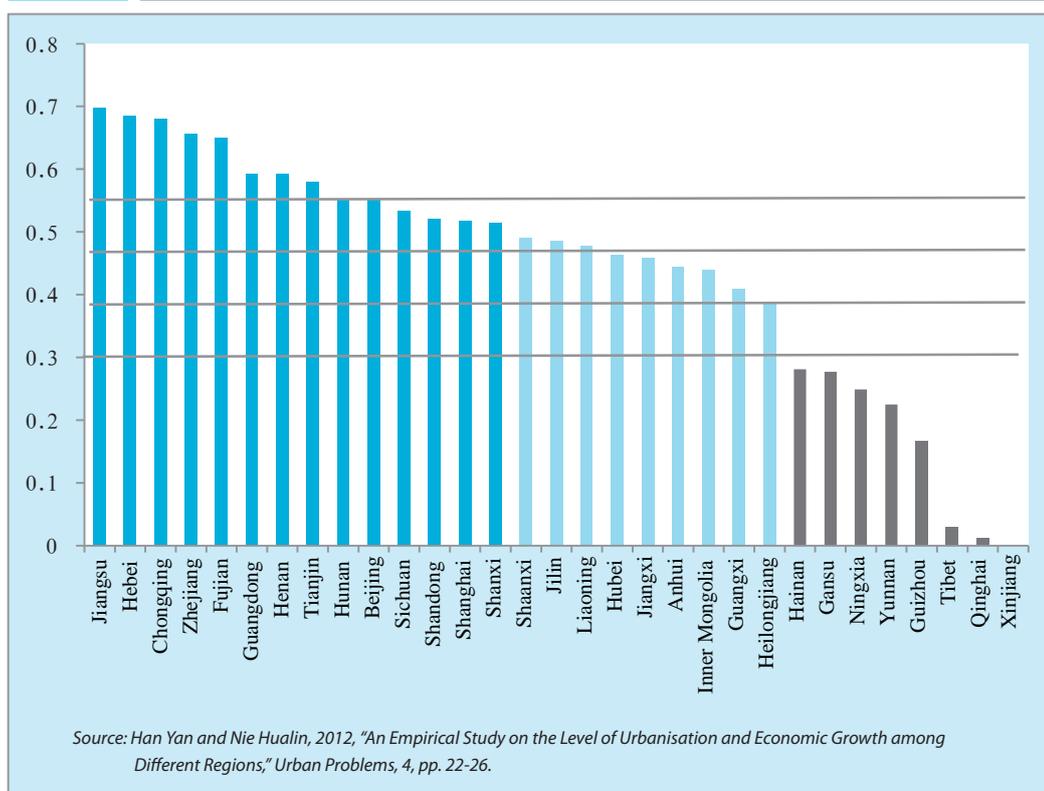
Rapid urban development has created favourable conditions for urban clustering since the reform and opening up. In his speech in southern China in 1992, Deng Xiaoping reconciled accusations that the market economy was excessively capitalist, famously stating, "Practice of a planned economy is not equivalent to socialism because there is planning under capitalism too; practice of a market economy is not equivalent to capitalism because there are markets under socialism too."<sup>16</sup> His comments helped open the way for reform. After 1992, as reforms accelerated, urban clusters emerged in the east, south and north, namely in the Pearl River Delta, the Yangtze River Delta and the Beijing-Tianjin-Hebei region (see Table 1.2). Since 2002, China's entry into the World Trade Organization has propelled further development of these areas. Many have become mature ur-

ban districts with well-developed infrastructure, a high level of economic and social development, and close relations among adjoining cities. According to available statistics, in 2007, 49 percent of China's total population, 51.4 percent of its urban population, 68.54 percent of total fixed asset investments, 76.5 percent of total retail sales volume and 78.8 percent of economic output were in urban clusters, even as these only occupied 21.13 percent of national territory.<sup>17</sup>

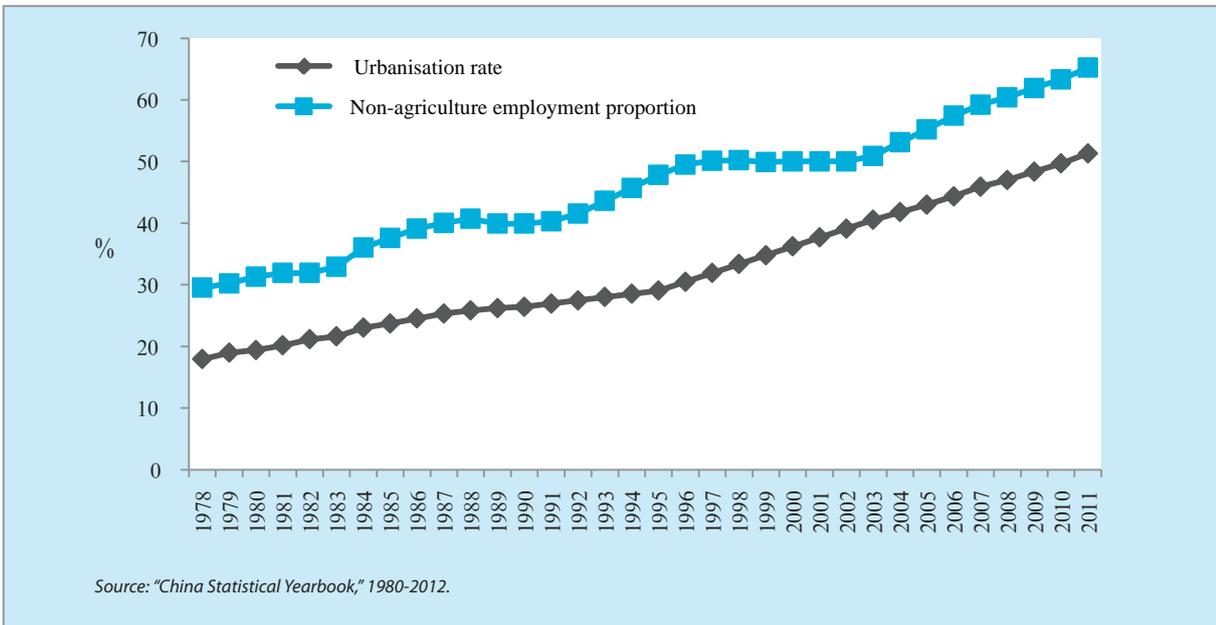
### A Positive Impact on Growth, but with Gaps

With their notably positive impact on economic growth, as affirmed by a recent research report,<sup>18</sup> cities have been a large part of the story of how, in such a short time, China has been able to pull millions of people out of poverty. China's HDI has steadily risen from 0.407 in 1980 to 0.699 in 2012.<sup>19</sup> Today, municipal districts of China's cities generate about 56.3 percent of GDP. According to estimates by this report,

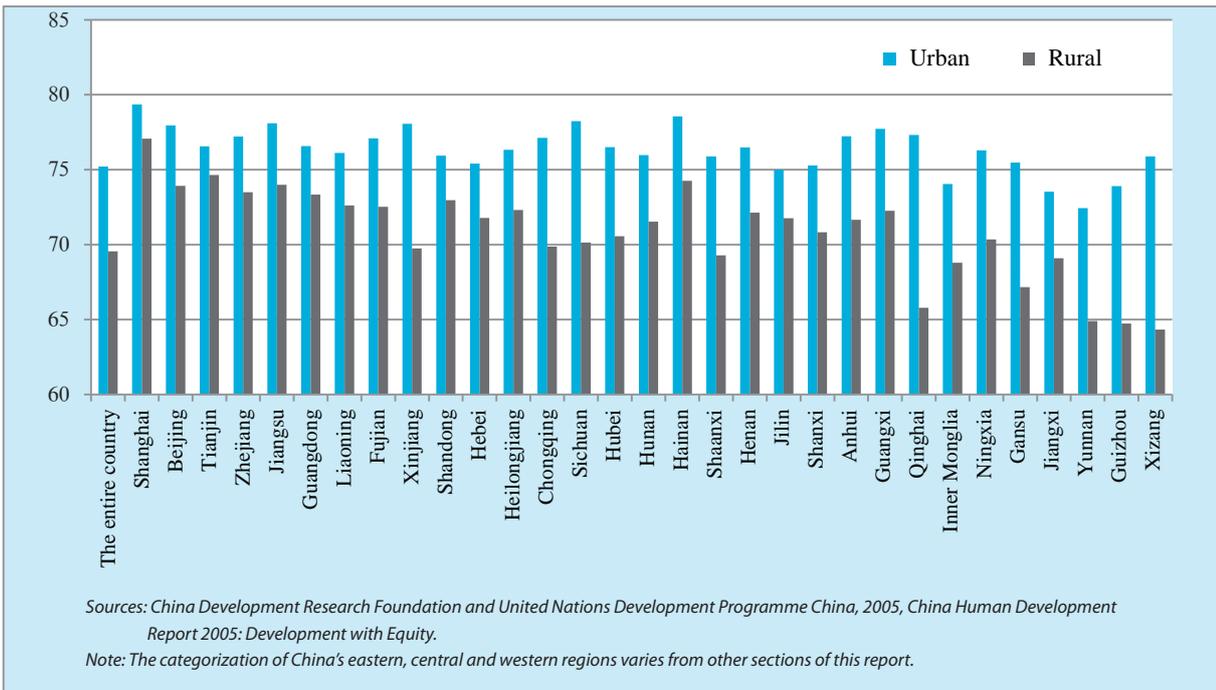
**Figure 1.9** Contribution of urbanisation to economic growth in China's provinces



**Figure 1.10** Variations in China's urbanisation rate and proportion of non-agricultural employment



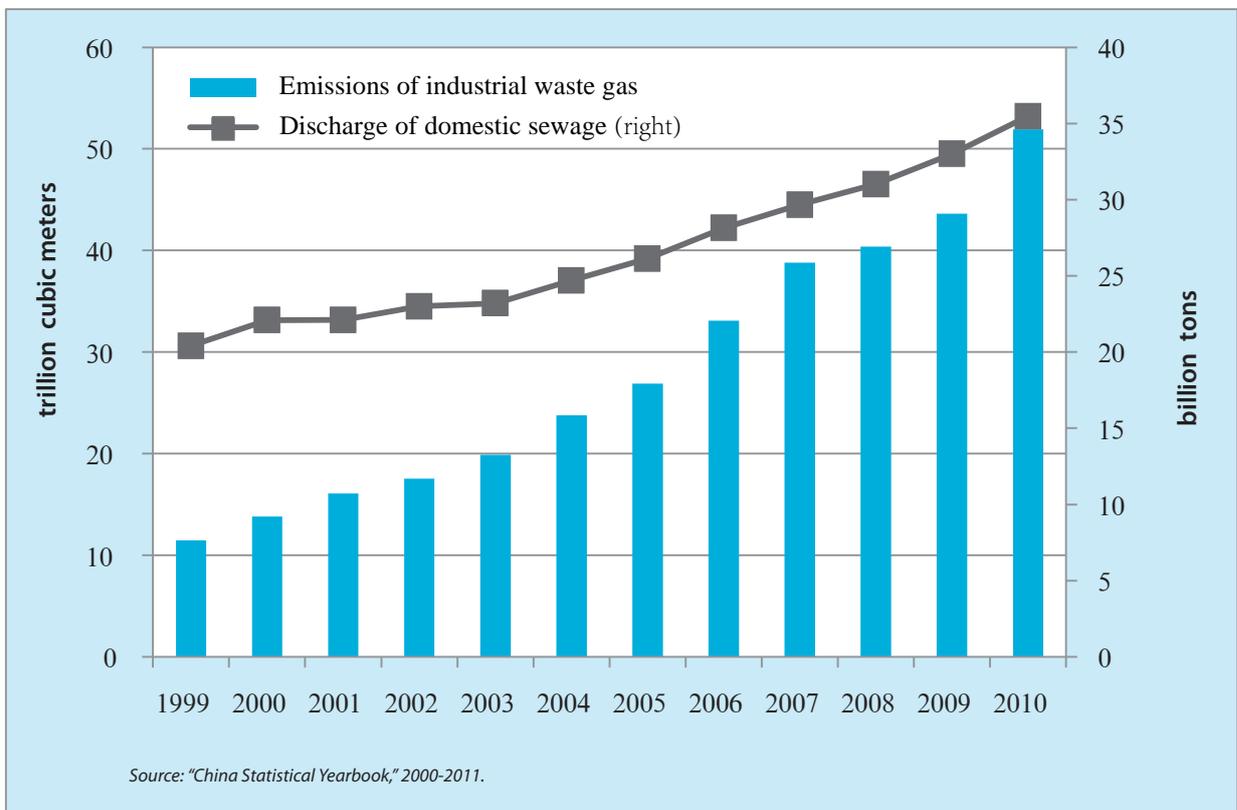
**Figure 1.11** Urban and rural life expectancy by province in 2000 (years)



by 2030, this figure is expected to rise to 75 percent of GDP. In all provinces, urbanisation makes a positive contribution to GDP. Generally, a higher contribution comes from eastern China, while the lowest contribution is from the western provinces (see figure 1.9).<sup>20</sup>

Analysis of data on China's urbanisation rates and non-agricultural employment from 1978 to 2011 shows that cities propel the growth of jobs, a trend expected to continue (see figure 1.10). By 2025, cities are projected to offer some 450 to 500 million jobs, compared with some 290 million in 2005.<sup>21</sup> The question, however, is whether or not demand will match

**Figure 1.12** Variations in national emissions of industrial waste gases and sanitary sewage discharge, 1999-2010



### Box 1.1: The Great London Smog

In December of 1952, the Great London Smog engulfed the city for five days, causing 12,000 immediate deaths and 8,000 more in the aftermath. The toxic atmosphere was linked to widespread combustion of fossil fuels, particularly coal. This unprecedented environmental disaster revealed the negative impacts of the Industrial Revolution and marked the beginning of government intervention to mitigate air pollution.

The first Clean Air Act of 1956 focused on limiting smoke discharge and setting up smokeless zones in the city, with subsequent acts strengthening and adding restrictions. Air quality improved markedly after implementation of solid fuel restrictions, introduction of low-sulfur coal, industrial relocation and taller smokestack requirements.

*See appendix for further information.*

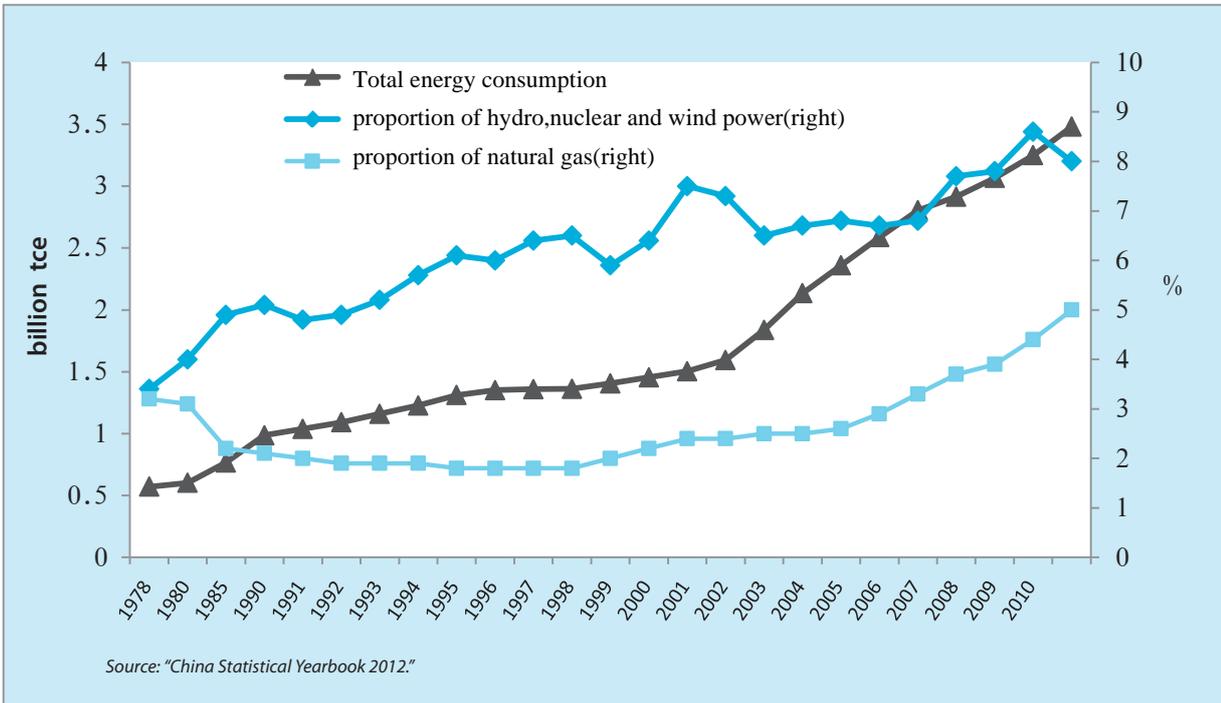
### Box 1.2: Promoting green businesses

Xinyu, also known as the 'Steel City' and the 'Solar City', hosts leading enterprises in iron, steel, building materials, silicon and other energy-intensive industries. Emphasis on low-carbon projects has created a new demand for alternative energy, spurring relevant companies to relocate to the area.

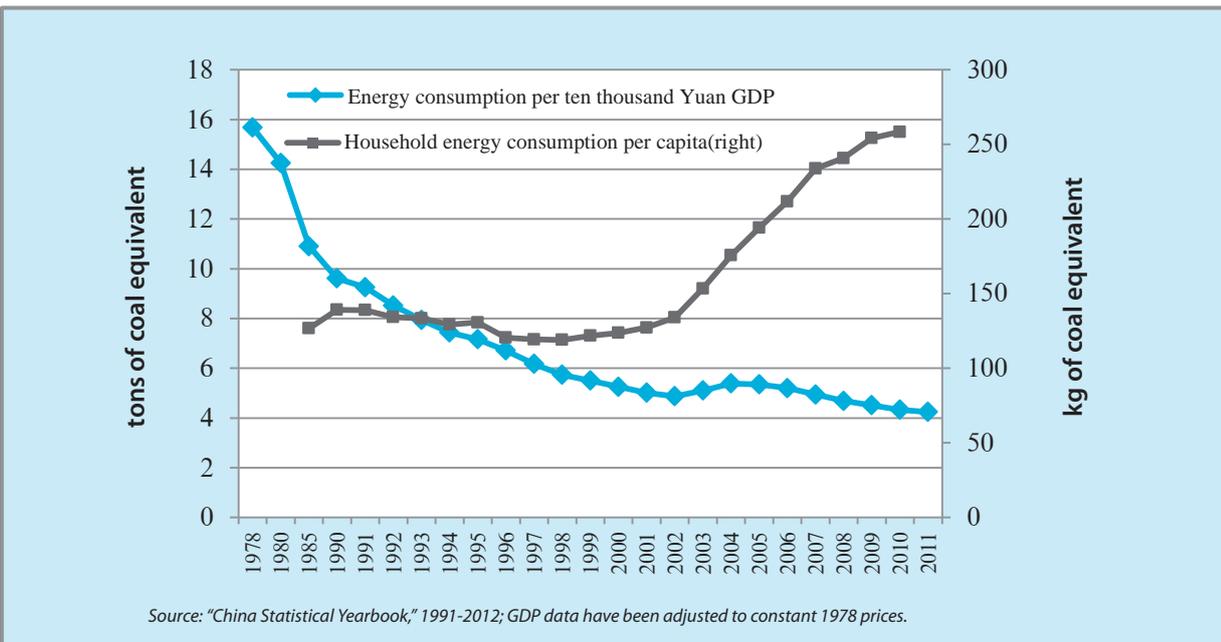
The city now uses the 'One Giant with Three Supplements' model, focusing on photovoltaics (the giant) supplemented by battery, wind power and low-emission equipment manufacturing. The promotion of green business development has had positive effects on the city's liveability, transforming Xinyu from a typical industrial city to an ecologically friendly clean-tech hub.

*See appendix for more information.*

**Figure 1.13** Variation of energy use in the course of China's rapid urbanisation



**Figure 1.14** Variation of energy use per 10,000 yuan of GDP in the course of rapid urbanisation



the supply of skills, especially as China shifts towards higher value-added economic activities, such as in the service industry. Another issue is whether or not the large number of graduate students will find suitable jobs to fit their skills. Already, since China's household registration system still hinders the transfer from rural to urban areas, the supply of non-agricultural labour for lower skilled jobs is not steady.

This has resulted in labour shortages in coastal areas in recent years.

A cause for concern is the fact that not all population groups are reaping the benefits of economic growth. There are growing divides, including between urban and rural areas, and across regions. These occur in

terms of income, employment and access to social services, the foundations of human development (see figure 1.11 for the comparison of life expectancy between urban and rural areas in 2000).

## *A Mixed Record on the Environment Comes with High Costs*

The growth of cities has come at high cost to the environment and the resources upon which human development depends. The concentration of industries in urban areas has led to pockets of severe urban pollution, fouling air and water. Air pollution, despite many measures to contain it, may now be the main cause of death in China.<sup>22</sup> In 2011, national emissions of industrial sulphur dioxide amounted to nearly 20.17 million tons, and, among 468 cities investigated, 227 cities experienced acid rain, which accounted for 48.5 percent of their total rainfall. In 140 cities investigated, accounting for about 29.9 percent of all cities, the incidence of acid rain was over 25 percent of total rainfall, while in 44 cities it was over 75 percent. Figure 1.12 presents trends in emissions of industrial waste gases and sanitary sewage during rapid urbanisation.<sup>23</sup> See Box 1.1 for an historical experience.

From 1978 to 2010, China's total energy use rose nearly fivefold (see figure 1.13), and the proportion of low-emission energy, such as from natural gas, and hydro, wind and nuclear power, consistently declined. The industrial and energy sectors are the key sources of carbon emissions in China today,<sup>24</sup> and emissions continue to grow, contributing to climate change. They correspond with rates of urbanisation: In areas where urbanisation is between 17 and 30 percent, emissions levels are comparable to those in low- and middle-income countries. Once urbanisation surpasses 30 percent, emissions reach those of middle- and high-income countries.

Urbanisation is also beginning to make positive contributions to the more sustainable use of natu-

ral resources, such as through greater capacity for pollution treatment and enhanced environmental management abilities. In recent years, notions of the low-carbon economy and energy-saving technologies have begun to take root, with the potential for large-scale changes in consumption patterns in concentrated urban populations. See Box 1.2 for an example of a city that has embraced green business development.

The intensity of city resource utilization is improving in some respects. For example, although urban water consumption increased from 48 billion cubic metres in 1997 to 51 billion cubic metres in 2010, per capita water consumption decreased from 214 litres in 1997 to 171 litres in 2010.

Energy use per 10,000 RMB of GDP decreased from 15.68 tons coal equivalent in 1978 to 4.24 tons coal equivalent in 2011—an impressive drop-off of 73 percent (see figure 1.14).<sup>25</sup> Over the long term, as urbanisation continues, energy intensity is predicted to continuously decrease.<sup>26</sup>

The European Union and the United States have improved energy use per unit of GDP at a high urbanisation level, while China and India have made this step at a lower urbanisation stage. Although the urbanisation rate and industrialization in China are higher than in India, China lags behind the latter in maximizing the amount of GDP generated per unit of energy use, with the difference closely related to industrial structure. Tertiary service industries are further along in India, while in China 'dirtier' secondary manufacturing dominates. China's urbanisation also differs from that of Brazil, where the amount of GDP generated per unit of energy use is much higher than in China, and even higher than in the United States.

In later sections, this report turns to explore the magnitude of emerging challenges to cities, impacts on human development and the options that China has for making cities more liveable and sustainable.

This chapter has tried to summarize China's immense

urban transformation in a few pages. By necessity, it focuses on some highlights of what would require volumes to probe, analyse and describe to give the topic justice. What is evident from this brief survey is that the drivers of this urban transformation have been many, ranging from policies to influence the pace and quality of urbanisation, to demographic

and population pressures, to major economic changes occurring through the last three decades both within China and globally. It has not been any one of these events that has contributed solely to the great urban transformation of China, but their combination.

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4. Ru Xing and Fu Chonglan, 2013, "Annual Report on China's Urban-Rural Integration (2012)," *Blue Book of Urban-Rural Integration*, Beijing, Social Science Academic Press.
5. G. William Skinner, 1977, "Introduction: Urban development in imperial China," *The City in Late Imperial China*, ed. G. William Skinner, Stanford University Press, pp. 1-32.
6. Laurence J. C. Ma, 1971, "Commercial Development and Urban Change in Sung China (960-1279)," Ann Arbor, University of Michigan.
7. Frederick W. Mote, 1977, "The Transformation of Nanking, 1350-1400," *The City in Late Imperial China*, ed. William Skinner, Stanford University Press, pp. 101-54.
8. A special economic zone is a geographical region that has economic and other laws that are more free-market-oriented than a country's typical national laws. China's special economic zones can have special policies and flexible governmental measures. This allows them to utilize an economic management system that is especially conducive to doing business, and that does not exist in the rest of mainland China.
9. On 9 June 1992, "The State Council on Issues Concerning Further Opening of Xinjiang Uygur Autonomous Region" agreed to further open Urumqi City, and implement the policies of coastal open cities. At the same time, "The State Council on Issues Concerning Further Opening Nanning, Kunming, Pingxiang and Other Five Border Towns" (letter No. 62), decided to implement the policies of coastal open cities on Nanning, Kunming. On 30 July 1992, "The State Council on Issues Concerning Further Opening of Chongqing and Other Cities" (letter No. 93) decided to further open Harbin, Changchun, Hohhot, Shijiazhuang and other border, coastal, provincial capital cities, and implement the policies of coastal open cities on Taiyuan, Hefei, Nanchang, Zhengzhou, Changsha, Chengdu, Guiyang, Xi'an, Lanzhou, Xining, Yinchuan and other inland provincial capital cities.
10. In 1958, the Chinese Government officially promulgated the family registration system to control the movement of people between urban and rural areas. A household registration record officially identifies a person as a resident of an area and includes identifying information such as name, parents, spouse and date of birth.
11. The Sixth China Census shows that in 2010, the proportion of the country's urban population reached 49.68 percent, while the non-agricultural household population accounted for only 34.2 percent. The rest is the agricultural household population, which can be understood as the migrant population.
12. Jonathan Woetzel, Lenny Mendonca, Janamitra Devan, Stefano Negri, Yangmei Hu, Luke Jordan, Xiujun Li, Alexander Maasry, Geoff Tsen, and Flora Yu, 2009, "Preparing for China's Urban Billion," McKinsey Global Institute.
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14. All-China Women's Federation, 2013, "The Study on China's Rural Left-behind Children and Migrant Children," Chongqing, Southwest Normal University Press.
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21. See endnote 12.
22. Mun S. Ho and Chris P. Nielsen (editors), 2007, "Clearing the Air: the Health and Economic Damages of Air Pollution in China," The MIT Press, Cambridge, Massachusetts.
23. Ministry of Environmental Protection of the People's Republic of China, 2012, "The Environmental Communiqué of China in 2011" (available at [http://jcs.mep.gov.cn/hjzl/zkgb/2011zkgb/201206/t20120606\\_231049.htm](http://jcs.mep.gov.cn/hjzl/zkgb/2011zkgb/201206/t20120606_231049.htm), last accessed July 2013).
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25. National Bureau of Statistics of China, "China Statistical Yearbook," 1980-2011, China Statistics Press, Beijing.
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## CHAPTER 2

# CHALLENGES TO LIVEABILITY AND SUSTAINABILITY

### Key Messages

- China confronts economic, social and environmental challenges to making cities more sustainable and liveable, such as widening income gaps, an increasingly ageing population, environmental burdens and other issues. The speed and magnitude of the urban transformation make these issues particularly noteworthy.
- Dependence on heavy manufacturing is high; the service industry is underdeveloped.
- Municipalities have limited options for financing, which curtails service provision.
- In addition to other economic forces at play in China, migration has increased some unmet demands for jobs and services in cities.
- Extensive urban development has damaged the environment, reduced resources and contributed to climate change.

China's rapid urbanisation raises questions about how to manage and improve city liveability, and to ensure that all citizens can enjoy the benefits created by it. Cities should contribute to sustainable development, involving a balancing of economic, social and environmental priorities, as will be discussed in this chapter.

### *Economic Challenges*

Unbalanced, uncoordinated and unsustainable development remains a problem in China.<sup>1</sup> Towards ensuring sustainable growth and promoting the urban citizenization of people migrating from rural areas, China's cities face challenges in adjusting the

speed and improving the quality of growth; making the economic structure more sustainable; coordinating the growth and distribution of income, especially an equitable distribution among women and men; and restraining the excessive rise in housing prices.

## UNSUSTAINABLE GROWTH

Over the past three decades, China has continuously maintained an annual economic growth rate of around 10 percent. Urban growth rates are even greater. But this immense momentum cannot continue forever. China's growth rate may eventually top out at a level slightly higher than those of developed countries. At that point, while some problems that have accumulated in the process of rapid expansion may begin to diminish, it may also be too late to address other pressing issues.

The 12th Five-Year Plan proposes to lower the growth rate and make the transformation of the economic development pattern a priority task, with a refocusing on scientific and technological advances and the higher educational level of the labour force, and a particular stress on the quality of growth. This shift coincides with a general global economic slowdown already affecting China.

In 2012, for example, Beijing's economic growth rate was 7.7 percent, the lowest level in 13 years.<sup>2</sup> The decline indicates dampened demand, which leads to shrinking markets. It also means loss or even bankruptcy of many enterprises, and that job growth will ease off. Moderate economic growth could help to propel economic transition, however. Both central and local governments can use this opportunity to adjust economic structures, improve the sustainability of growth, and coordinate the key economic engines of investment, consumption and exports. This process could be geared towards not only stimulating economic growth, but also promoting attention to new sources of investment, providing better public services with equal accessibility for women and men, improving transport and communication networks, and enhancing the more efficient use of

natural resources such as water and energy.

Until now, the quality of China's economic growth has been mixed. Massive expansion has been driven by high investment rates that cannot be maintained. At one time, with insufficient domestic demand, exports were seen as the main drivers of productivity to expand options for China's economy. But as overseas demand has shrunk during the global economic crisis, the problem of excessive manufacturing capacity has become increasingly acute. To ensure that the economy will continue to thrive while helping to improve the quality of life, domestic consumption would need to rise. Based on historical trends, it is unlikely to rise fast enough, however, especially with growing income gaps and an imperfect pension system. Total investments could even decline as a result. Another issue entails regional imbalances in development, which require different strategies in diverse areas. This will make macroeconomic regulation and control of the whole economy more complex.

Despite improvements in its industrial structure, China's dependence on secondary manufacturing industries is excessive, especially compared with more developed economies. In the late 1980s, the proportion of tertiary service industries exceeded that of agriculture, with a higher growth rate than that of secondary industry for a time. The latest data show that in first season of 2013, the proportion of tertiary industry output in GDP is higher than that of secondary industry. But compared with many countries, the tertiary sector's proportion of value added in GDP is still low.

In major cities, secondary industry contributed to 52 percent of GDP in municipal districts, while tertiary industry was only 42 percent in 2010.<sup>3</sup> The world average for the latter is about 60-70 percent. Within secondary industry, China has a preponderance of heavy industry, which relies on intensive energy use and puts great pressures on the environment. From 1999 to 2011, the output of light industry fell from 42 percent to below 30 percent of total secondary industry output, while the proportion of heavy industry increased from 58 percent to above 70 percent.<sup>4</sup>

## RISING HOUSE PRICES

Housing is one of the basic determinants of urban liveability, but for more and more city residents in China, it is increasingly unaffordable (see figure 2.1). Costs in some coastal cities are as high as, or even surpass those of developed countries. Regional differences in housing prices are stark. National efforts to regulate the housing market are not likely to be effective.

An asset bubble is a very real risk. It could affect financial stability and the healthy development of the economy, as well as social stability, since housing for most people is a prime asset. A large number of new settlers, particularly the millions of people migrating from rural areas, who cannot afford to buy property, have to rent dilapidated housing in urban fringe areas. This impedes their ability to integrate into new communities. In the long run, exorbitant prices may reduce a city's competitiveness, and speculation can crowd out more productive economic activities.

Rapid urbanisation has fuelled strong demand for housing. At one point, this was also the case in Japan, but by the time the urbanisation rate reached 80 percent, demand began to decline and the real

estate market bubble burst. With China still in an accelerating phase of urbanisation, demand is difficult to manage.

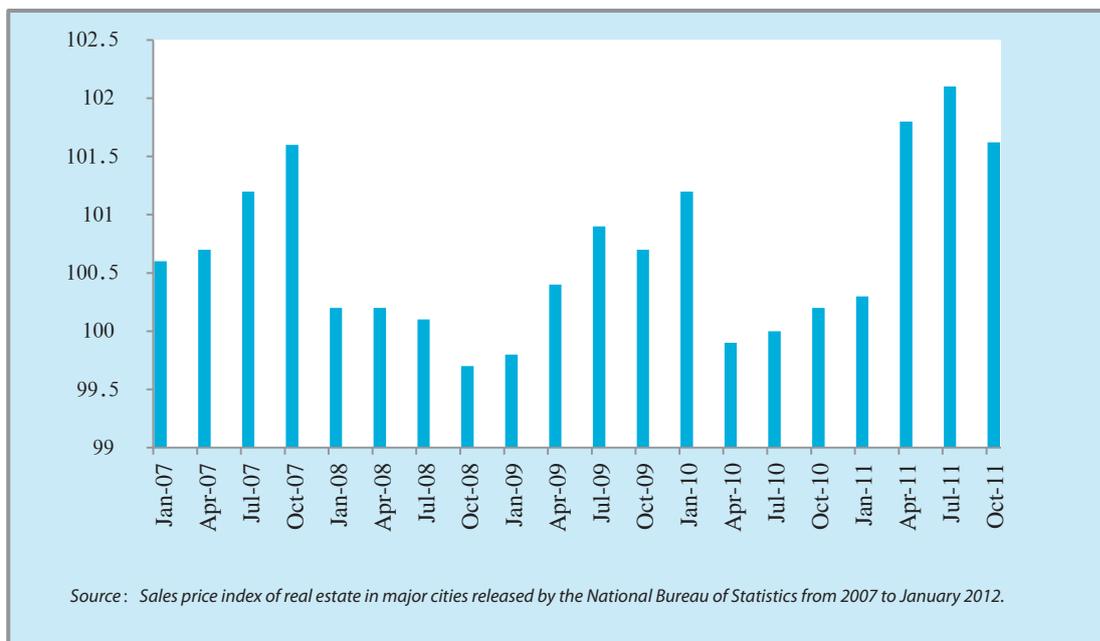
Another reason for high housing prices is the global surge of 'hot money' spurred by expectations that the RMB will appreciate continuously. Local governments' high dependence on land transference fees<sup>5</sup> for revenues is also a factor. A concurrent phenomenon is the oversupply of housing in towns that have not been able to attract residents, either because of their location or prices.

Part of the solution to controlling prices could come through effective policies to help local governments move beyond 'land finance' and explore new sources of revenue.

## WIDENING INCOME GAPS

Growing income disparities in China undercut a sense of fairness and hinder inclusive human development. At present, the per capita income of urban residents is triple that of rural people. The income gap between urban dwellers as a whole and low-income groups, including migrant workers, is also widening.

**Figure 2.1** Housing sales price indexes in major cities on a seasonal basis



Recently, the National Bureau of Statistics compared the incomes of urban and rural households, calculating the national Gini coefficient, which was 0.474 in 2012.<sup>6</sup> It has not published the Gini for urban residents, however, because of difficulties in obtaining real income data from high-income urban residents. Many researchers suggest nonetheless that Gini coefficients in urban areas are higher than in rural ones, and exceed the national average. According to the Ministry of Civil Affairs, over 20 million urban residents are poor enough to receive the minimum living subsidy<sup>7</sup> (see table 2.1).

Before the 1990s, poverty was viewed mainly as a rural problem—this was the focus of government policies. In cities, limited attention mainly went towards the ‘three-withouts’, including people without labour capacity, without a stable income or without legal supporters. Today, the poverty of migrants has increasingly become the focus of concern. Big differences in access to employment, education, medical care and social security divide people who are registered as residents in a given municipality and those who are not.<sup>8</sup> The Government has recognized issues strongly connected with income inequality, including through the “Document on Deepening Reform for Income Distribution” jointly released by the Ministry of Human Resources and Social Security, the National Development and Reform Commission, and the Ministry of Finance. The document has been approved by the State Council, and more detailed policies at the local level can be expected.

## INADEQUATE CONSUMPTION

Balanced economic growth in China will require

growing domestic consumption, yet consumption rates have been declining continuously. The individual consumption rate fell from 46 percent in 2000 to 34 percent in 2010. The rate of general consumption, which includes individual consumption and government consumption—the latter accounting for less than 20 percent of total output—decreased from 62 percent in 2000 to 47 percent in 2010. The government consumption rate dropped by 2 percentage points during the same period.<sup>9</sup>

According to the National Bureau of Statistics, the savings rate in China was up to 52 percent in 2011.<sup>10</sup> Individual credit consumption is 15 percent of total income, compared to a rate of 60-70 percent in many other countries.

Moving away from overdependence on exports towards an economic model more grounded in domestic consumption, while maintaining an economic growth rate adequate for the modernization of the economy and society, will depend on generating more domestic consumption relatively rapidly. Stimulating consumption needs to be integrated into urbanisation, given its core role in fuelling growth (see box 2.1).

## SKewed SOURCES OF PUBLIC REVENUE

According to the Ministry of Finance, from 1999 to 2011, gross income from state land transference fees was about RMB 12.75 trillion, equivalent to around a trillion RMB per year. In local financial revenues, the proportion of income from this source increased from 9 percent in 1999 to 44 percent in 2009.<sup>11</sup> Many cities see more than half their financial revenues

**Table 2.1: People receiving the minimum living subsidy**

Year	Population (10,000)	Annual growth (%)	Year	Population (10,000)	Annual growth (%)
2003	2,246.8	8.8	2008	2,334.8	2.8
2004	2,205	-1.9	2009	2,345.6	0.5
2005	2,234.2	1.3	2010	2,310.5	-1.5
2006	2,240.1	0.3	2011	2,276.8	-1.8
2007	2,272.1	1.4			

Source: Ministry of Civil Affairs, “Statistical bulletin of social service development (2004-2012).”

coming from these fees.<sup>12</sup> There are few other options for revenue collection, since local governments are not allowed to issue bonds, and banks perform strict audits on loans. As a result, unsustainable land finance puts great pressure on cities.

In general, local fiscal revenues are tight, even as the central Government's emphasis on stable economic growth has required local governments to invest heavily in social services and other related projects. For the first half of 2012, nearly 40 percent of local governments did not accomplish half their revenue targets. One of the main reasons is that their land

transference fees are declining. Local governments also bear RMB 10.7 trillion of debt; 38 percent of debts are scheduled to be paid based on land transference fees.<sup>13</sup>

## Social Challenges

A number of social problems have emerged during the development of Chinese cities, including the integration of migrants, gaps in social security and social services, and public safety concerns. Many concerns stem from increasing population pressures.

### Box 2.1: The rise of the middle class

Between 2000 and 2010, Chinese total economic output tripled, giving China the second largest economy in the world after the United States. But growth was mainly generated by investment. Since the private savings rate is high, the level of consumption has been relatively low. Three reasons explain this propensity: low income levels, an imperfect social security system and an economic structure that heavily depends on investment.

Since 2010, many studies have pointed out that sustained economic growth builds on nurturing the consumer enthusiasm of the middle class. This requires attention to the urbanisation process, because cities can provide vast markets for people to conveniently buy all kinds of goods. Different enterprises could also provide more specific services for middle-class consumers. It is estimated that about 51 percent of city residents will be middle class by 2020.

As more and more people become new members of the middle class, their ways of life are changing, which can stimulate consumption. The gradual growth of college enrolment rates means that young people will marry at an older age. They prefer spending on entertainment and travel, or other projects. Chinese women's independence and career development prospects have greatly improved relative to the past, which will help narrow the income gap between men and women, and increase demand for goods and services targeting women.

Researchers have pointed out that current urban consumption patterns indicate 'consumer upgrades'. With disposable income levels increasing, consumers are able to afford high-quality goods, such as branded garments. Over time, consumers will be more concerned about demonstrating their status and personal taste through their consumption behaviour.

Source: Yuval, Atsmon, Max Magni, Lihua Li and Wenkan Liao, 2012, "Meet the 2020 Chinese Consumer," McKinsey Consumer & Shopper Insights (available at <http://www.mckinseychina.com/wp-content/uploads/2012/03/mckinsey-meet-the-2020-consumer.pdf>, last accessed 30 April 2013).

### Box 2.2: Population growth in Beijing and Shanghai

The Sixth National Population Census showed that Beijing had nearly 20 million residents in 2010, with an increase of 6 million over the last decade. Its annual growth rate of 3.8 percent surpasses the national average. Among Beijing's total residents, over 7 million are from other provinces and cities, with an increase of 4.5 million since 2000, for an annual growth rate of 10.6 percent.

The Census found that the permanent resident population of Shanghai in 2010 was 23 million. Among them, nearly 9 million people are from other provinces and cities, 39 percent of the total.

Source: The Sixth National Census.

## PRESSURE FROM POPULATION

China has one of the fastest urban population growth rates in the world. In 1949, only 10.6 percent of Chinese lived in cities, a portion that rose to 17.9 percent by 1978. During the process of reform and opening up, and the promotion of the market economy, the urban population took off. Between 1982 and 1990, growth increased at a rate of 4.35 percent per year, higher than the 3.99 percent rate between 1949 and 1981. In 2000, China's urban population reached 35.7 percent of the total. By 2012, 711.820 million people lived in cities, accounting for 52.57 percent of the total population<sup>14</sup> (see box 2.2).

This rapid increase will inevitably lead to large-scale urban construction. If population growth outstrips upgrades in urban life, there could be significant pressures on transportation, housing, public services, social security and the environment.

## PRESSURE FOR EMPLOYMENT

Imbalances in the employment structure, such as a mismatch between demand and skills, can complicate urban development, especially during rapid growth spurts. As China changes its industrial structure, reforms or closes state-owned enterprises, and

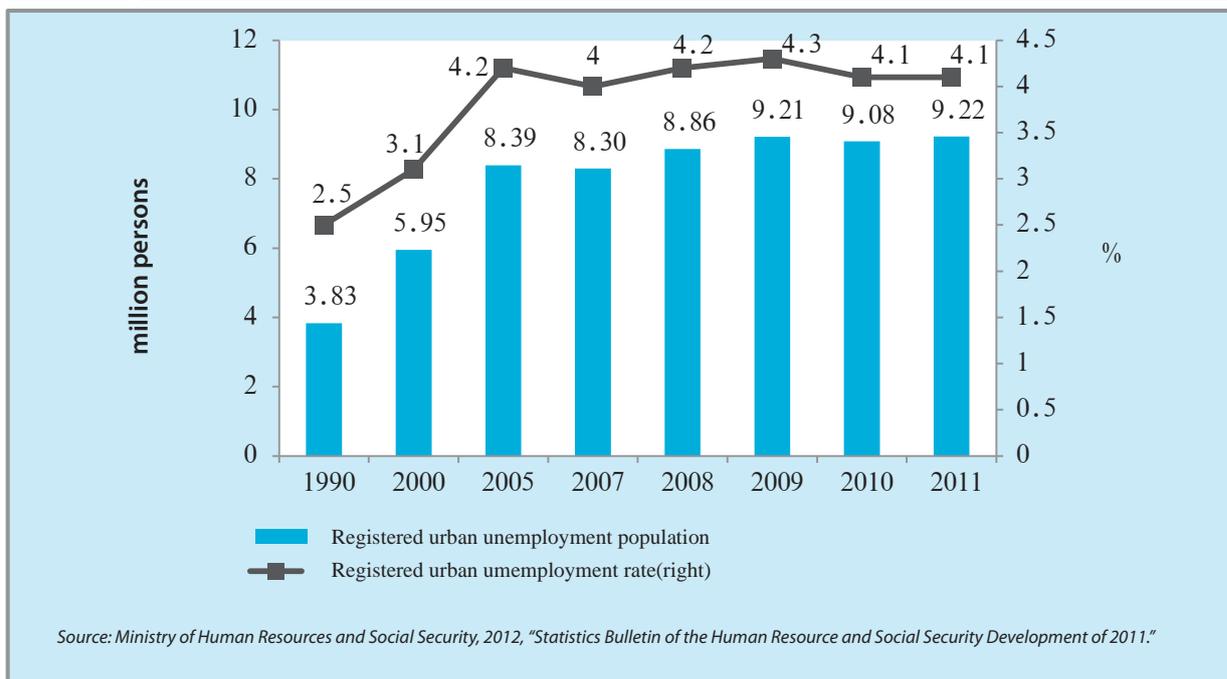
adopts new technology, further challenges could come from growth no longer providing enough jobs. Unemployment and inadequate employment are among the major factors contributing to urban poverty.

During the 12th Five-Year period, an annual increase in urban jobs of about 25 million is needed, but just over 9 million jobs can be created on average each year.<sup>15</sup> Although the number hit a record of 12 million in 2011, and China's Government Work Report of 2012 proposed creating more than 9 million posts that year, demand will likely continue to outstrip supply in the following years.

According to the Ministry of Human Resources and Social Security, the registered urban unemployment rate nationwide is about 4.1 percent (see figure 2.2). But the calculation of unemployment has been criticized for some inaccuracies. Many people do not register their joblessness, and the actual rate would be much higher if unemployed migrant workers and undergraduates were taken into consideration.

For rural populations, jobs in cities have become an important income source. About 35 percent of the cash income of farmers nationwide is from migrant

**Figure 2.2** Registered urban unemployment population and rate



jobs. In some provinces, the income from migrants exceeds local fiscal revenues.

Since 1999, when universities and colleges expanded enrolment, the unemployment of undergraduates has become more and more serious. According to the Ministry of Education, there were 840,000 undergraduates in 1999. Recent data released by the Ministry of Human Resources and Social Security found the number of fresh graduates reached a new high of 6.99 million in 2013. Based on previous employment rates, even if 80 percent of undergraduates gain some form of first employment, the number without jobs will still be large. As is true around the world, female undergraduates face extra difficulties in the competition for jobs.

### RESTRICTIONS ENCOUNTERED BY MIGRANTS

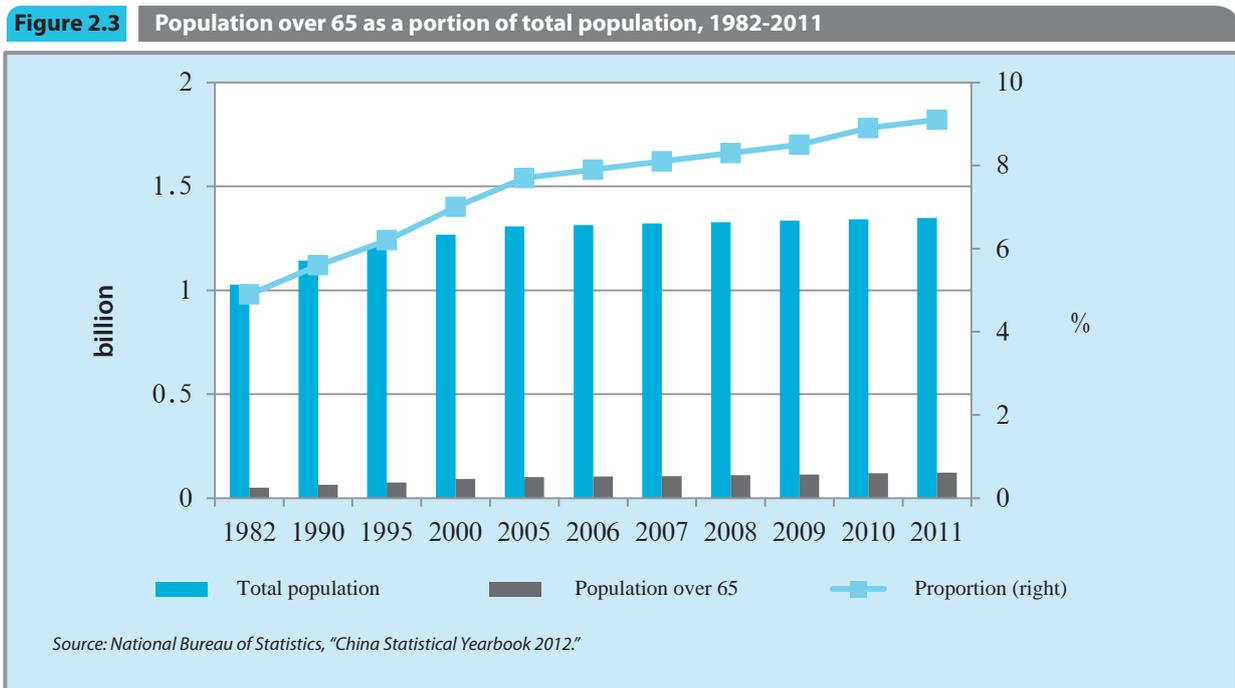
Populations of migrant workers in different cities range from several thousands to millions. Economic and educational opportunities are two major reasons attracting them to urban areas. Over time, some become registered city residents, but most remain registered as rural residents. This leaves them in a 'half-urban' state. They do not enjoy the same benefits as people with urban household registration, and have little protection in case of lost employment

or incapacity.

In a certain sense, a considerable portion of China's development achievements comes from the sacrifices of migrant workers. With low incomes, many live in poverty and suffer from occupational diseases due to bad working conditions. Families are separated; children do not have adequate educations.

The household registration system is an important barrier for integrating migrants in cities, and in recent years, some small and medium-sized cities have come up with policies to abandon registration restrictions. But since the system is linked with certain services and benefits, and the carrying capacities of cities are limited, many restrictions to obtaining local household registration persist in large and medium-sized cities, such as the "point system" of household registration in Guangdong Province.

The national and some city governments have taken measures to safeguard the rights of migrants, and to promote equitable access to services and resources, including by extending education opportunities and increasing the minimum wage. Since migrant families are often concerned about their children not being able to take college entrance examinations with domicile registration restrictions, for example,



### Box 2.3: Future opportunities and challenges from ageing

China is already an ageing society,<sup>20</sup> and will become more so in the foreseeable future. According to China National Working Commission on Ageing, the number of ageing people will peak around 2050 at about 480 million, about one in three people.<sup>21</sup> The labour force will peak around 2015.<sup>22</sup> In 2010, UNDP projected that the proportion of Chinese people aged 60 and above will grow up to 30.7 percent in 2050.<sup>23</sup>

An ageing urban population will face a more limited labour supply and decreased productivity. There will be a large medical and endowment burden, and new requirements for pension systems and medical insurance, as well as leisure-time activities, cultural education, and living conditions and regulations. The upgrade of medical services will incur large financial burdens and other challenges, but also create new employment opportunities.<sup>24</sup>

Shandong and Fujian provinces have introduced programmes for examinations without restrictions. The Ministry of Education announced in 2012 that four ministries<sup>16</sup> will jointly formulate and issue the “Document of College Entrance Examination without Domicile Registration Restrictions,” a move that had been approved by the State Council. This may offer some relief for migrant populations, although added competition for schooling and jobs could stir tension with local residents.

#### AN AGEING SOCIETY

China’s social security system faces a number of challenges, including a rapidly ageing population. According to UN standards, in an aged society, more than 7 percent of people are over age 65. By the end of 2011, China’s over-65 population had reached 122.88 million, equivalent to 9.1 percent of the total, increasing by 2 percent over 2000 (see figure 2.3). China is now ageing at the second fastest rate in the world, after Japan. Being aged before being rich will complicate the course of social and economic development (see box 2.3).

Twenty-six Chinese provinces and cities have entered into aged society status. In rural areas, 15.4 percent of the population is over 65, a higher portion than in most cities. The United Nations Population Fund (UNFPA) projects that by 2050, the over-65 population of China will be 332 million people or 23 percent of the total population.<sup>17</sup> Taking Shanghai as an example, from 2010 to 2011, the number of people over age 65 increased by 87,300, with the total up to about 2.4 million, a rise of nearly 4 percent. Their portion of the total population edged up from 16 percent to 16.6

percent, higher than the national average.<sup>18</sup>

With accelerating ageing, the number of retired employees keeps soaring, as do expenditures on pensions, medical care and welfare. More products and services are needed for older people; public facilities in cities are far from adequate. The pension management and social security systems could be further developed. In the past five years, the pension deficit has increased by an annual compound rate of 25 percent. By the end of 2011, the accounts of private pensions indicated a balance of RMB 2.5 trillion, but the actual amount was only RMB 270.3 billion. The gap increased from 1.7 trillion in 2010 to RMB 2.2 trillion in 2011.<sup>19</sup>

Pension funds are guaranteed by state sovereign credit. As long as the state does not go bankrupt, the insured do not have to worry about being unable to cash in their pensions. But the possibility of bankruptcy does exist if the current pension system is not reformed. In Shanghai, a severe deficit in social security is supported mainly by increasing fiscal expenditures, a situation that will likely worsen over time.

#### A PARTIAL ACHIEVEMENT IN SOCIAL SECURITY

In 2011, the National Social Insurance Law came into effect, aimed at establishing a social security system for both urban and rural residents, and protecting the legal rights of all citizens to participate in social security and enjoy corresponding benefits.

Current breakthroughs include a rapid expansion in coverage, substantial increases in compensation, a

boost in the social security fund and the preliminary establishment of a public service system for social security. According to the “Statistical Communiqué of the People’s Republic of China on the National Economic and Social Development in 2012,” released by the National Bureau of Statistics, by the end of 2012, 304 million people had joined the basic urban pension insurance system for employees nationwide, a 19.9 million-person increase over 2011. The number included 230 million workers and 74 million retirees. The number of people in the basic urban medical insurance system was 536 million, up 62.5 million over previous year. Among them, 265 million joined the basic medical insurance system for urban employees; 271 million participated in the basic medical insurance system for urban residents. There were about 50 million rural migrant workers in the urban basic medical insurance system by the end of 2012, increasing by 3.6 million people over 2011. Around 15.2 million people joined the unemployment insurance system, and about 2 million received unemployment insurance compensation.

Among the existing ‘three pillars’ of social security in China,<sup>25</sup> however, only government-provided social security is substantial. Employer annuities and private pensions are less well developed, undercutting the overall scope and sustainability of social security. It will be difficult to manage an ageing society and meet increasing endowment demands within the present system. This has a direct economic impact, since without a reasonable plan to reduce risks, people will continue to fear for their future, and save rather than spend on consumption.

## A LACK OF INNOVATION IN CITY MANAGEMENT

As cities grow, appropriate management becomes increasingly important (see box 2.4 for one experience). Traditionally, city management in China relied on internal administration, with little participation from the public, although some policies have begun to emerge to encourage citizen involvement. In 2012, for example, municipal governments agreed that comprehensive management of services and public affairs needs both government guidance and

public participation, including in areas such as public facilities, the city environment and transportation. But on the whole, China’s urban management remains led mainly by public administrators, with little involvement of market-based instruments and non-governmental groups.

There are a couple of key challenges to coordination in urban administration. One involves limited horizontal coordination among government departments. Many current development issues are large and complex, requiring close collaboration across different arms of government. Ministries and departments are largely organized along sectoral lines, however, making it difficult for them to work together on coherent strategies. Recent supra-ministry reforms have tackled some of these challenges, but structural reforms alone may not be enough, a problem familiar to governments around the world. A natural tendency is to push coordination challenges upward. While coordination will always remain a principle preoccupation of top government organs, it is also necessary at all levels. Some governments are introducing new and flexible methods of work to facilitate inter-departmental cooperation, and new performance results frameworks and incentives to reward civil servants who reach out beyond their departments. As China embarks on its seventh round of government reform, it will be important to look for additional ways of cutting across the silo tendencies of ministries and departments to ensure complex challenges are addressed holistically, at different levels of the system.

Another challenge is vertical coordination across different levels of government. Governmental structures need further adjustments to reduce both overlapping and neglected functions. There could be significant gains in government performance effectiveness and efficiency through further rationalization of powers and responsibilities across the current five levels of administration, as well as horizontally across ministries and departments. For instance, many of the problems associated with the excessive local government focus on GDP growth at the expense of other imperatives, including the environment and people’s basic social needs, derive at least

**Table 2.2: A growing number of NGOs**

Year	Mass organizations <sup>26</sup> (10,000)	Private non-enterprise organizations <sup>27</sup> (10,000)	Foundations
2001	12.9	8.2	
2002	13.3	11.1	
2003	14.2	12.4	954
2004	15.3	13.5	892
2005	17.1	14.8	975
2006	19.2	16.1	1144
2007	21.2	17.4	1340
2008	23.0	18.2	1597
2009	23.5	18.8	1780
2010	24.3	19.5	2168
2011	25.3	20.2	2510

Source: Statistical data on the development of social organizations released by the Ministry of Civil Affairs.

### Box 2.4: Progressive governance in Seoul

Seoul has repeatedly been acknowledged for its progressive governance system, taking first place in the 2010 UN Public Service Awards for its Women-Friendly City Project and second place in 2011 for its Open Tax Court for Citizens programme.

Seoul's system of governance promotes cooperation among neighbouring local governments, and seeks to build a social structure based on sound market principles and democratic values... Mayors and district heads are elected by popular vote every four years, and in 2009, women made up 13.5 percent of upper-level and 18.6 percent of lower-level government positions.

See appendix for more information.

### Box 2.5: Beijing's five million cars

It took Beijing 48 years to acquire a million motor vehicles—from 1949 to 1997. The second million required only six-and-a-half years. Jumping from 2 million to 3 million took place in just under three years and nine months, and from 3 million to 4 million only 2 years and 7 months. By January 2012, the number had crossed 5 million.

Aware of the gravity of traffic jams, the municipal government is now taking measures to construct a network of expressways, rail transit systems and static traffic that should ease the flow.

Source: Beijing Daily, 17 February 2012, "With the Number of Motor Vehicles Exceeding 5 Million, Beijing is Short 3 Million Parking Spaces."

partially from a skewed incentive system embedded in the gaps and overlaps of current administrative structures. Only when these shortfalls are addressed, and optimal divisions of power and responsibilities established, will local government effectively implement central policies and directives. This will also require a separation between policy formulation and implementation functions within and across de-

partments. A new legal framework will be required to codify these different roles and responsibilities as well as the interactions between them.

Non-governmental organization (NGO) can contribute to urban management in a number of ways, serving as a channel for participation, and playing important roles in aiding vulnerable people, increas-

### Box 2.6: Mexico City's strict controls and alternative transport

Mexico City has nearly 20 million residents. Since tremendous amounts of traffic have contributed to widespread air pollution, it has enacted strict controls on vehicle maintenance, mandated the use of catalytic converters and banned leaded fuel.

The city also provides alternatives to car ownership with an extensive metro system, advanced Bus Rapid Transport system, bicycle rental stations and conservation promotions. Its excellent transport system has been officially recognized by the Institute for Transportation and Development Policy, winning the 2013 Sustainable Transport Award.

*See appendix for more information.*

ing social tolerance and safeguarding social stability. They help reduce the misuse of market mechanisms and government interventions. Legislation to encourage NGO participation lags behind, however, even as the number of these groups is increasing rapidly (see Table 2.2).

Some challenges to effective participation come from NGOs themselves. Many are new and faced with various institutional restrictions, such as inadequate capabilities and severe funding shortages. Excessive governmental intervention has fostered bureaucratic tendencies among them, while inadequate public awareness and interest in public welfare has limited volunteerism.

#### A ROAD OR A PARKING LOT?

Many of China's cities face serious traffic jams (see box 2.5). During rush hour, roads become almost like parking lots. By the end of 2012, 240 million motor vehicles were in circulation, including 120 million cars. There were 260 million people with driving licenses.<sup>28</sup>

Poor urban planning and city administration account for some traffic congestion. While roads have been expanded, traffic management is inadequate. Many road networks are improper and underdeveloped, and disconnected with public transportation. Sidewalks and infrastructure for non-motorized transport are also often absent. These problems increasingly plague small and medium-sized cities, many of which are beginning to accelerate their development. See box 2.6 for one experience with better management.

#### HOMOGENIZING THE URBAN LANDSCAPE

An important marker of a city's future development is how its cultural heritage is protected. Like any rapidly changing society, China is absorbing many new and modern elements. While this is natural, unfortunately, it is resulting in many Chinese cities becoming homogenized. Despite China's long history and rich cultural heritage, the unique characteristics of its cities continue to be lost. This is due in part to the wanton destruction of cultural relics, including swathes of traditional houses. While modern construction and the protection of unique city features could be jointly managed and balanced, they are often seen as opposing each other in ongoing urban construction. There is little recognition that a city's 'spirit', which reflects its special characteristics, is irreplaceable. Better coordination and introduction of integrated approaches to planning, management and development could contribute to the protection of city relics, cultural spaces, etc.

Some impetus to destroy cultural landmarks has come from the reliance of many local governments on land transference fees for revenues. The purpose of the commercial development that provides the fees is to maximize profits, not to carefully protect cultural legacies. Additionally, some government leaders favour vanity projects over preservation. See box 2.7 on an alternative prize-winning approach to urban architecture.

#### THREATS TO HEALTH

Urban residents suffer from a variety of health

## Box 2.7: A Chinese architect wins the Pritzker Prize

In 2012, Chinese architect Wang Shu won the Pritzker Prize, considered the ‘Nobel Prize’ of architecture. He has been widely recognized for his artistry in expressing traditional Chinese culture in modern designs, and for harmonizing structures with their physical and cultural environment.<sup>29</sup>

He also focuses on utility, saying, “When I say that I build a ‘house’ instead of a ‘building,’ I am thinking of something that is closer to life, everyday life.”<sup>30</sup> This approach moves away from generic templates of grandeur and progress to instead emphasize human and cultural elements.

Lord Palumbo, chair of the Pritzker Prize committee, noted about Wang Shu: “The question of the proper relation of present to past is particularly timely, for the recent process of urbanisation in China invites debate as to whether architecture should be anchored in tradition or should look only toward the future. As with any great architecture, Wang Shu’s work is able to transcend that debate, producing an architecture that is timeless, deeply rooted in its context and yet universal.”<sup>31</sup>

Ningbo Museum is one example of Wang Shu’s work. With a distinctive angular style, it was designed around the principles of environmental protection and energy efficiency. The building incorporates large amounts of recycled building material and includes intriguing elements such as fur and bamboo.



In Ningbo’s Yinzhou Park, Wang Shu designed five buildings—an art gallery, a café, a park management building and two tea rooms—that mix traditional elements and modern materials, venturing far beyond typical garden structures. Located in a green space, they suggest a strong connection to the surrounding city. Each was built in a unique style, with different materials and construction technology, and shows varied views of the park.

threats, including from pollution and unhealthy lifestyles. Chronic diseases such as diabetes and high blood pressure have risen with changes in diet and exercise. Unbalanced diets have not been given enough attention, as indicated by the many comprehensive as well as maternal and child health hospitals that do not have staff with the skills to help people apply nutritional guidelines.

Reform in the basic medical security system is an important means to address difficulties in accessing services. Ongoing health care reform has focused on

these issues. By the end of 2011, three basic medical insurance systems—the rural cooperative medical service, basic medical insurance for urban residents and basic medical insurance for urban employees—were in place. These three systems cover more than 95 percent of Chinese citizens.<sup>32</sup>

Despite reforms, however, some people are still excluded. Even those who do have insurance find that compensation levels do not match rapidly increasing costs. Among the ‘three reforms’<sup>33</sup> of medical treatment and the public health system, the medical se-

curity system poses the most difficulties. This is due to the discordance of the ‘three reforms’, especially lags in medical treatment and the public health system, and a partially reformed medical security system. Further carrying out reforms of the last towards gradually establishing a sound basic system is essential.

## THREATS TO PUBLIC SAFETY

For cities to be liveable, people need to see them as stable places where they can pursue livelihood and other opportunities, and know their rights are protected. A number of Chinese cities are falling short of this aim, as the growth of social conflict and group protests has begun to underline the toll of poverty, disparities and poor city management. Many disputes seem to focus on economic concerns, such as housing demolition, alleged corruption in the downsizing of state-owned enterprises, miscarriage of justice, salary delays, social security gaps, overly long work hours, and so on.

## UNSAFE FOOD

In 2011, authorities investigated and punished 143,000 violations of food safety laws and regulations, and shut down over 15,000 enterprises. Currently, there are over 20 laws, nearly 40 administrative regulations and over 150 departmental rules on food safety, covering all links from the farmland to

the dining table. More than 10 administrative departments are responsible for food safety.

Compliance with food safety rules and regulations is hampered by weak penalties for non-compliance, however, and the lack of enforcement capability due to inadequate monitoring; outdated technology and equipment, particularly for product testing; and poor management of food production enterprises. A lack of related knowledge among the general public helps problems to remain overlooked.

China’s food industry lacks systematization and standardization. It is also perceived as missing a strong sense of integrity and ethics. Most businesses are small or medium-sized, with a large quantity of workshops, vendor stands and canteens scattered in different localities. This configuration makes food safety administration and monitoring extremely difficult.

## *Challenges to Natural Resources and the Environment*

Rapid urbanisation causes the depletion of natural resources, threatens the liveability of cities, and impedes sustainable human development in China. Serious problems include limited water, land and energy; poor quality air, water and sanitation with

### Box 2.8: Not enough water in Beijing

Since 1949, Beijing has experienced three large-scale water shortages. Because current population growth has exceeded the capacity of city water sources, Beijing is now in its fourth water crisis, with the most severe conflict between supply and demand.

In 2011, the available water supply was 107 cubic metres per person, only a fifth of the international standard of 500 cubic metres for extreme water shortages. The shortfall threatens to undercut increased living standards and the development of the city.

Even if various measures are implemented—including excessive capturing of underground water, the draw-down of supplies from Beijing’s Miyun Reservoir and expanded recycling—water shortages will continue increasing, from 380 million cubic metres in 2012 to a projected 660 million cubic metres in 2014. To solve the problem, the central Government has invested heavily to transfer water from the Han River to Beijing via the South-North Water Diversion Project (central route), which is being designed to supply up to 1 billion cubic metres of water a year by 2014.

Source: Times Weekly, 5 June 2012, “Beijing is Facing Water Crisis; the Amount of Water per Capita is Only 1/5 of Extremely Dry Line.”

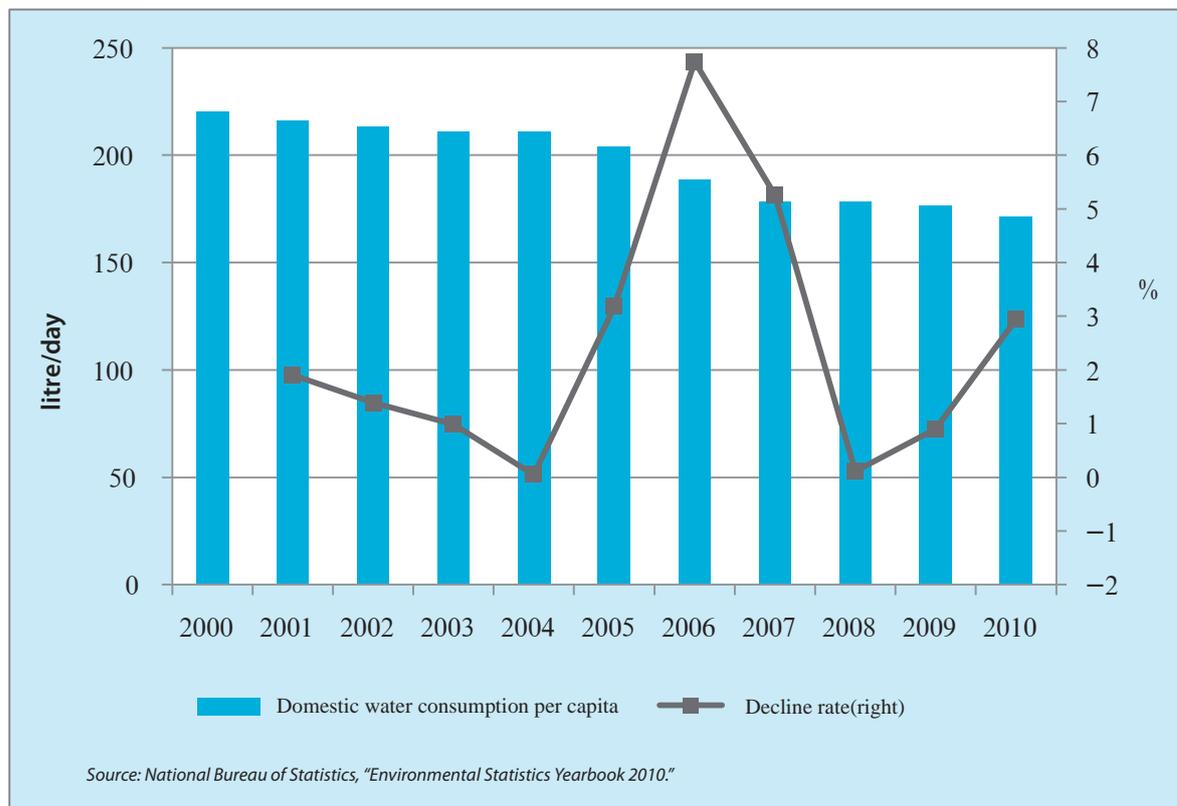
## Box 2.9: A slowing sinking Shanghai

Surface subsidence, where ground levels sink, has become Shanghai's major geologic hazard. Over-pumping of groundwater is one of the main causes. Another is the rapid expansion of underground spaces for high-rise buildings and transportation.

From 1967 to 2011, the ground dropped on average by 0.29 metre. During the 11th Five-Year Plan period, for 162 square kilometres of the city and its surroundings, the sink exceeded 50 millimetres. Several centres of subsidence have formed in downtown and the nearby countryside, with the largest sink reaching 3 metres. Some of the sinking areas are lower than the mean high tide of the Huangpu River, making them prone to flooding.

Source: *Liberation Daily*, 21 November 2012.

**Figure 2.4** Domestic daily water consumption per capita in cities in 2000-2010



threatening health effects; worsening soil erosion; the loss of green spaces and frequent occurrences of extreme climate events. These factors affect large portions of the populations in different ways and degrees, depending on their level of vulnerability, linked to poverty, gender, etc.

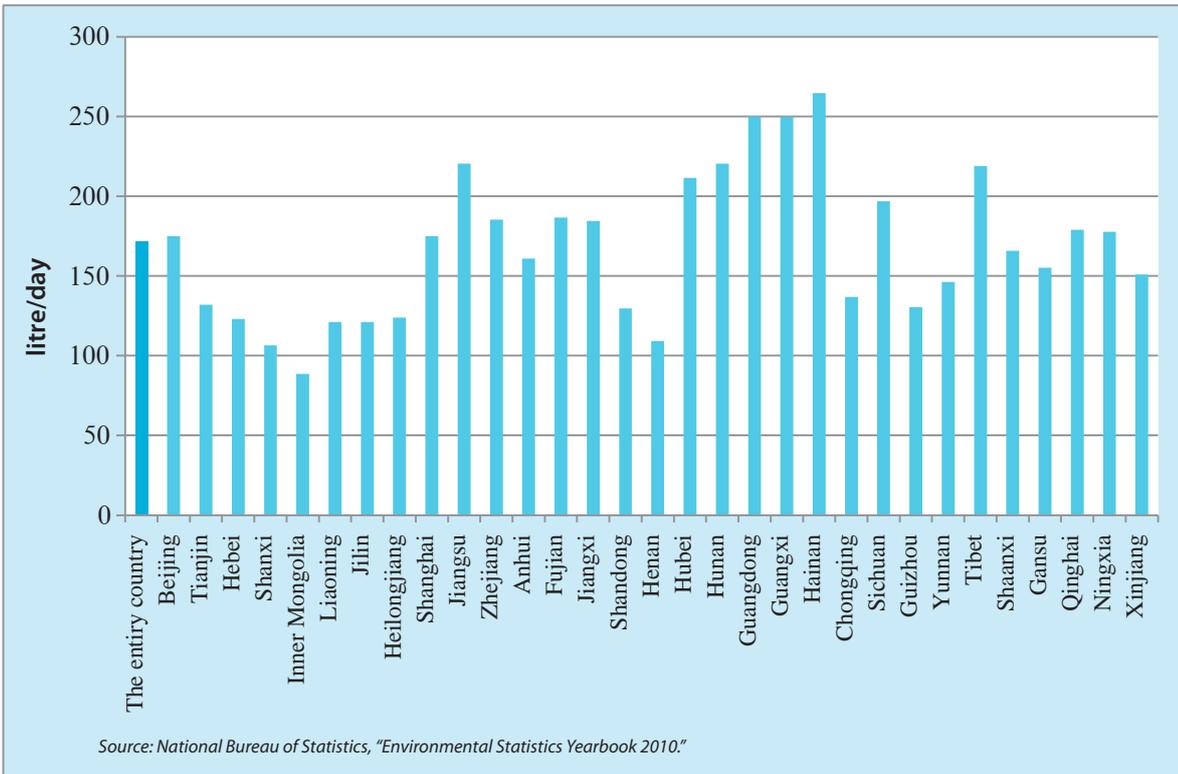
### NEARLY TWO-THIRDS OF CITIES FACE WATER SHORTAGES

China is a country with severe water shortages. Over 400 cities, two-thirds of the total, suffer scant sup-

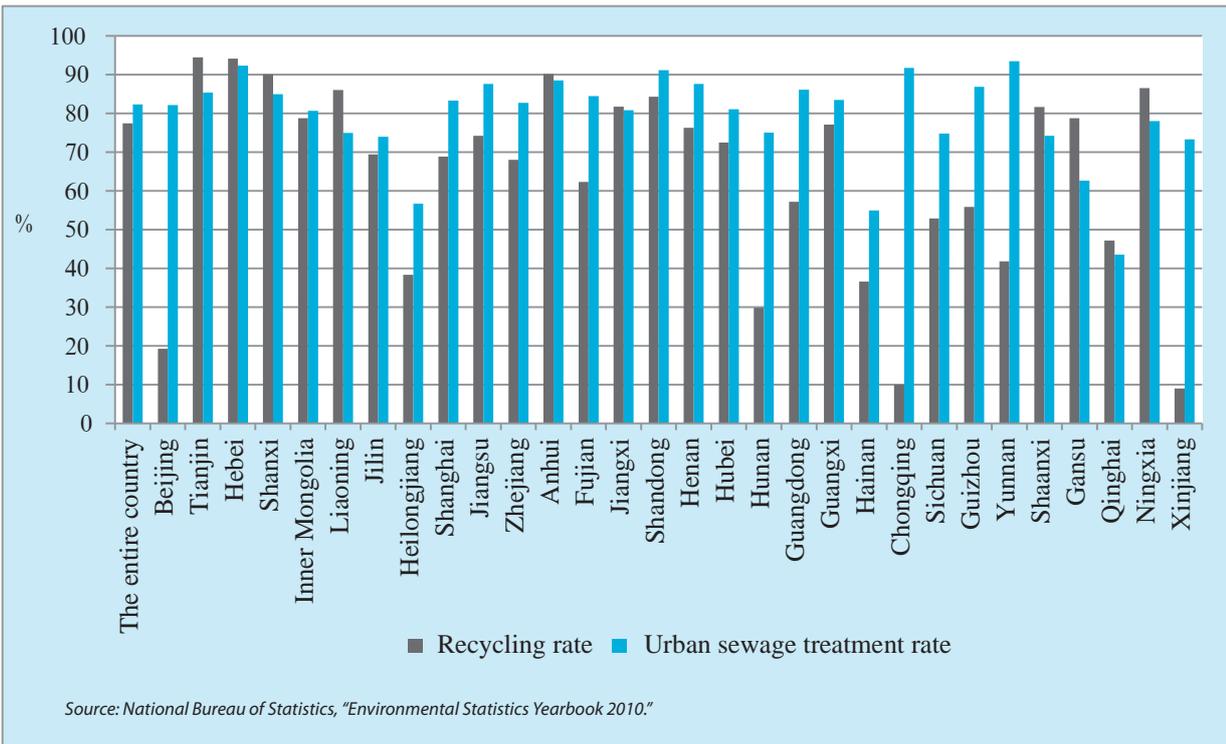
plies (see box 2.8 for an example). More than 100 cities are faced with severe shortages; the total shortfall is about 5.8 billion cubic metres per year.<sup>34</sup> Regional distribution of water resources is uneven, with high consumption by provincial capitals and eastern coastal cities. Cities in the central part of the country consume at a medium level, and those in western areas at a low level.

Overall, urban water consumption per capita has decreased in recent years (see figure 2.4), but the total amount of water consumption varies widely across

**Figure 2.5** Provincial urban domestic daily water consumption per capita in 2010



**Figure 2.6** Sewage treatment and water recycling rates in 2010



**Table 2.3: Water resources of cities in different regions**

	Coastal cities in the east	Cities in the centre	Cities in the west
Water resource consumption	High	Medium	Low
Water consumption per 10,000 RMB GDP	Low	Medium	High
Water resource utilization efficiency <sup>36</sup>	0.8	0.6	0.4

Source: National Bureau of Statistics, "China Statistical Yearbook 2010" and Ministry of Environmental Protection, "Environmental Statistics Yearbook 2010".

### Box 2.10: Better water management reduces resource pressures\*

In crowded megacities, tremendous municipal pipe systems deliver vital water and other services. Intricate networks pass beneath buildings and busy roads, complicating essential maintenance and repairs.

The Pudong area of Shanghai is addressing these issues through new technologies to boost efficiency and reduce leakage. A geographic information system (GIS) maps the entire pipe network, helping managers monitor it and rapidly respond to any emergency situations. Based on GIS data, advanced hydraulic models can simulate various scenarios; through comparisons with real-time data, managers can detect abnormal water losses and illegal siphoning. Future demand can be projected, to assist plans to modify or expand the pipe network accordingly. A flow control centre regularly collects data from more than 300 water metres, performs up-to-the-minute analysis of supplies and tracks water quality.

Qingdao, a beautiful coastal city, embraced greener development as part of preparations to host the 2008 Olympic Regatta. Because sewage plants operate near the coastline and tourist attractions, all output must be absolutely harmless to safeguard public health. Accordingly, sewage treatment plants were outfitted with sophisticated inclined-plate sedimentation tanks, biofilter processes, ultraviolet disinfection systems and biological odour removal devices. Sludge biogas is recycled to reduce energy consumption. The Madao sewage plant, for example, now produces 70 percent of its required energy and has reduced its carbon footprint by 80 percent.

The Tianjin Soda Plant, a subsidiary of Tianjin Bohai Chemical Industry Group, has designed an environmentally friendly sewage recycling system that reduces water consumption by 50 percent. The system also ensures that the plant adheres to strict customer requirements for water quality and environmental protection.

\*Some new technologies mentioned above were developed and adopted by Veolia Water Company and other businesses.

cities (see figure 2.5) for differing reasons. For example, Xining City, the capital of Qinghai Province, although located at the source of three rivers, suffers from extreme water shortages due to its geographical location and water pollution.

Somewhere between 2030 and 2040, China's total population will reach 1.4 billion, and it will become a nation of severely restricted water supplies, with water consumption per capita at less than 1,000 cubic metres.<sup>35</sup> The water supply gap for industries and domestic consumption will be 20 billion cubic metres annually.

Drinking water in many Chinese cities depends heavily on groundwater. Overexploitation of this

resource, however, leads to ground instability and sinking, which can cause cracked pavements and collapsed buildings (see box 2.9). In coastal cities, tidal intrusion threatens to salinize aquifers and other subterranean sources of fresh water, rendering them undrinkable and useless for agriculture.

Compounding shortages is the inefficient use of water resources. Water consumed per RMB 10,000 of GDP is up to 399 cubic metres, five times the global average. Leaking pipes siphon off 20 percent of water supplies in urban water distribution networks. Recycling of industrial water is around 60 percent, compared with 85 percent in developed countries (see table 2.3 on water consumption and efficiency of water use).

Currently, water resource conservation, protection and use are mainly guided by administrative measures, without effective incentives for improvements. There is little public mobilization around these issues, despite the urgent need to move towards green cities by transforming production modes, strengthening water purification and reuse, and improving sewage treatment (figure 2.6 shows national and provincial urban sewage treatment rates). Water resources are the lifeblood of cities, and their depletion and misuse could severely restrict future urban liveability. See box 2.10 for some examples of progressive measures.

## A LIMITED SUPPLY OF LAND

Land for urban expansion is approaching its limit. Nearly all suitable acreage in the coastal south-eastern cities, the Yangtze River Delta and the Pearl River Delta has been developed. Increasing demand for construction only aggravates the mismatch between land demand and supply.

Land use intensity in many cities has far exceeded the international warning level of 30 percent. For example, the rates of Shenzhen and Dongguan have reached 47 percent and over 40 percent, respectively.<sup>37</sup> In the Pearl River Delta, the average annual increase in land used for construction was 3.12 percent from 1997 to 2007. By 2007, the average land development intensity of the delta's nine cities was 16 percent, and that of Shenzhen was 46.5 percent, higher than that of Germany, France, Hong Kong and Japan.

In Guangzhou, the Government has agreed that by 2020, the total area for new construction should be 123 square kilometres, with average annual development of around 12.3 square kilometres. Recently, however, construction has been approved for nearly 28 square kilometres per year. In 2012 alone, the area designated for construction was about 50 square kilometres.<sup>38</sup>

## UNBALANCED ENERGY SUPPLIES

The distribution of energy resources in China is unbalanced. Coal and gas are mostly found in the northern and north-west regions, while a large pro-

portion of proven oil reserves are mainly distributed in eastern coastal areas. The major energy consumers are concentrated on the eastern coast, with large scales and long distances a basic feature of energy delivery.<sup>39</sup>

While demand for energy is high in cities, the market supply is tight. In 2011, the total energy use of China was 3.48 billion tons of coal equivalent, up 7 percent over the previous year, with increased use of coal, crude oil and natural gas. Nuclear power and renewable energy usage rates are low. New and renewable sources of energy contribute to less than 10 percent of total use.

By the end of the 12th Five-Year Plan, the Government aims to increase the portion of non-fossil energy—hydro, nuclear, wind, solar, biomass, etc.—in primary energy use to 11.4 percent. Installed capacity to generate power from non-fossil energy is expected to increase to 30 percent of total generation capacity.<sup>40</sup> But in 2011, the proportion of non-fossil energy in energy use fell to 8 percent from 8.6 percent in 2010. Given the current structure of the economy and the high dependence on coal in the energy mix, the challenges are immense. Nonetheless, the Government is determined to continue promoting a path to a lower carbon economy.

Many cities have suffered constraints due to energy shortages. In Xi'an in 2012, dropping temperatures boosted gas demand to 7 million cubic metres per day, with a shortage of 0.5 million cubic metres. As a result, the gas pressure was low and supplies temporarily ceased in about 10,000 households, causing hardship for residents.<sup>41</sup>

From January to July of 2011, the hydropower of Hubei Province was inadequate, and coal for power generation was in short supply. The total power use of Wuhan city, the provincial capital, was up almost 12 percent from the previous year, with industrial power use having risen by nearly 16 percent. The power supply was ensured through coal procurement and power purchases from other provinces.<sup>42</sup>

Some progress is being made in raising energy effi-

**Figure 2.7** Urban sewage discharge, 2000-2010



ciency. In 2011, Beijing's total energy use was 69.92 million tons of standard coal, an increase of 0.6 percent over the previous year. But energy use per RMB10,000 of GDP was 0.4585 tons of standard coal equivalent, the lowest level nationwide. With this, Beijing achieved the annual goal of reducing energy use per RMB 10,000 of GDP by 3.5 percent. Industrial energy use was remarkably reduced by 18.5 percent for above-scale industries.<sup>43</sup> This achievement, however, was mainly due to closing the Shougang Group's steel-related business by the end of 2010. In general, given the slowdown in global economic growth, increasing energy efficiency has been difficult. Boosting domestic demand heavily depends on energy-intensive production of basic raw materials such as steel, iron and cement.

Energy use per RMB 10,000 of GDP in some western China cities has increased. In northern China, small coal-burning boilers supply 70 percent of industrial heat in some small and medium-sized cities. Energy efficiency is low, and pollution can be severe.

## THE PRESSURE OF WIDESPREAD POLLUTION

For many cities, the price of rapid industrialization and urbanisation has included environmental pol-

lution. Air quality is deteriorating badly, water pollution is extensive, and urban sanitation pressures from garbage disposal are increasing. These issues threaten the lives, safety and property of residents, and are already exerting major negative impacts on the health of several urban centres. They undercut multiple dimensions of human development by reducing living quality, increasing disease, threatening social stability and even causing environment refugees in some areas.

At present, China's total discharge of industrial and urban sewage is 41.6 billion cubic metres annually. Only 23 percent is treated to reach national sewage effluent discharge standards (GB 8978-1996);<sup>44</sup> the rest is mostly discharged directly into rivers. Figure 2.7 shows the increase in urban sewage discharge in recent years.

Compliance with water quality standards remains low at 46 percent, with up to 90 percent of urban water areas and 65 percent of drinking water sources polluted by urban sewage, domestic garbage, industrial waste, fertilizers and pesticides.

The drinking water source of over 400 out of 657 cities nationwide is underground water.<sup>45</sup> A survey of 118 cities showed that 64 percent of their un-

derground water is severely polluted, 33 percent is slightly polluted, and only 3 percent is clean. Underground water in about 75 cities is distributed in areas with severe pollution.

Among events negatively affecting the environment across China, water pollution contributes to 50 percent of the total, the highest portion. In June 2011, for example, after phenol from a vehicle accident leaked into the Xin'an River in Jiande, citizens rushed to supermarkets to buy bottled water. Two months later, milk-coloured sewage was discharged into Baijia Lake in Jiangning, Nanjing, covering half the lake surface. In early 2012, cadmium polluted the Longjiang River in Yizhou City, Hechi, Guangxi Province, and ended up downstream in the Liujiang River, threatening the drinking water sources of scores of urban districts of Liuzhou.

In the first half of 2011, among the seven major river systems, only the Yangtze River and the Pearl River had good water quality. The Hai River, with over 40 percent of water section categorized as Grade V level, was classified as being severely polluted. The rest of the rivers were polluted moderately or slightly.<sup>46</sup> In sections passing through cities, 90 percent of the water was polluted to different degrees.

Since the 1990s, air pollution has become more and more serious (see Box 2.11). A composite of soot and motor vehicle exhaust hangs over some big and medium-sized cities.

In 2010, the urban atmospheric pollution of about a fifth of cities nationwide was heavy. Of 113 key cities listed in the National 10th Five-Year Plan for Environmental Protection,<sup>47</sup> ratified by the State Council on

### Box 2.11: Extremely heavy air pollution in Beijing sets a new historical record

On the morning of 13 January 2013, the Beijing Meteorological Station issued the first orange smog alert in Beijing's meteorological history at 10:35 am, indicating that the smog visibility was less than 2,000 metres. The smog stayed all day, becoming the most serious pollution since Beijing put up 35 PM2.5 monitoring stations to collect real-time data.

At 9 a.m., air quality monitoring showed that except for Ding Ling Tombs, Badaling and Miyun Reservoir, the air quality index in other areas exceeded 500 micrograms, the most serious level of pollution. It continued at that level for three days.

The PM2.5 concentrations from several monitoring stations, such as those in Beijing Xizhimen North, at South Third Ring Road and at the Olympic Sports Centre, exceeded 900 micrograms per cubic metre, with the highest reading at 993 micrograms per cubic metre at the Xizhimen North station. The Beijing municipal government has launched an emergency plan with measures to reduce the impact of smog and haze.

*Source: Science and Technology Daily, 14 January 2013, "Beijing: PM2.5 approaching 1000."*

### Box 2.12: Shanghai's attempts to control air pollution

Encouraged by the Ministry of Environmental Protection, some coastal cities in eastern China began publishing data on fine particulate air pollution in 2012. Shanghai has been a leader in this process. Ten years ago, it set up the first monitoring station for research purposes, and the city started continuous pilot monitoring of multiple data collection points in 2005. Today there are 24 non-stop monitoring points covering the city, with 6 more to be added

Most of the fine particles in Shanghai's air come from car exhaust, industrial furnace emissions, construction site dust and the burning of straw in the city's suburbs. In 2012, at the fifth meeting of the 13th People's Congress of Shanghai, Mayor Han Zheng noted that utilizing a PM2.5 standard, according to ambient air quality standards (GB3095-2012),<sup>58</sup> will result in decreasing the pollution by up to 15 percent.

*Source: China Standardization, 2012, no. 3, "Shanghai: Complex atmospheric pollutions such as PM2.5 is to be prevented and remediated."*

*See appendix for more information.*

26 December 2001, the air quality of about a third did not reach the national Grade II standard.<sup>48</sup> In 2011, among the 325 cities above prefecture level,<sup>49</sup> 89 percent reached the environmental and atmospheric quality standard; 11 percent exceeded it.<sup>50</sup> However, when air pollution standards are updated from coarse particulate matter, or PM10, to include finer PM2.5 particles,<sup>51</sup> fourth-fifths of Chinese cities fall short of the minimum quality standard.

In northern China, where cities are particularly polluted, the concentration of suspended particles in the air exceeds the national Grade I standard<sup>52</sup> by twice, and is over 10 times the international standard. In January 2012, the national average was 4.3 days of smog, the second highest value since 1961. The problem was particularly bad in the Beijing-Tianjin-Hebei region, the Yangtze River Delta and the Pearl River Delta. More than 40 cities there, with a population of about 600 million people, suffered from up to 10 days of smog that covered nearly 2.7 million square kilometres.<sup>53</sup>

PM2.5 pollution is most severe in eastern cities, with the average density being up to six times that of developed countries. Monitoring in pilot cities in 2011 tracked compliance with the Grade II standard on fine particles—it stipulates a maximum of 35 microns per cubic metre. The exercise found an average of 58 microns per cubic metre.<sup>54</sup>

In 2010, the Ministry of Environmental Protection, the National Development and Reform Commission, the Ministry of Science and Technology, the Ministry

of Industry and Information Technology, the Ministry of Finance, the Ministry of Housing and Urban-Rural Development, the Ministry of Transportation, the Commerce Ministry of and the National Energy Administration jointly issued a document stating that by 2015, China will establish an atmospheric pollution joint prevention and control mechanism; formulate a system of laws, regulations, standards and policies on regional atmospheric environment management; significantly reduce total emissions of atmospheric pollutants; ensure that key enterprises<sup>55</sup> discharge pollutants in accordance with related standards; maintain air quality in all cities in key areas at or exceeding the national Grade II level<sup>56</sup>; significantly reduce acid rain, haze and photochemical pollution; and substantially improve regional air quality. The monitoring and testing of PM2.5 is in the pilot stage; there is a long way to go before broader implementation in 2016. See also box 2.12.

Each year, Chinese cities produce about 150 million tons of garbage, with an annual increase of up to 10 percent. The disposal capacity of many cities is insufficient, and the efficiency of garbage disposal facilities is low. At present, 90 percent of municipal solid waste ends up in landfills, 7 percent is incinerated and the rest is treated via composting. There are no domestic garbage treatment facilities in 325 cities, and large quantities of garbage in 1,636 towns pile up year after year.<sup>57</sup> By 2010, the Chinese mainland was producing nearly one billion tons of garbage a year, the greatest national quantity in the world. Among more than 600 large and medium cities, two-thirds face serious problems with the build up of

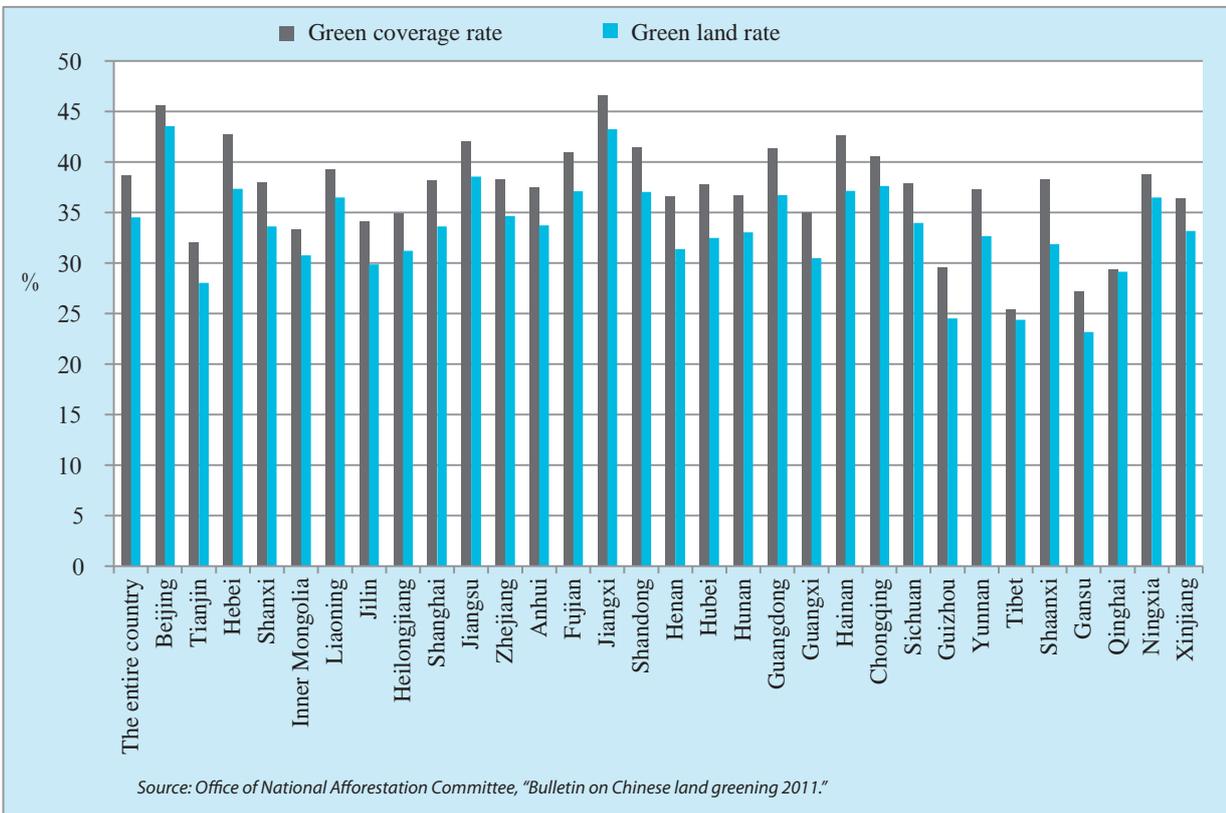
### Box 2.13: Transforming waste into energy in Amsterdam

With only 33,893 square kilometres of land, the Netherlands is a small country. Since it is not possible to allocate any space for landfill, the city of Amsterdam has designed an advanced waste-to-energy power plant to handle its municipal waste.

Standard recycling protocol dictates that all waste streams should be separated and processed, but Amsterdam's system is designed differently: All wastes except paper and glass are combined and incinerated. The facility traps all harmful byproducts, ensuring that only water vapor is released. The plant has a net energy yield of 30 percent, comparable to the 2006 average for coal-fueled power plants, and the resulting energy is used to power the city's trams. The plant also captures thermal energy from the process and uses it to heat around 40,000 homes.

*See appendix for more information.*

**Figure 2.8** The portion of green land in some provinces and cities



**Box 2.14: The cost of fast-paced construction in Xiamen**

A study conducted by the Xiamen Water Resources Bureau found that in 2011, soil erosion affected 111.89 square kilometres of the city, 6.6 percent of the total area. Since 2008, soil erosion had become more severe, and the affected area had grown by 11.9 square kilometres.

Erosion in Xiamen is mainly due to construction and production activities, which have continued at a fast pace in recent years. They have included stone exploitation in neighbouring mountains, road construction, real estate development and the establishment of tea plantations.

Source: Xiamen daily, 26 June 2012, "Last year, the number of loss of water and soil in Xiamen was 111.89 square kilometres, 3.4% lower than that of average level in province."

garbage. One-fourth have difficulties finding places to dump garbage.<sup>59</sup> See box 2.13 on the experience with transforming garbage into energy in Amsterdam.

**INCREASING ECOLOGICAL RISKS**

Intensive construction, mining, stone exploitation and real estate development activities have disturbed ecological systems in China's cities, producing severe soil erosion, and sudden disasters from floods and landslides (see Box 2.14 for an example). Currently, the urban area of China is 167,000 square

kilometres. The average per capita construction area is 133 square metres, above China's planning standard of 120 square metres, and the average in the rest of the world of around 83 square metres.

In 2011, China's urban green land area per capita was only 11.18 square metres, compared to 40-70 square metres for cities around the world considered tourist attractions and/or highly liveable. At present, with the growing shortage of land for construction, expanding and protect green space has become an urgent and arduous task. Figure 2.8 shows the rates of green land for some provinces and cities.

City welfare is closely tied to the surrounding environment. Cities in southern areas fare better than those in northern areas, and the eastern coastal cities better than the cities in the north-west and economically undeveloped areas. Air quality and the availability of vegetation are both greater in the eastern coastal cities than elsewhere. Because of the arid climate, lack of green land and topography, the environmental quality of cities in western areas is far lower than of those in eastern areas.

## UNCERTAINTIES IN ADDRESSING CLIMATE CHANGE

Like countries around the world, China has begun to experience the changing climate through extreme weather events and natural disasters, such as increases in rainfall in some areas and record droughts in others (see Box 2.15). The frequency of strong typhoons has almost doubled in the last decade,<sup>60</sup> and sandstorms are more severe.

### Box 2.15: Heavy rain proves fatal

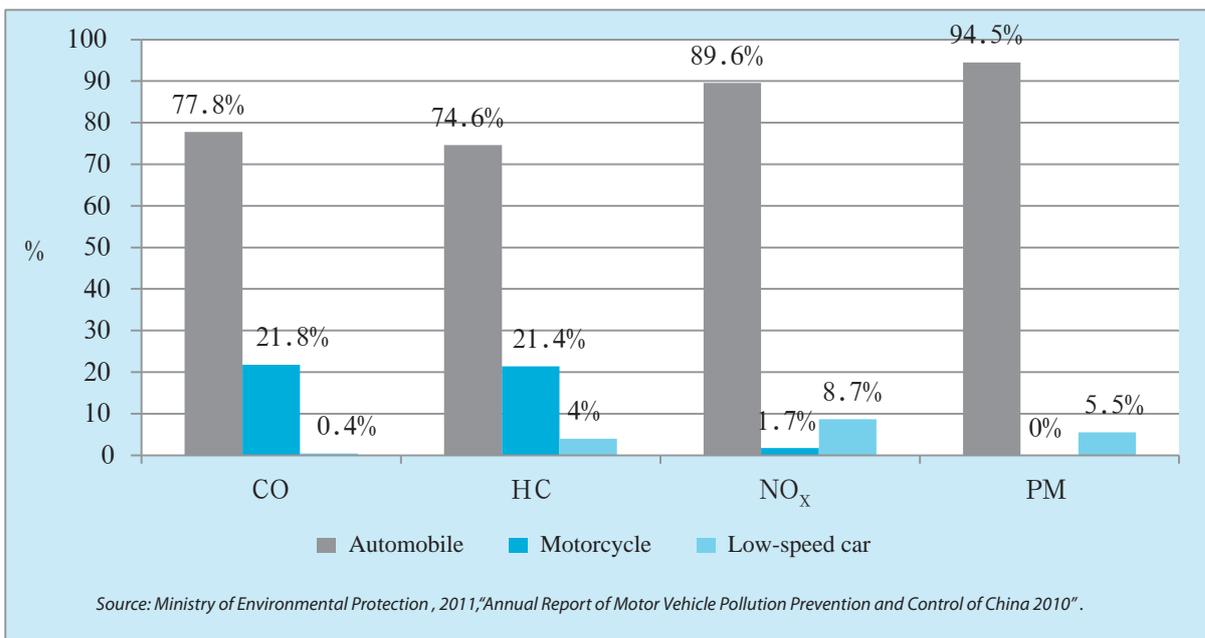
In July 2012, a heavy rain hit Beijing, with up to 460 millimetres falling in Fangshan District, a 500-year record. Soil and water poured down the sides of the mountains around the city, damaging an area of 16,000 square kilometres and affecting nearly 2 million people. There were 79 deaths; economic losses exceeded 10 billion RMB.

Several days later, heavy rain hit Fangshan District again, making post-disaster recovery difficult. In one hour during the storm, 52 millimetres of rain fell. This compounded the already severe damage caused by the previous heavy rain.

After the disaster, the municipality of Beijing studied what had been learned in terms of emergency management and took measures to enhance disaster warning mechanisms and build municipal emergency management capacities by various means. New systems are in place to send text messages as advance warnings, and promote communication among citizens. The urban drainage system has been upgraded. These experiences can be studied by other cities to help mitigate potential losses.

Source: Beijing Government Headquarters of Flood Control and Drought Relief.

**Figure 2.9** Share of emissions by types of motor vehicles



Source: Ministry of Environmental Protection, 2011, "Annual Report of Motor Vehicle Pollution Prevention and Control of China 2010".

Over the last three decades, the coastal sea level has risen by 2.6 millimetres annually.<sup>61</sup> This combined with typhoons has resulted in millions of people in coastal cities suffering from severe storm surges and tidal disasters. By the end of the 21st Century, the sea level is expected to rise by 18 to 59 centimetres, a serious threat.<sup>62</sup>

Other impacts on cities could come from the destruction of biodiversity and the spread of contagious diseases in urban areas with dense populations. Phenomena such as haze and acid rain will increase and become more serious. Climate change and the reduction of wetland areas have caused unusually large numbers of birds to migrate out of the Yangtze River Basin in recent years.

In 2009, China's per capita carbon emissions were 6.9 tons, compared to the 4.9 ton world average, 8.1 tons in the European Union and 19.3 tons in the United States. China was the largest single emitter in the world, at around a quarter of the total.<sup>63</sup> With China in the midst of urbanisation and industrialization, the transportation system and buildings in cities are major sources of emissions, along with a high dependency on coal. Energy conservation and emissions reduction will continue to be a challenge given a large population and limited natural resources, despite current efforts to increase clean and renewable energy sources. At present, China's capacity to address climate change is weak, particularly in some small and medium-sized cities with poor infrastruc-

ture and planning. Adaptation and mitigation will be long and systematic projects requiring scientific and technological inputs, the correct policies and sufficient supporting capabilities.

Some early progress is evident. While China's motor vehicle inventory has increased 25 times in 30 years, the rapid upgrade of emissions standards has kept the emissions increase at only 12 times. Even so, motor vehicle pollution is increasingly serious,<sup>64</sup> as one of the main sources of poor air quality and emissions (Figure 2.9) Although the Government has initiated a new plan to promote the development of new/clean energy automobiles, cities need to complement this move with traffic management and motor vehicle quantity control.

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Working Group II) emphasizes urban issues and climate change, with a focus on economic and social dimensions. A science-based foundation similar to the panel is needed for cities. Early climate change impact studies focused on ecosystems and agriculture. For cities, climate science needs to evolve to incorporate complex models on small scales to examine the combined effects of heat islands, air pollution, engineering, architecture and urban design.<sup>65</sup> New information and uncertainty about climate risks need to be integrated into effective and efficient city-level adaptation planning through a risk assessment framework that considers 'hazards' and 'adaptive capacity'.<sup>66</sup>

1. As affirmed in Hu Jintao's report to the 18th National Congress of the CPC. It indicated that the development gaps between urban and rural areas and among regions are still large, and so are income disparities.
2. Data released by Beijing Statistics Bureau and Beijing Survey Corps of the National Bureau of Statistics.
3. National Bureau of Statistics of China, 2011, "China City Statistical Yearbook 2011," China Statistics Press, Beijing.
4. Institute of Industrial Economics of the Chinese Academy of Social Sciences (CASS), November 2012, "The Report on China's Industrialization," Social Sciences Academic Press, Beijing.
5. Governments charge fees for land transfer transactions. According to China's Constitution, there is no private ownership of land. It is owned either by the state or collectives such as rural villages. There are various uses for state-owned land, but only construction land is designated for urban development. After the opening up and reform process began, a land market began functioning, where land can be leased for industrial, commercial and residential uses, for a period between 30 to 70 years. The transference fee is the amount paid by the developer for leasing the land.
6. National Bureau of Statistics, Speech presented by Administrator Ma Jiantang on 18 January, 2013 at press conference, (available at <http://finance.ifeng.com/news/special/data201212/20130118/7574529.shtml>, last accessed May 2013).
7. The minimum living subsidy scheme, also known as Di Bao, was introduced in 1992 to help support unemployed urban poor people, though this assistance was only for registered residents. In the mid-2000s, it was extended to include nearly 42 million rural residents, bringing the total of supported citizens to nearly 150 million (Miguel Niño-Zarazúa and Tony Addison, 2012, "Redefining poverty in China and India," United Nations University, available at <http://unu.edu/publications/articles/redefining-poverty-in-china-and-india.html>, last accessed April 2013).
8. China Development Research Foundation, 2012, "The Turning Period of China's Income Distribution," China Development Press, Beijing.
9. National Bureau of Statistics of China, "China Statistical Yearbook," 2000-2010, China Statistics Press, Beijing.
10. According to "China Statistical Yearbook 2012," the GDP of China was 47 trillion RMB in 2011, which includes final consumption at 22.5 trillion, capital formation at 22.9 trillion and net exports at 1.2 trillion. Thus, China's savings rate is up to 52 percent.
11. Ministry of Finance, 3 April 2010, "The main status of national land transfer fee" (available at <http://finance.jrj.com.cn/house/2010/04/2116347333705.shtml>, last accessed May 2013).
12. A research report of GuotaiJunan Securities indicates that from 2009 to 2011, the average proportion of land grant income in the local financial revenue of 16 cities for the three years was as high as 63 percent.
13. According to data released by the Ministry of Finance.
14. National Bureau of Statistics of China, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing.
15. People's Daily, 18 March 2011, "Ministry of Human Resources and Social Security: China's labour resources will reach its peak years" (available at <http://finance.jrj.com.cn/opinion/2011/03/1807329487626.shtml>, last accessed September 2012).
16. Ministries of Education, Development and Reform, Public Security, and Human Resources and Social Security.
17. United Nations Population Fund (UNFPA), 2007, State of World Population 2007: Unleashing the Potential of Urban Growth (available at <http://www.un.org.cn/public/resource/e7102d15216f85e5c2e4d2e33784b72f.pdf>, last accessed September 2012).
18. Shanghai Department of Civil Affairs, Shanghai Ageing Working Committee and Shanghai Department of Statistics, 2012, "The statistical investigation of Shanghai on ageing population and ageing affairs."
19. Chinese Academy of Social Sciences (CASS), 2012, "China Pension Report 2012," Economy & Management Press, Beijing.
20. United Nations Population Fund (UNFPA), 2006, "Population aging in China: facts and figures" (available at <http://www.un.org.cn/public/resource/e7102d15216f85e5c2e4d2e33784b72f.pdf>, last accessed June 2013).
21. China News, 31 October 2011, "China's ageing population will peak around 2050, one third of all will be the old" (available at <http://www.chinanews.com/gn/2011/10-31/3427109.shtml>, last accessed June 2013).
22. The World Bank and the Development Research Center of the State Council of the People's Republic of China, 2008, "China 2030: Building a Modern, Harmonious, and Creative High-Income Society" (available at <http://www.worldbank.org/content/dam/Worldbank/document/China-2030-complete.pdf>, last accessed June 2013).
23. Population Division of the United Nations Department of Economic and Social Affairs, 2013, World Population Prospects: The 2012 Revision (available at [http://esa.un.org/unpd/wpp/unpp/panel\\_population.htm](http://esa.un.org/unpd/wpp/unpp/panel_population.htm), last accessed June 2013).
24. Ibid.
25. "Three pillars" of social security in China refers to basic pension, corporate pension and commercial pension.
26. Social organizations are an important part of political life in contemporary China. All of China's current social organizations have a quasi-official nature. Under the Registration Regulations of Social Organizations, social organizations must be approved by competent authorities—government departments above the county level and authorized organizations. Social groups are actually subsidiaries under competent authorities.
27. Private non-enterprise organizations refer to non-profit social service activities organized and supported by non-state-owned assets, and run by enterprises and institutions, social organizations and other social forces as well as individual citizens, including various types of private schools, hospitals, arts organizations, research institutes, stadiums, vocational training centres, welfare centres and talent exchange centres.
28. Ministry of Public Security Traffic Management Bureau, 30 January 2013, "The national motor vehicle amounted to 233 million."
29. Cilento, Karen, 2012, "The Local Architect / Wang Shu," ArchDaily, 28 Feb 2012, (available at <http://www.archdaily.com/212424/the-local-architect-wang-shu/>, last accessed 30 April 2013).
30. The Hyatt Foundation, 2012, "Biography: Wang Shu," The Pritzker Architecture Prize, (available at <http://www.pritzkerprize.com/2012/biography>, last accessed 30 April 2013).
31. Ibid.
32. Xinhuanet, 22 February 2012, "Chinese Premier Wen Jiabao chaired a State Council executive meeting" (available at [http://news.xinhuanet.com/politics/2012-02/22/c\\_111556543.htm](http://news.xinhuanet.com/politics/2012-02/22/c_111556543.htm), last accessed June 2013).

33. The three reforms of medical and health care refer to the reform of the basic medical insurance system for urban workers, the reform of the medical and health system, and the reform of the production and circulation of medicine.
34. Chen Lei, the Minister of Water Resources, in a speech at the National Water Resources Work Conference, 8 May 2012 (available at <http://www.lfdx.gov.cn/news/ShowArticle.asp?ArticleID=1007>, last accessed May 2013).
35. At present, the per capita water standard generally is more than 1,000 cubic metres in a modern country. Even with advanced water-saving management techniques, the minimum standard in dry regions is 500 cubic metres.
36. The water resource utilization rate refers to the rate of water consumption as a percentage of total water resources in a watershed or a region. Generally speaking, the utilization rate of a river cannot exceed 40 percent of its total water resource amount.
37. Chinese Academy of Social Sciences (CASS), 2010, "Urban Blue Paper: Chinese Urban Development Report No. 3," July, Social Sciences Academic Press, Beijing.
38. Yangcheng Evening News, 9 February 2012, "More Than 100 Projects in Guangzhou Require 50 square kilometres of Land: the Land Supply and Demand Contradiction is Severe" (available at <http://news.sina.com.cn/c/2012-02-09/103823906721.shtml>, last accessed May 2013).
39. The State Council Information Office, 26 December 2007, "The White Paper of Energy Situation and Policies of China" (available at [http://www.gov.cn/zwggk/2007-12/26/content\\_844159.htm](http://www.gov.cn/zwggk/2007-12/26/content_844159.htm), last accessed June 2013).
40. The State Council Information Office, 24 October 2012, "The White Paper of Energy Policies of China (2012)" (available at [http://www.gov.cn/jrzg/2012-10/24/content\\_2250377.htm](http://www.gov.cn/jrzg/2012-10/24/content_2250377.htm), last accessed June 2013).
41. Xi'an Evening News, 9 January 2012, "The Pressure of Natural Gas Supply in Xi'an Increases with Gas From North to South Directly Supplied to Urban Districts" (available at <http://news.hsw.cn/system/2012/01/09/051208979.shtml>, last accessed June 2013).
42. The monitoring data was released by the Economic Operation Adjustment Bureau of the National Development and Reform Commission in August 2011.
43. Beijing Bureau of Statistics, 20 August 2012, "The communiqué of energy consumption, water consumption in Beijing 2011." Above-scale industry refers to an annual industry income of 20 million RMB and above.
44. The integrated wastewater discharge standard (GB 8978-1996) was formulated to implement the Environmental Protection Law of the People's Republic of China, the Law of the People's Republic of China on Prevention and Control of Water Pollution, and the Marine Environmental Protection Law of the People's Republic of China. These regulations control water pollution, protecting the quality of rivers, lakes, canals, reservoirs, the oceans and groundwater. They also help maintain human health and ecosystem balance, promoting both national economic and urban-rural development.
45. The Ministry of Environmental Protection, October 2011, "National Underground Water Prevention and Control Plan (2011-2020)" (available at [http://www.zhb.gov.cn/gkml/hbb/bwj/201111/t20111109\\_219754.htm](http://www.zhb.gov.cn/gkml/hbb/bwj/201111/t20111109_219754.htm), last accessed June 2013).
46. Surface water environmental quality standards (GB3838-2002) specify six grades according to water quality. Grade I is for water sourced in the National Nature Reserve; Grade II applies to the water that can be used for centralized drinking, or a surface water source protection area suitable for rare aquatic habitats, fish and shrimp production fields, and the larvae feeding field; Grade III applies to surface water source in a centralized drinking water, fish and shrimp wintering grounds and migration routes of aquaculture areas of fishing waters and swimming area; Grade IV is suitable for general industrial water districts and the recreational water areas non-direct contact with body; Grade V is applied to agricultural water district and the general landscape requirements waters. Water quality cannot meet above standards are categorized as inferior-Grade V.
47. In 2001, the State Council, China's highest administrative authority, approved the National 10th Five-Year Plan for Environmental Protection (2000-2005), which requires air quality in over 50 percent of cities to meet at least the second level of a three-tier National Air Quality Standard system. The plan also established a daily urban air quality report and forecast system. In the following year, the Demarcation Plan of Air Pollution Control for Key Cities designated 113 cities as air pollution control cities, required to reach the second level of the national standard during the 10th Five-Year Plan (Sharon S. Dawes, G. Brian Burke and Lei Zheng, 2011, "AIR Now-I Shanghai: Crossing Cultures, Sharing Knowledge.")
48. China's National Ambient Air Quality Standards (NAAQS) were put into effect in October 1996 and amended in January 2000. The standard limits are categorized into three grades calibrated for different functional zones. Cities are required to comply with Grade II of the NAAQS, which applies to residential areas, mixed commercial/residential zones, and cultural, industrial and rural areas.
49. A prefecture-level city is an administrative division of China, ranking below a province and above a county. They form the second-highest level of the administrative structure, alongside prefectures, leagues and autonomous prefectures.
50. The Ministry of Environmental Protection, 2011, "Report on the State of the Environment in China 2010" (available at <http://jcs.mep.gov.cn/hjzl/zkgb/2010zkgb/>, last accessed June 2013).
51. Atmospheric particulate matter—also known as particulates or particulate matter—are tiny pieces of solid or liquid matter in the earth's atmosphere. They are suspended in the atmosphere as atmospheric aerosol, a term that refers to the particulate/air mixture, as opposed to the particulate matter alone. Particularly, PM2.5 refers to particles smaller than 2.5 micrometres.
52. Grade I of the NAAQS applies to specially protected areas such as natural conservation areas, scenic spots and historical sites.
53. According to detection statistics released by the National Weather Service.
54. The Ministry of Environmental Protection, 2012, "Report on the State of the Environment in China 2011."
55. Key enterprises refers to corporations that have a large influence on regional air quality.
56. Key areas refers to Beijing-Tianjin-Hebei, Yangtze river delta, Pearl river delta, central part of Liaoning, Peninsula of Shandong, Wuhan and its surrounding regions, Changsha-Zhuzhou-Xiangtan, Chengdu-Chongqing, and west part of Taiwan Strait.
57. China News, 25 April 2010, "The total garbage piled in China over 6 billion tons, experts called on waste incineration for power generation" (available at <http://www.chinanews.com/cj/cj-hbht/news/2010/04-25/2246080.shtml>, last accessed June 2013).
58. In February 2012, China released a new ambient air quality standard, GB 3095-2012, which sets limits for the first time on PM2.5. This standard specifies the provision, implementation and supervision of the classification of ambient air functional zones; standard grading; pollutant items; average time and concentration limits; monitoring methods; and data effectiveness. The standard will be implemented on 1 January 2016.
59. China News, 1 October 2012, "The total garbage piled in China's cities and are hard to collect by categories" (available at <http://www.chinanews.com/sh/2012/10-01/4224886.shtml>, last accessed June, 2013).
60. On 10 August 2006, Typhoon Saomai reached the coastal area of Cangnan, Zhejiang Province. It was the most powerful typhoon to hit mainland

China since 1949. Upon its arrival, the maximum wind strength in the centre of the typhoon was Level 17 (60 meters/second) stronger than that of Hurricane Katrina, which struck the United States in 2005.

61. From 1891 to 1990, the coastal sea level increase rate in China was 1.4 millimetres per year. The rate in recent years has been about 2.6 millimetres per year, an increase of 70 percent.
62. Intergovernmental Panel on Climate Change, 2007, "Climate Change: Synthesis Report," Cambridge University Press.
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64. The Ministry of Environmental Protection, 4 November 2011, "Annual Report of Motor Vehicle Pollution Prevention and Control of China (2010)."
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# CHAPTER 3

## SCENARIOS FOR THE URBAN FUTURE

### Key Messages

- Getting urbanisation right calls for cities to be socially equitable, economically dynamic, and environmentally sound and friendly.
- Considerable investments will be required, including in environmental protection, social services and appropriate infrastructure, but these could yield significant benefits and savings in the medium and long term.
- Care of the elderly and the integration of migrants will require targeted spending, and affordable and accessible social services.
- A compromise between the speed and quality of urbanisation is feasible, and can be aligned with making cities liveable and sustainable, including through greater participation in decision-making.

Earlier chapters have reviewed urbanisation in China and current challenges. In the near future, domestic demands to deepen reforms and resolve resource constraints are likely to grow. As well, China may be subject to international shifts and various uncertainties, such as declining demand for its manufactured goods; the rebalancing of the global economy; the readjustment of the industrial

structure; a growing number of developing countries entering into the stage of rapid industrialization and urbanisation, which could intensify the global struggle for markets; contradictions in resource supply and demand, and the need to reduce emissions. Given these diverse challenges, as well as new opportunities, strategic choices to guide urbanisation are critical.

Socio-economic development will continue to drive urbanisation and its benefits, but also exert pressures on the sustainable use of resources, human development and urban liveability. This chapter discusses different demands under various economic, social and environmental scenarios, and compares options for ensuring liveable cities for the future.

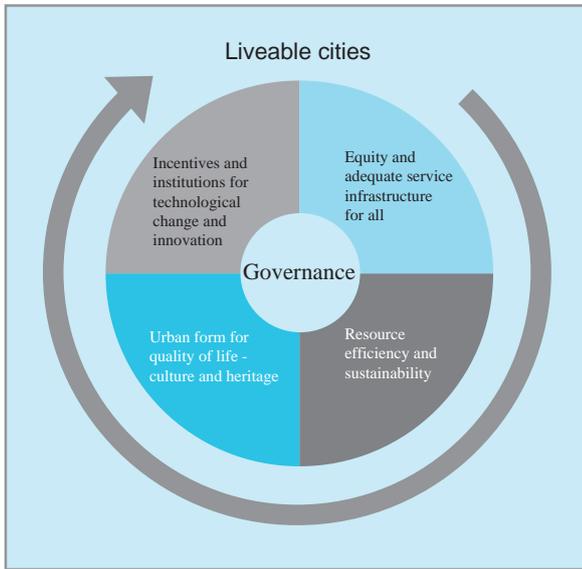
Since some of the biggest human development challenges in China are found in its cities, how well it succeeds in making its cities more liveable, across many dimensions as shown in figure 3.1, will be key to success in human development.

## The Foundations of Sustainable and Liveable Cities

For urbanisation in China to advance the goals of human development, cities must be liveable and grow along sustainable paths under the guideline of ecological civilization. Getting urbanisation right requires addressing some core challenges and opportunities: so that cities can be socially equitable, economically dynamic and environmentally friendly. All three dimensions may involve specific aspects of equity, efficiency, sustainability, innovation and safety (see table 3.1)

**Table 3.1: Challenges to sustainable and liveable cities**

	Economy	Society	Resources and environment
Equity	With the development of the market economy system, the middle class is expanding rapidly, but growing economic disparities exist, including by gender.	Treatment and policy differences between migrant and resident population; urban poverty.	Unbalanced resource distribution; acute conflict between economic development and environmental protection.
Efficiency	The economic growth rate is high, but economic development efficiency needs to be enhanced.	Education, medical care and social security cannot keep up with needs.	Resource and energy utilization rates are low.
Sustainability	Developing a low-carbon economy is the goal of many cities, but hard to achieve.	The low-carbon concept has been gradually accepted by the public, but the cultivation of good living habits needs to be strengthened.	Water shortages, air pollution, soil erosion, reduced green spaces and energy crises, among other pressures, have severely affected human and ecological systems, posing bottlenecks to the sustainable use of resources and the environment.
Innovation	The innovation capacity of China is relatively low; institutional and systematic restrictions need to be broken, and reform deepened.	The transition from city management to city governance is limited; the city innovation structure is insufficient; and the participation of social forces is limited.	Energy substitution faces technological bottlenecks; mechanisms to respond to climate change and technological innovation are insufficient.
Safety	Basic economic stability is guaranteed.	Incidences of social unrest occur frequently; food safety is often compromised.	Energy supply crisis; severe water resource pollution; deterioration of ecological environment.

**Figure 3.1** Liveable cities roadmap

## EQUITY

An important social criterion for city liveability is whether or not people enjoy fair opportunities to attain the foundations of human development, cultivate well-being, and acquire material possessions and social status. Increasing socio-economic inequalities in China are among the main threats to liveable and sustainable urbanisation.

According to an old Chinese saying: “What’s dangerous for a society is not scarcity, but inequality.” Despite government attempts to advance equity and social justice, income gaps, regional differences and variations in urban-rural development rates continue to increase.

Promoting greater equity, including gender equity and empowerment, requires action on several fronts. These include: further regulating the performance and incentives of public officials, adjusting income distribution policies, enhancing support to vulnerable groups, examining issues of inequality through rural-urban migration links, and widely promoting the value of social equity for all urban residents.

## EFFICIENCY

Urbanisation in China suffers the same problem of low efficiency as the overall economy. Blind expan-

sion has wasted resources and pushed up costs. It has also led to unreasonable urban layouts and structures, which reduce the quality of life, and in some cases the efficiency and competitiveness of industries.

Chinese economist Wu Jinglian has identified four reasons for the inefficiency of Chinese urbanisation: a flawed land rights system, a misconceived government role in urbanisation; a hierarchy that rewards city size above all other criteria, and a general misconception that larger cities are always better.<sup>1</sup>

According to Wu, the inefficiency of urbanisation manifests in the speed of land development far outpacing population increases. The amount of land used by cities increased by 8.1 percent from 2009 to 2011, while the urban population rose by only 1.4 percent.<sup>2</sup>

To reduce inefficiency, the city government needs to change from being a controller to being a good manager, administrator and inspirational leader. Many city officials are of course aware of their challenges and their problems, and have begun to introduce and implement measures to increase the efficiency of administration of their cities and services. Leadership is needed to help urban stakeholders envision what kind of city they want. Their vision is key. Once it is accepted, then goals and targets can be established, and actions identified to help the city reach them.

## SUSTAINABILITY

The concept of sustainable development has emerged over the past few years as a prerequisite for urban planning, involving a balance of economic, social and environmental imperatives. Each of these points is under strain in China’s cities.

China is revising urban planning policies and implementing important new initiatives to focus them more on sustainable development in the midst of continued economic expansion. These measures establish national objectives to be achieved through

the adoption of regional and local plans. Resource consumption, energy security and critical environmental issues are increasingly integrated in urban planning.

But there are many challenges to meeting these goals. They include, among others, the high cost of developing new energy, the increased demand for resources, immature technology, the arduous task of adjusting the industrial structure, the pressure to increase energy conservation, and in some cases the impacts of location and natural endowment.

Urban planning could aim at ensuring that cities are people-centered (see box 3.1). This means creating enough green space for leisure and recreation, and providing safe pedestrian walkways and cycling paths. It entails mixed-use development so that residents can work and shop in the communities where they live. There are an increasing number of good reports and potential references on these issues,

such as UNESCO's Recommendations on the Historic Landscape, which alludes to the dynamic nature of living cities, culture, creative industries and services.<sup>3</sup>

## INNOVATION

The capacity for innovation can advance city development in a sustainable manner (see box 3.2). It is reflected in measures taken in science and technology, management, culture and the economy, to name just a few.

Generally speaking, the motivation for innovation and creativity in urban planning in China is considered relatively low. Many cities simply abandon their own traditions or culture to construct so called 'European streets' for tourism and business. The lack of innovation has led to policies that are often not as appreciative as they could be of cultural legacies, and resulted in limited variations in city planning and building. The homogenized city 'spirit' may conform

### Box 3.1: A healthy, progressive place to live, Portland

Portland, Oregon in the United States carefully controls urban expansion to ensure that it does not lose sight of its primary purpose as a city: to provide a safe and comfortable environment for citizens. Urban design projects stretch back as far as 1903, when architects wisely anticipated the widespread emergence of automobiles. In 1920, a referendum protected open spaces and placed restrictions on building heights.

Today, the city consistently ranks high in liveability among cities in the United States, often being cited for its excellent bike paths, extensive green spaces, sustainable transportation policies and citizen safety. Progressive urban policies foster links between academia and industry, and promote female and minority participation in government and the workforce. Portland is a healthy and progressive place to live.

*See appendix for more information.*

### Box 3.2: A creative, entrepreneurial powerhouse, Singapore

The Asian financial crisis of 1997 forced Singapore to reevaluate its growth strategies, leading the island nation to remake itself as a creative and entrepreneurial powerhouse. Singapore consistently places highly in the Global Innovation Index, ranking seventh in 2010 and third in 2011, making the city an international locus for research and development (R&D).

Singapore actively encourages industry-university cooperation and expends 2.66 percent of its GDP on R&D projects (the Organisation for Economic Co-operation and Development or OECD average is 2.35 percent). Singaporean laws are designed to facilitate business and technology startups with fast and inexpensive bureaucratic procedures, while strict intellectual property regulations protect the financial interests of innovators.

*For more information, see appendix.*

to the immediate requirements of economic and social development, but in the end, it indicates a certain absence of creativity and innovation.

To promote innovation, the Government needs to better define its role. Its function, for example, could be more to lead and delegate powers to lower levels, and guide social forces and market mechanisms towards actions that improve city life and human development.

## SAFETY

Urban safety issues cover public, ecological, food, economic and social safety. Safety is highly dependent on equity and efficient management, which can head off insecurities related to the lack of jobs and social security, and poorly protected development rights.

Cities are founded on the rule of law and promote adequate law enforcement to ensure public safety. At the same time, according to China's own conditions and cultural traditions, they must focus on improving education as key to the formation of a civil society. General educational improvements can reinforce the capacity of social services. By bolstering workers' skills, they can increase the possibilities for employment and social harmony, and reduce social instability. Public participation and civil society groups that give people a voice are also crucial in fostering urban security.

## *Making Cities Work: Some Key Issues*

China's urbanisation challenges require timely and strategic responses. The central Government is more and more aware of the importance of sustainable, participatory, people-centered urbanisation for economic and social development, and has been introducing a number of measures to help in this regard. Some of these are listed in this report. But given the magnitude and complexity of the challenges, much

more is needed. The following sections highlight some key issues to consider in making cities more sustainable and liveable. Some have already been mentioned in other sections of this report.

## THE DEMAND FOR LAND AND HOUSING

Land constraints, given burgeoning urban populations, have become one of the biggest bottlenecks to sustainable urban development. China is a populous country with relatively little land—acreage per capita is much lower than the average Asian level.

Inappropriate planning allows too much encroachment on the few remaining open spaces and causes imbalances. There have been huge impacts on arable land use in rural areas from industrialization and urbanisation. From 1997 to 2011, farmland decreased by 124 million mu;<sup>4</sup> some 70 percent of the remaining 1.82 billion mu produces at medium and low levels, according to the Ministry of Land and Resources.<sup>5</sup> The reduction of arable land has been too much and too fast. This not only wastes a lot of land resources, but also threatens national food security. To solve the problem, China has taken measures to strengthen the management of land utilization and comprehensive improvement. To ensure that the amount of cultivated land is no longer reduced, the land use management and control system, which encompasses planning and management, basic farmland protection, and ensuring the requisite balance of arable land, has been improved.

Internationally, housing rights and sustainable development were promoted as linked concepts in 1996 when the second United Nations HABITAT Conference put forward the notion that "everyone has the right to adequate housing and sustainable development of human settlements." This does not mean that every urban resident should be a homeowner, but people in cities should be granted access to decent housing as a basic right. In the midst of a city housing crisis, China has sped up construction of affordable housing projects (see box 3.3) and established a housing system with characteristics of both market mechanisms and government intervention. It aims at promoting balanced supply and de-

mand, with the added benefit of producing new jobs through construction and other industries. Homes will go to low-income and migrant residents, thus helping to mitigate current inequalities.

Since most new housing projects attempt to use safe and environmentally friendly equipment and technologies, they could contribute to energy efficiency and sustainability.

## PROVIDING WORK FOR MIGRANTS

Endowed with abundant human resources, China has to supply adequate jobs through urbanisation, especially for rural surplus labourers who have come to cities. They concentrate in non-agricultural jobs, especially in manufacturing; construction; services; wholesale and retail trade; transport, storage, post and information; hotels and catering.<sup>7</sup>

Most migrant workers face income inequality and job insecurity, long hours of work, poor housing conditions and a lack of social security. This has led to labour shortages in some cities recently, as some migrant workers have returned to rural areas, or moved to other sectors and cities.

Many local governments have therefore gradually been loosening restrictions on migrants. For example, Guangdong Province initiated a registration system reform in 2010, where migrant workers can become registered urban citizens by adding up points

from different criteria.<sup>8</sup> The central Government has underlined the need to help rural migrant workers become urban residents by offering skills training and beginning to gradually promote the reform of the urban registration system. In 2011, the “Notification of Actively and Gradually Promote the Reform of Registration System by General Office of the State Council” was implemented. The Ministry of Human Resources and Social Security, the National Development and Reform Commission, and other relevant ministries have begun to release supporting policies. Eighteen provinces (districts and cities) have introduced specific implementation advice; 14 provinces (districts and cities) have begun to establish unified urban and rural household registration systems. These actions are helping rural people better settle in urban areas and find jobs. But providing decent work for most migrant workers will likely remain a major challenge for years to come.

## MANAGING SEVERE RESOURCE CONSTRAINTS

Resource pressures in Chinese cities stem from a general shortage, low efficiency in use, and loss of access due to pollution and environmental damage. The exponentially growing urban demand for water, energy and other resources poses tough challenges, especially in large cities in the drier northern regions.

For the most part, the spatial distribution of China’s cities is not in line with the capacity of local resources,

### Box 3.3: Public housing helps the poor and the economy

To cope with the global economic crisis, the Chinese Government put forward the ‘four trillion’ plan to stimulate the economy, including RMB 900 billion to build guaranteed housing. Between 2009 and 2011, this entailed adding 2 million units of low-rent housing and 4 million units of affordable housing, as well as the renovation of over 1 million units in shantytowns built in forested, agricultural and mining areas.<sup>6</sup>

The goal under the 12th Five-Year Plan, starting in 2011, is to build 36 million units of indemnificatory housing, reaching 20 percent of residential housing construction in 2015. From 2011 to 2012, China started the project to construct 18.24 million units of urban affordable houses, about 12 percent higher than the 11th Five-Year Plan period’s total amount. It has completed 10.33 million units, nearly equivalent to the total amount completed during 11th Five-Year Plan period.

Guaranteed housing relieves the problem of shelter for low-income families in urban areas, while expanding domestic demand, and fuelling economic growth and job creation. Between 2009 and 2011, annually 300 RMB billion was invested in it, creating up to 3 million employment opportunities in related industries.

such as water supplies. Many resources are located in China's western regions, where difficult and remote terrain increases supply costs.

Based on patterns elsewhere in the world, the national demand for energy grows the fastest from the middle of urbanisation to full urbanisation, at which point use begins to slow. Since China is in the middle stages, rising energy demand may not subside for decades. Among regions and countries that have also faced resource constraints, some European Union countries and Japan have adopted measures such as 'compact cities' to make the most efficient use of them.<sup>9</sup>

## REDUCING TOLLS ON THE ENVIRONMENT AND HEALTH

Accelerating urbanisation takes a toll in terms of increased greenhouse gas emissions, and the pollution

of air and water, which threaten health and daily life, as well as the environment. In 2008, the WHO listed seven Chinese cities, including Beijing, as among the 10 most polluted places in the world.<sup>10</sup>

China has invested considerable human and material resources in urban environmental protection and governance in recent years. According to the 12th Five-Year Plan for National Environmental Protection, China plans to invest over RMB 3 trillion in environmental measures through 2015, with about one-third of the total earmarked for pollution control facilities, double the amount allocated under the 11th Five-Year Plan.

This could significantly increase environmental quality in urban areas, and make energy conservation and environmental protection new strategic industries in the near future. See boxes 3.4 and 3.5 for experiences with urban environmental improvements.

### Box 3.4: From toxic dump to tourist destination, Istanbul

Istanbul is situated on the Bosphorous Strait, which connects the Black and Marmara seas. The Golden Horn is a natural harbor along this waterway, and has long had a reputation for being one of the most scenic parts of the city.

During the 1930s, Istanbul saw a large influx of immigrants and rapid industrial expansion around the Golden Horn. Without regulation, large quantities of untreated waste were dumped directly into the bay, transforming it into a toxic dump.

In 1984, the steadily worsening situation prompted action from the municipal government. It demolished illegal residences and relocated factories to the new Ikitelli industrial zone, overhauled the waste disposal system, dredged the waterway to remove toxic buildup, rebuilt an old bridge that was obstructing water flow and renovated the area to restore its cultural value. These measures were successful, and the Golden Horn is again renowned among tourists and local residents.

*See appendix for more information.*

### Box 3.5: A Chinese village adopts environmental safeguards, Huaxi Village

In 2010, 13 small villages in Jiangsu province were combined into a larger agglomeration—Huaxi. It is the first Chinese village to pass the ISO14001 environmental management certification system, having taken steps in recent years to safeguard the environment. Projects have primarily focused on cleaning a river, improving business practices and beautifying public spaces.

Recently, Huaxi mandated use of dust removal equipment and wastewater treatment by industries. The municipality also gathered 150 disparate businesses into a single industrial zone with a central wastewater treatment plant. This reduces costs and saves energy.

*See appendix for more information.*

## AIMING FOR EQUITY IN PUBLIC SERVICES

As China has moved from a traditional rural society to a more modern, city-based one, it has faced and will continue to face a significant transition in its industrial structure, employment patterns, living environment and social services. This process needs to include treating rural migrant workers and their family members as equal citizens, with the same rights as all urban residents, and ensuring all city dwellers have full access to basic urban public services. Currently, only 14 percent of migrants have pension insurance, 17 percent medical insurance, 24 percent work injury insurance and 8 percent unemployment insurance.<sup>11</sup>

Chinese authorities have underlined the need to help rural migrant workers become urban residents through the urban 'citizenization' process, calling it important to the progress of urbanisation. Although this is an important step towards upholding equal rights for migrants, much more needs to be done to eliminate the continued gaps between migrant workers and registered urban residents. These will not be conducive to social stability, city liveability or sustainable development.

One way forward could be a diversified cost-sharing mechanism between origin and receiving provinces so that migrant workers and urban residents enjoy the same treatment in terms of social security, employment, public services, affordable housing and education.

## INVESTING IN IMPROVEMENTS

While China's urbanisation will drive growth, the expanded demand that results will require steep investments. The central Government, local governments and the private sector will need to channel more resources into infrastructure and public goods. Currently, central government spending has shifted from investment in infrastructure to social services, although over time, relevant ministries and local governments have constantly increased municipal infrastructure construction. The capacities of municipal facilities and service levels have improved signifi-

cantly as a consequence.

In order to strengthen the financial security of municipalities, the central Government considers the migrant population in calculating transfer payments to municipalities, issues bonds on behalf of local governments for several years, and strengthens financial support for cities with fiscal shortfalls. It also takes effective measures to prevent local government debt risk from spiraling out of control.

Funding burdens are likely to intensify as urbanisation progresses, straining the public financing system. Necessary additional resources may require moving from today's one-source, government-dominated financing to a mix of sources. While to a certain extent investment demand can be deemed the cost of urbanisation, there may also be significant benefits from efficient investment in many areas, such as environmental protection, social services and appropriate infrastructure. These are investments whose benefits may not only offset initial costs but also reduce future ones.

## *How Urbanisation Could Evolve*

To start exploring how China could pursue the twin goals of sustainable development and liveable cities, this section introduces a baseline scenario based on current trends (see box 3.6). The results were derived through an econometric model established with historical data (see appendix for technical details). The model captured quantitative indicators and analysed trends, spanning 2010 to 2030. Socio-economic demands, environmental stresses and investment requirements for urban development were factored in, with all economic indicators adjusted to the constant prices of the base year, 2010.

After the baseline scenario, the report presents three optional urbanisation models based on different sets of assumptions.

Basic parameters and assumptions for building the baseline scenario were as follows:

### Box 3.6: Understanding scenarios

The exploration of alternative futures is an important part of socio-economic analysis. Complex socio-economic systems, however, like other complicated systems, are hard to predict, especially to longer term horizons such as 2030 or 2050.

To manage uncertainties, scenario analysis is used to explore plausible future development paths. Scenarios are only images of the future, or alternative futures. They are neither predictions nor forecasts. Rather, each scenario is one alternative image of how the future might unfold.

Different scenarios are deductions based on internally consistent and reproducible assumptions or theories about key relationships among as well as driving forces of changes; they are derived from both history and the current situation.<sup>12</sup> The scope of scenarios varies by selected variables or particular assumptions.

For urbanisation simulations, since very complicated and dynamic systems are involved, it is hard to make accurate predictions. But scenarios can highlight diverse opportunities and challenges, and give some sense of more optimum directions.

This report adopts top-down quantitative modeling, consisting of simultaneous econometric equations with a focus on the predictive analysis of future trends. Different assumptions can be added or supplemented to consider the medium- and long-term variations of indicators related to urban sustainability and liveability. The details of the methodologies and framework can be found in the annex.

- The population is expected to peak in 2026 at approximately 1.45 billion people, and then decline slowly to about 1.445 billion in 2030.
- In 2030, the overall level of urbanisation in China will reach about 68 percent.<sup>13</sup>
- In 2010, migrant workers living in cities and towns but not integrated into the urban residency system accounted for about 31 percent of the total urban resident population.<sup>14</sup> By 2020, this proportion will decrease to 15 percent, and by 2030, urbanisation would eliminate dual treatment within cities. The cost of fully integrating a rural worker is assumed to be around RMB 80,000.<sup>15</sup>
- In terms of trends in industrial structure, the proportion of primary industry will continue to decline. That of secondary industry will be reduced to about 46 percent in 2020 and 41 percent in 2030, while the proportion of tertiary industry will constantly rise to about 54 percent in 2030.<sup>16</sup>

Under these assumptions, if current trends continue, China's urban population is expected to rise from 666 million in 2010 to about 976 million in 2030, an average annual increase of 15.5 million. The eastern coast will continue to see a high urbanisation rate, while the rate will remain slow in the western region. Urbanisation in the east is expected to approach 80

percent in 2030, the average level of western European countries.<sup>17</sup> The rates in the north-eastern, eastern and central regions will climb to 63 percent, 64 percent and 68 percent, respectively (Figure 3.2).

In 2010, the non-agricultural population accounted for about 34.2 percent of China's total population, about 15.5 percentage points below the official urbanisation rate of 49.7 percent. This implies that around 210 million peasant workers lived and worked in cities and towns. According to the basic assumptions, an investment of RMB 41.6 trillion will be required over the next two decades to fully realize their integration in urban areas.

People over age 65 are expected to account for up to 18.2 percent of the total population in 2030, about 9 percentage point higher than the 9 percent share in 2010 (see figures 3.3a and 3.3b). Given labour migration patterns, where migrants are mainly people of working age, the challenges of caring for older people will be greater in rural areas. Once migration tapers off, however, the share of older people in urban areas will quickly increase and exceed that in rural areas, which will impose huge pressures on the urban social security network over the next few decades. This will create both challenges and opportunities (see box 2.3 in chapter 2).

China's urban workforce totalled 347 million people in 2010.<sup>19</sup> This figure will double to about 670 million in 2030, in line with current trends.

In 2010, GDP was about RMB 44 trillion,<sup>20</sup> including RMB 25 trillion from the municipal districts of urban areas.<sup>21</sup> Under the baseline scenario, GDP will expand to RMB 132 trillion by 2030,<sup>22</sup> with an annual growth rate of 6 percent. Urban areas will contribute RMB 99 trillion, at an annual increase of about 6.6 percent. Per capita urban GDP is expected to cross RMB 100,000 in 2030, higher than the national average of just under RMB 92,000, and up from some RMB 39,000 in 2010.<sup>23</sup>

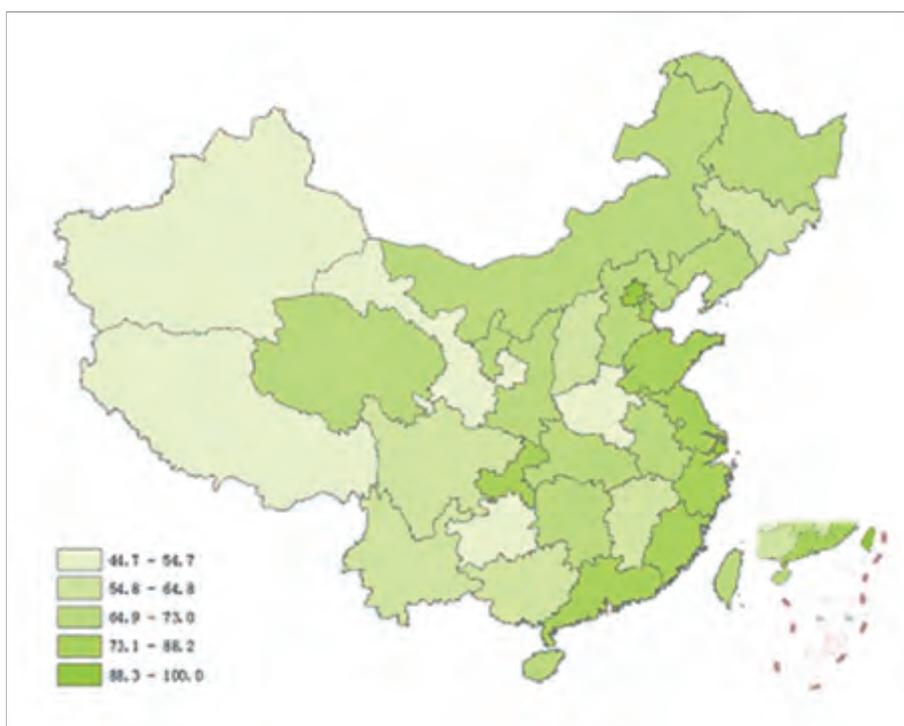
Urban areas will likely expand in the near future, but at a lower rate compared with current trends, given constraints in available land and policies to balance growth. The baseline scenario predicts that by 2030, total built areas will increase to 54,200 kilometres, a

rise of nearly 22,400 square kilometres over 2010 (figure 3.4).

In 2010, the per capita floor space of residential buildings in urban areas was about 31.6 square metres.<sup>24</sup> If the number remains unchanged in the next two decades, combined with the estimates of the future total population and the urbanisation rate, housing demand in 2030 will amount to nearly 31 billion square metres, up almost 10 billion square metres over 2010.

Continued urban economic development will spur primary energy use, which will approach 6.1 billion tons of standard coal equivalent in 2030, albeit at a slower growth rate (figure 3.5). It is hard to envision China's overall energy use peaking before 2030, but energy intensity per unit of GDP will decrease 38 percent in 2030 over 2010. Non-fossil energy sources—including nuclear, wind and solar—will surge, accounting for nearly 26 percent of total energy use in

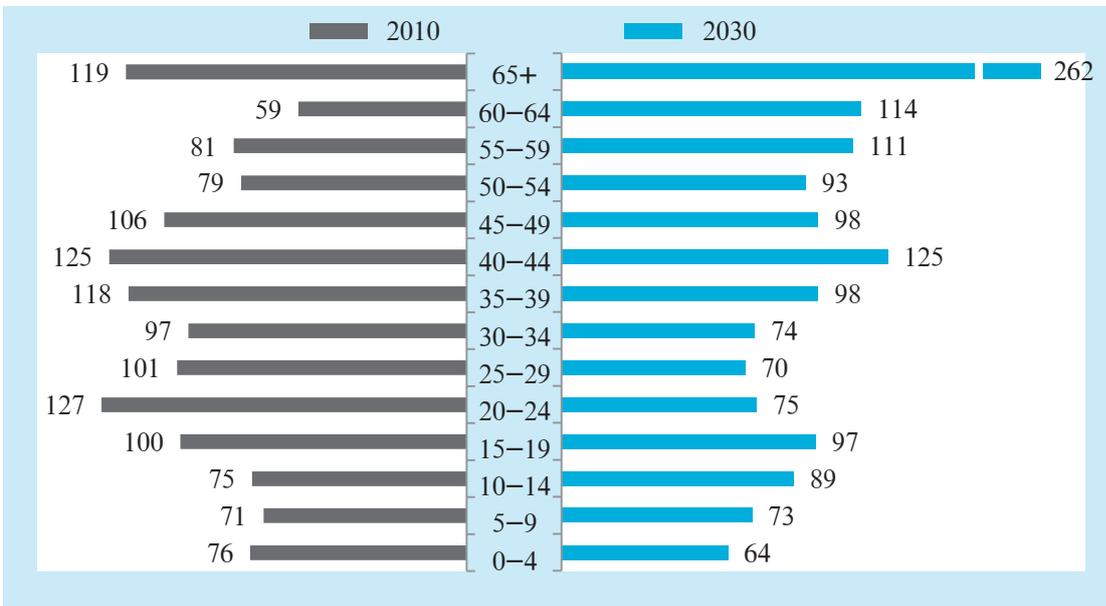
**Figure 3.2** Provincial urbanisation rates in 2030, baseline projection (unit:%)



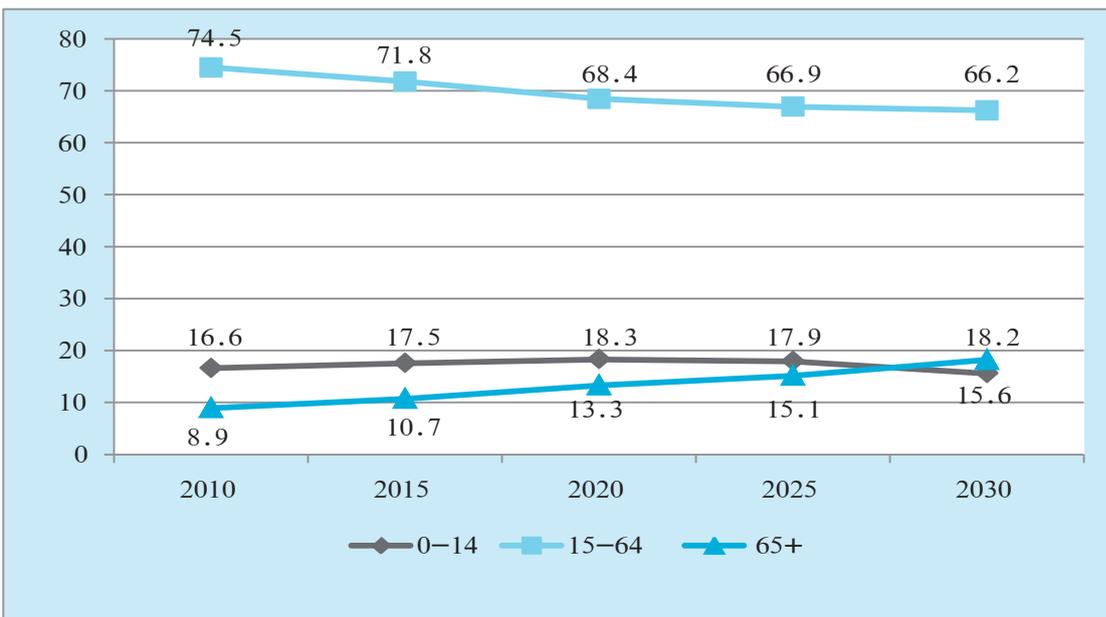
Note 1: Mainland provincial urbanisation rates for 2030 come from the model team of IUE-CASS; due to lack of data, the model does not make projections for urbanisation rates in Hong Kong SAR, Macao SAR and Taiwan, Province of China. The figure uses 2010 data for all three. In 2010, urbanisation rates in Hong Kong SAR and Macao SAR were already 100 percent. The urbanisation level in Taiwan, Province of China, was 69.94 percent.<sup>18</sup>

Note 2: The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

**Figure 3.3a** Age structure of China in 2010 and 2030 (Unit: millions of people)



**Figure 3.3b** Age structure change, 2010-2030, baseline projection (unit: % of total)



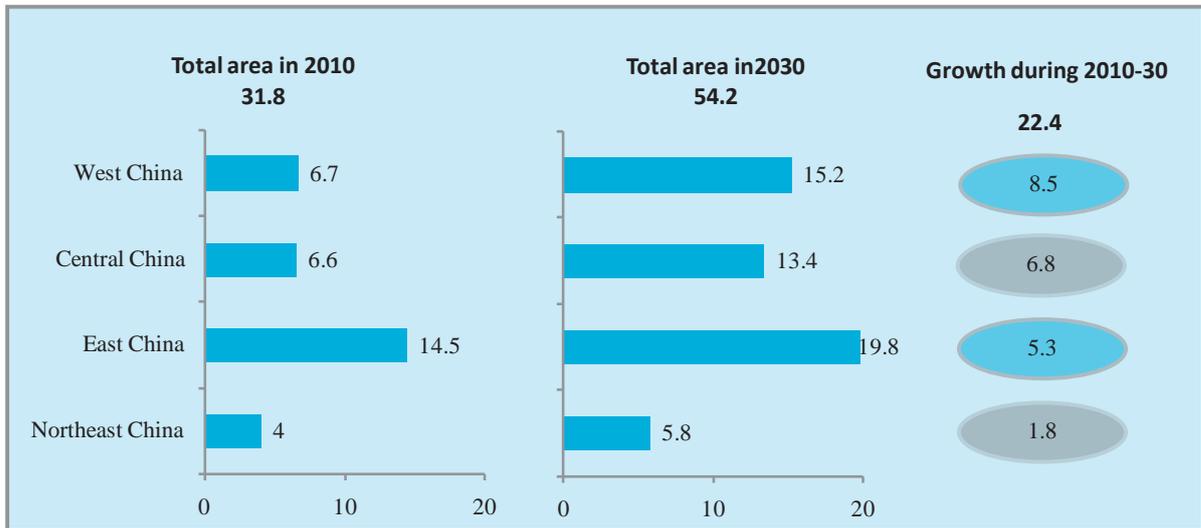
2030, with a 17 percentage point increase over 2010. Coal use will decline to 54 percent, 14 percentage point lower than the 2010 level.

Forecasts for different provinces suggest that the eastern region will be responsible for just under 38 percent of total energy use in 2030, down from 43 percent in 2010, while the figure for the western region will swell from 25 percent in 2010 to nearly 31 percent, and that for the middle region will decline

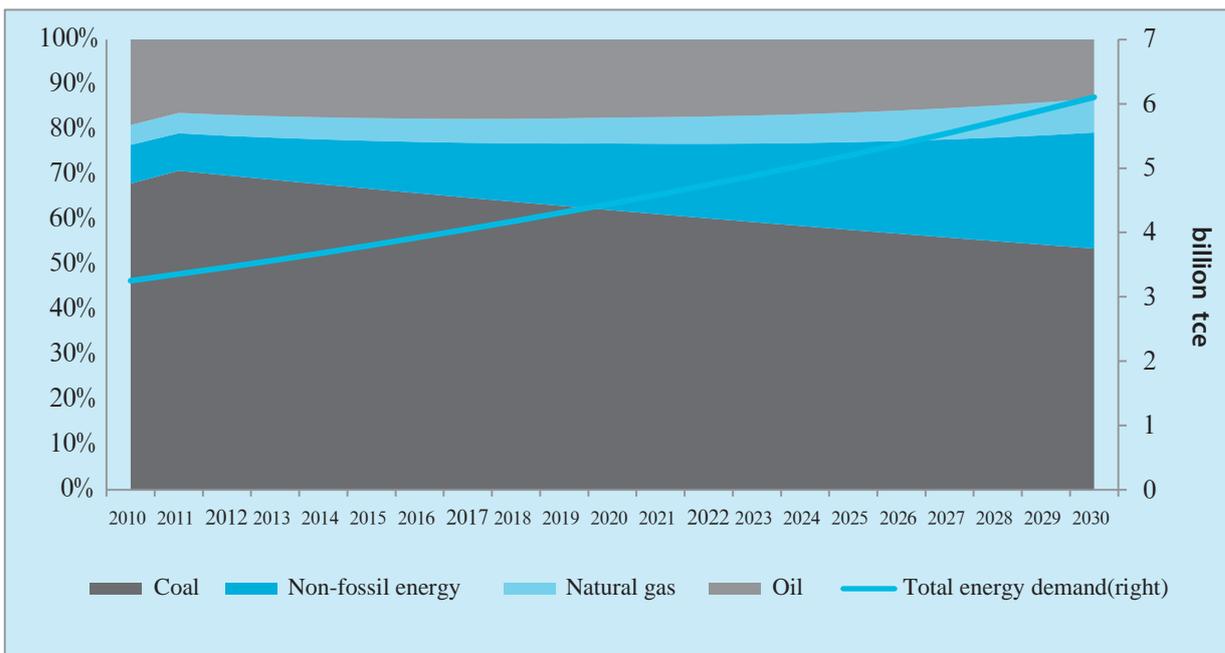
from 22 percent to under 20 percent. The share for the north-east will remain basically unchanged, up from 10 percent to about 12 percent (see figure 3.6).

China has had quantified, binding targets for energy intensity, carbon emissions intensity and air pollutants since the 11th Five-Year Plan (see box 3.7). Local governments are assessed accordingly. At the 2009 United Nations Climate Change Conference, China also committed to reducing carbon emissions per

**Figure 3.4** China's built area, 2011-2030, baseline scenario (Unit: thousand square kilometres)



**Figure 3.5** Energy demand and structure in China, 2011-2030, baseline scenario



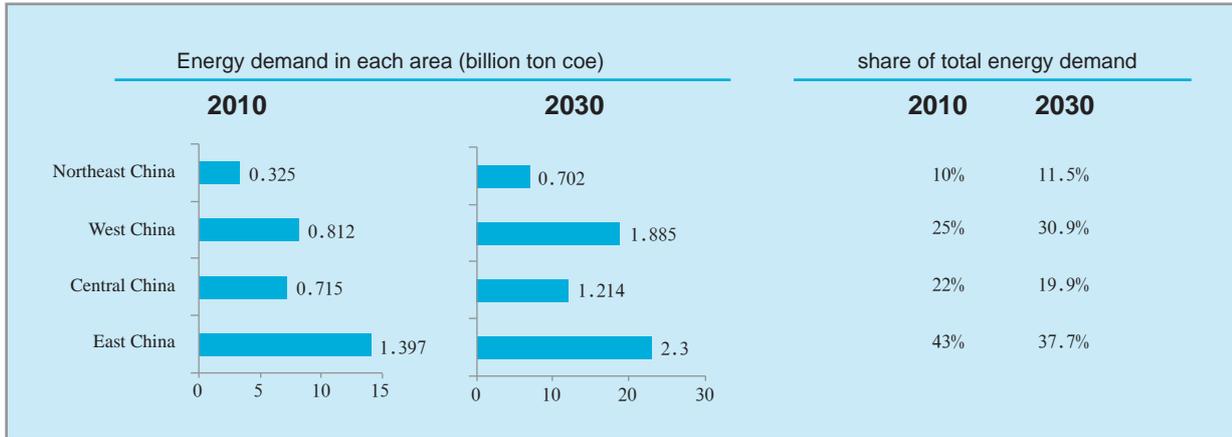
unit of GDP by 40-45 percent by 2020, with 2005 as a baseline level. Assuming the mandatory domestic reduction targets for energy intensity and various types of pollution as well as voluntary international commitments are all achieved, sulphur and carbon dioxide emissions in 2030 will total over 16 million tons and nearly 13 billion tons, respectively. By 2008, almost all Chinese cities had widespread access to tap water; coverage was below 90 percent in only 15 percent of cities.<sup>27</sup> In 2010, the urban tap water supply was nearly 51 billion cubic metres,<sup>28</sup> a volume predicted to expand to over 58 billion cubic metres

in 2030. Residential water demand will see a substantial rise to over 30 billion cubic metres in 2030.

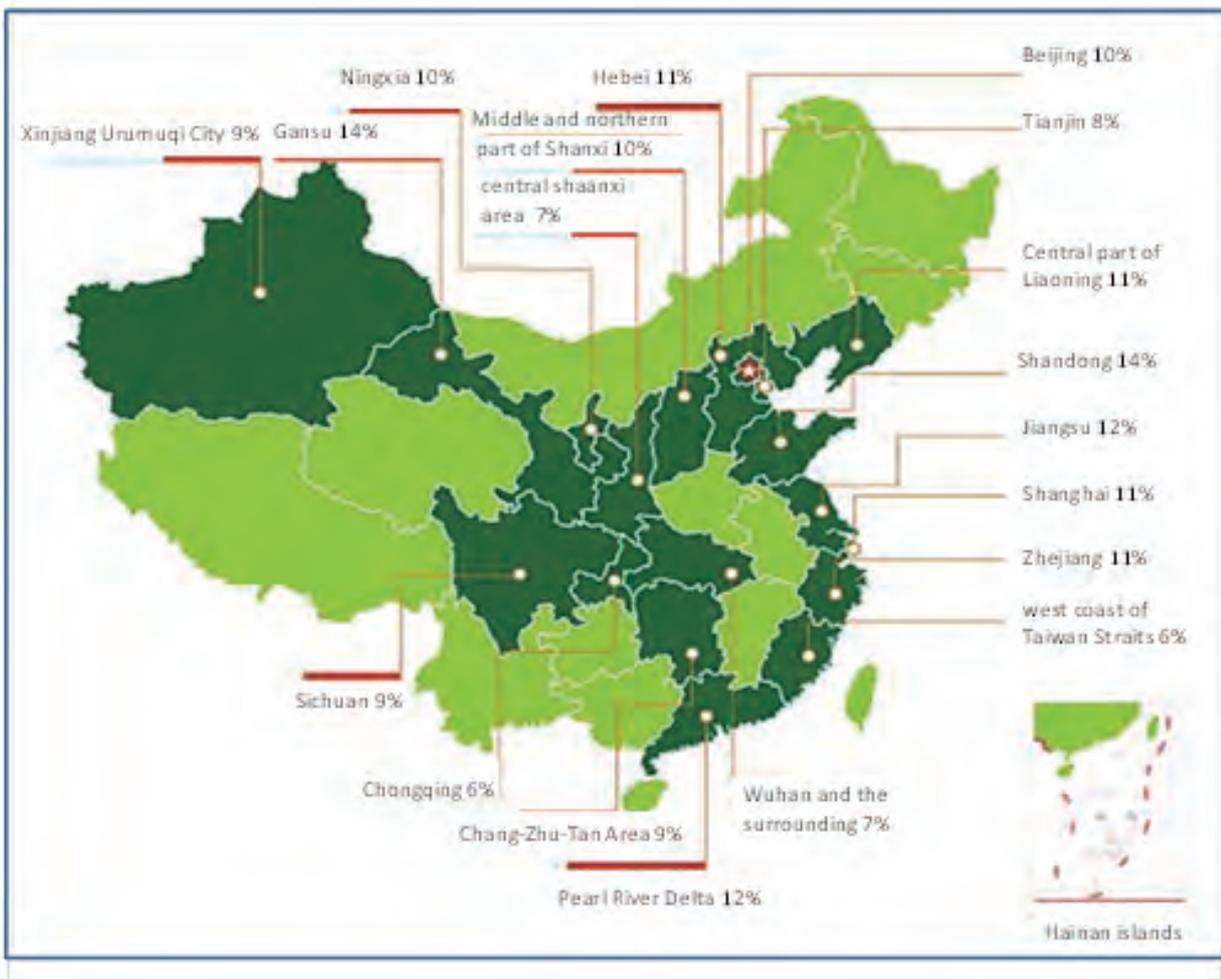
### Some Alternative Scenarios

Additional information on future directions in urban sustainability and liveability can come from developing a series of scenarios, beyond the baseline. The report devised these with a focus on balancing quality and speed in future urbanisation. Quality in-

**Figure 3.6** Regional changes in energy use, baseline scenario



**Figure 3.7** Annual sulphur dioxide concentration reduction targets for key areas, 12th Five-Year Plan<sup>25</sup>



Note: The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations or UNDP concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

### Box 3.7: Policies to reduce emissions and air pollution make a difference

China's massive energy use, plus the fact that its energy mostly comes from coal, makes it one of the biggest sources of air pollution and greenhouse gas emissions, a cause for international concern. The 11th Five-Year Plan set targets to reduce pollutants and emissions, and increase energy efficiency. Through concerted actions across the Government and related ministries, by the end of 2015, all key reduction targets are expected to be achieved.

During the 11th Five-Year Plan, energy use grew only 6.6 percent annually, while total economic output increased by an annual average of 11.2 percent. Energy intensity will be 0.59 at the end of 2015, much lower than the 2010 level of 1.04, with reductions of about 630 million tons of standard coal equivalent and 1.46 billion tons of carbon dioxide emissions. Sulphur dioxide emissions and chemical oxygen demand (COD) discharges will have fallen by 14.3 percent and 12.5 percent, respectively, from 2011 to 2015, exceeding mandatory reduction targets.<sup>26</sup>

With accelerated industrialization and urbanisation, and increased consumption, China's future energy use will continue to grow, making saving energy and reducing emissions more difficult. But public awareness of the importance of these issues is increasing, along with measures to act on them.

The 12th Five-Year Plan has clear targets for both. Nationally, energy intensity will be reduced by 16 percent and carbon intensity by 17 percent below 2010 levels by the end of 2015. COD discharges and sulphur dioxide emissions will decline by 8 percent from 2010 levels by the end of 2015. Ammonium nitrate and nitrogen oxide emission will be cut by 10 percent (more detailed targets can be found in the annex).

Implementing mandatory reduction targets will make economic growth more compatible with limited resources and environmental protection, and reinforce the sustainability of urbanisation.

cludes an emphasis on better services for urban residents and migrants, improved economic and social development as well as environmental stewardship, and a more liveable urban living environment. Speed stresses the quick realization of extensive urbanisation, which requires larger economic output as a basis.

The three scenarios considered here encompass high, medium and low urbanisation, with details as follows.

#### VARYING ECONOMIC IMPACTS

Different urbanisation levels will vary in their economic impacts. Under the SG scenario, national GDP in 2030 will reach RMB 151 trillion, with cities contributing 78 percent of the total. The per capita GDP of urban residents will reach RMB 109,000.

Under the MP scenario, with the same urbanisation level as the baseline scenario, but greater government investment in improving city liveability and sustainability, the 2030 urban GDP will reach RMB 110 trillion, up from the baseline scenario. The per capita GDP of urban residents will climb to RMB

112,000.

Under the MMS scenario, with even larger sums invested in improving urban liveability and delivering a multiplier effect yielding a range of benefits, GDP will reach RMB 103 trillion, and the per capita GDP of urban residents will be about RMB 110,000. See figure 3.8.

#### THE COST OF URBAN 'CITIZENIZATION'

Different scenarios indicate varying costs to integrate or 'citize' the 210 million migrants who live in cities but are not registered as residents there. The cost would be over RMB 75 trillion under the MMS scenario, through 2030. For the MP scenario, it would be over 54 trillion, and nearly 49 trillion under the SG scenario. See figure 3.9 and box 3.8 for more details.

#### STABLE CONSTRUCTION RATES

Due to limited land, the growth rate of urban construction is expected to remain relatively stable. Under the SG scenario, the construction area will be 58,400 square kilometres by 2030; under the MMS

### Speed, with gaps (SG scenario)

Under the high urbanisation route, continuous and rapid urbanisation will stimulate economic growth for the foreseeable future. The growth rate will put enormous pressure on basic services, resources and environmental protection. Gaps in urbanisation among regions will widen.

Masses of rural residents will continue arriving in urban areas for at least 10 years; the scenario shows that the national urbanisation level in 2030 will top 71 percent, higher than the baseline scenario. The cost of integrating each migrant into cities will be around 80,000 RMB.

Per capita housing space will remain unchanged, as in the baseline scenario; publicly provided housing for lower-income residents will account for 25 percent of the total. By 2030, 96 percent of urban residents will have access to tap water, and daily per capita water consumption will be 105 litres. No special measures to extend water provision will be taken, compared with the baseline scenario.

### A moderate pace with increased investment (MP scenario)

In the medium urbanisation scenario, the focus will be on improving city residents' quality of life by better responding to various demands. The central Government will invest more in basic social welfare for migrants, and aim to remove barriers to integration.

The urbanisation speed will be about the same as in the baseline scenario, with the overall level touching almost 68 percent in 2030. The per capita cost for integrating migrants will be about RMB 100,000, due to increased access to public services. By 2030, per capita housing space will rise to 40 square metres; public housing will account for about 40 percent of the total. Access to city water will reach 98 percent, with daily per capita water consumption at about 132 litres. There will be increased investment in emissions reduction and environmental protection.

### Moving more slowly, maximizing liveability (MMS scenario)

The low urbanisation scenario assumes a comparatively stable urbanisation speed. Increased investment in all regions will be aimed at improving liveability, household well-being, housing standards and the overall quality of city life. The provision of public housing will increase. More efficient use of resources will be paired with greater investments in reducing emissions and protecting the environment.

National urbanisation will reach nearly 65 percent in 2030, with the cost of integrating migrants at about RMB 150,000 per person. Per capita housing space will rise to 40 square metres; public housing will account for about half the total. Access to tap water will reach 99 percent. Daily per capita water consumption will be 160 litres.

scenario it would be 49,500 square kilometres.

Given continued increases in demand for urban housing under all three scenarios, levels of investment in public housing will affect living standards. Under the SG scenario, the total housing demand will be 33.1 billion square metres in 2030, despite the assumption that the per capita housing area will remain roughly the same. Publicly provided housing, 25 percent of the total, will require an investment of over RMB 20 trillion. Under the MP and MMS scenarios, investments will be RMB 36 trillion and RMB 51 trillion, respectively, due to higher urban housing standards, and a larger proportion of public housing. See table 3.2 and figure 3.9.

## TAPPING WATER SUPPLIES

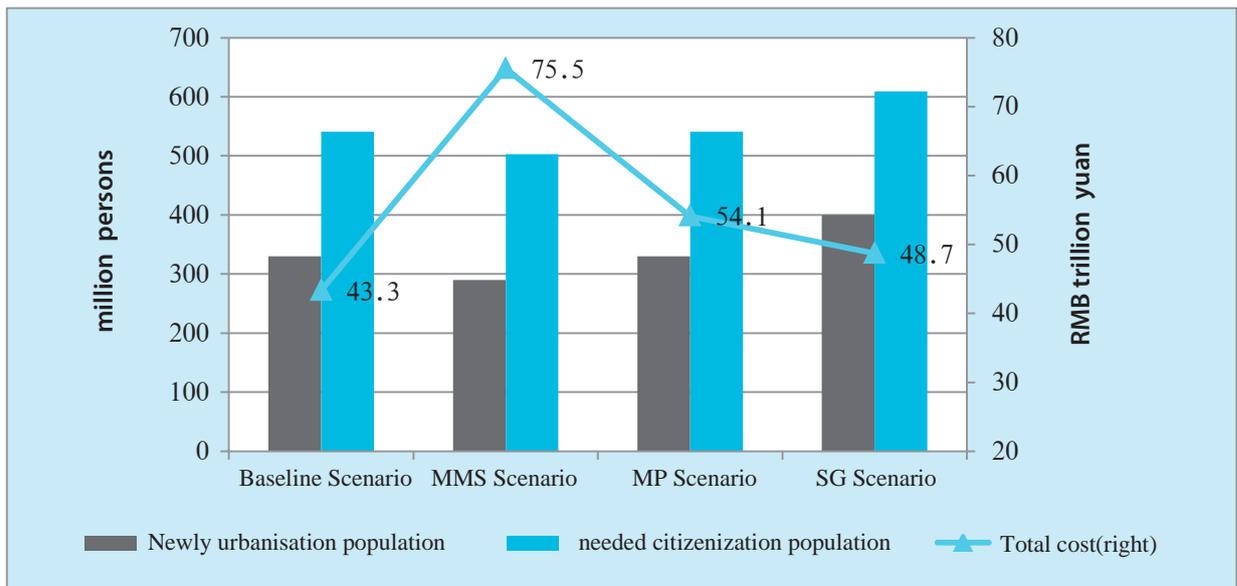
In the future, the share of urban tap water in total water consumption will be slightly larger, third in size after agriculture as the largest user<sup>35</sup> and industry as the second largest. Sustainable development will require more efficient urban water consumption; improved liveability implies increased per capita supplies.

Key drivers of urban tap water demand include the number of city residents and per capita daily consumption for residential and other uses. The scenarios refer to these with assumptions based on 'Standard of Urban Residents Water Consumption' (see statistical appendix, table 23).

**Figure 3.8** Urban GDP and per capita GDP projections, various scenarios



**Figure 3.9** Cost of urban citizenization projection, various scenarios



Under the SG, MP and MMS scenarios, total urban water demand trends are basically the same as in the baseline scenario, but vary in terms of their drivers. The MP and MMS scenarios predict that by 2030, total urban tap water demand will be 71 billion cubic metres and 75.8 billion cubic metres, respectively.

This will be more than under the baseline scenario, due to greater per capita daily consumption. The total under the SG scenario will be 62.5 billion cubic metres, due to increasing urban population. See figure 3.11.

## INVESTING IN CITIES

Urbanisation will boost investment demands in many areas. Given data availability, this report only

focuses on total investments in urban fixed assets, such as machinery, land, buildings, installations, vehicles and technology, as a good indicator of overall demand.

### Box 3.8: How much to become an urban resident?

The integration of migrant workers in China's cities comes with public and private costs, covering those related to identity, status, values and social rights, as well as economic integration.<sup>29</sup> Governments pay for additional city infrastructure, social security and public administration. Private costs include those for living, education, housing and social security.

Limited research on costs, mainly public ones, produces different conclusions. In studying sustainable development, for example, the Chinese Academy of Sciences suggested it costs RMB 25,000 for a migrant worker to become an urban resident.

Zhang calculated the cost for 43 cities in China. The results indicate that the cost for the first generation of migrants in the eastern coastal region is RMB 98,000, and RMB 86,000 for the second generation. In inland areas, the cost is only RMB 57,000 and 50,000 for the first and second generations, respectively.<sup>30</sup>

According to the China Development Research Foundation, the average cost is RMB 100,000. If China intends to integrate 400 million migrants by 2030, to reach an urbanisation rate of 65 percent, it will need to spend RMB 2 trillion every year.<sup>31</sup>

The Development Research Center of the State Council surveyed costs in four cities: Chongqing, Zhengzhou, Wuhan and Jiaying. It calculated a figure of RMB 80,000 per person, but noted this dropped to about RMB 46,000 per person after removing the long-term expenditure of pension insurance.

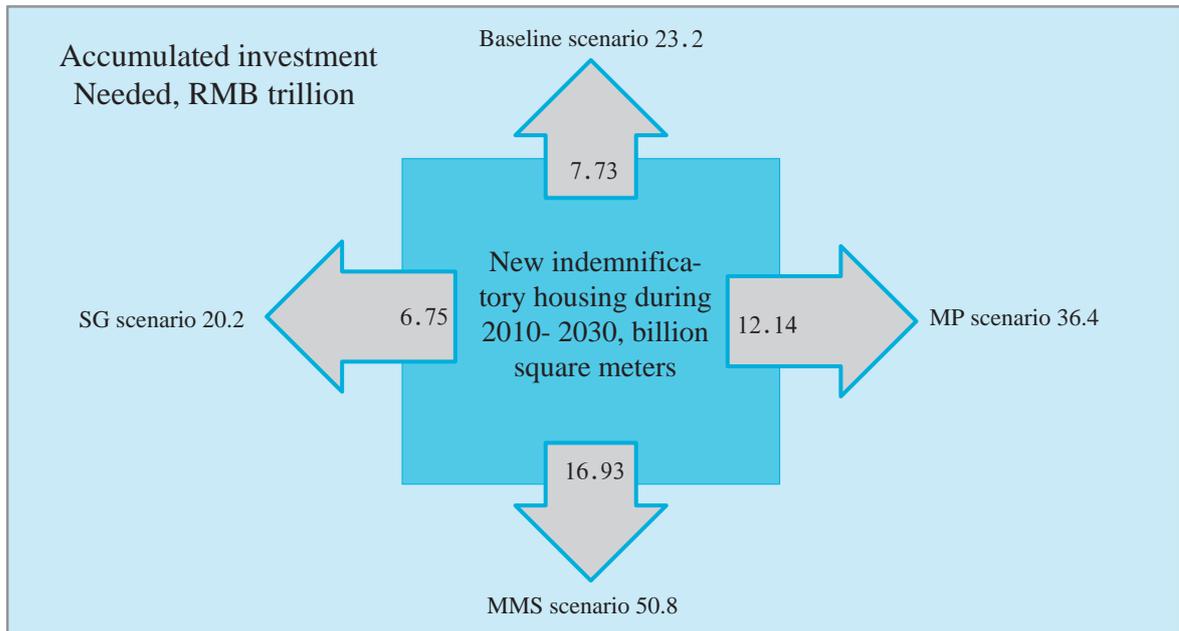
China City Development Report 2012, released by IUE-CASS, suggests that about 500 million migrant workers will become citizens in the next 20 years, at a cost of RMB 40 to 50 trillion, about RMB 2.5 trillion every year.<sup>32</sup>

One survey on the private costs for migrants was conducted by the Institute of Social Sciences and the Forestry Administration of Guangzhou. It indicated that a migrant worker will spend RMB 1.3 million on clothing, food and transportation to become a citizen of the city.<sup>33</sup>

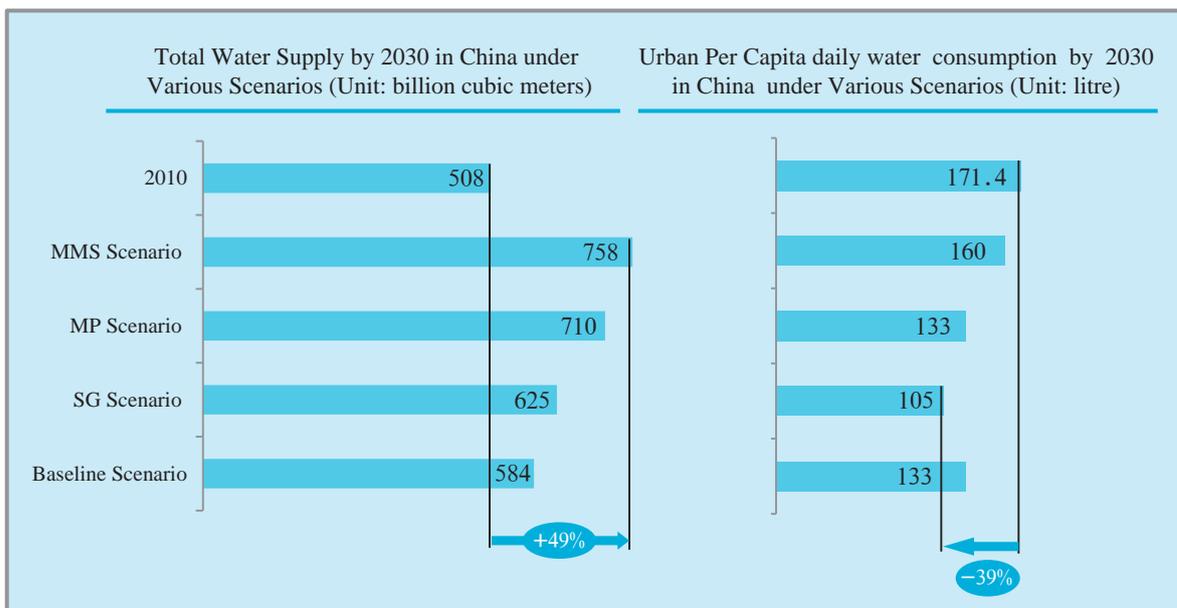
**Table 3.2 Housing assumptions and projections, various scenarios**

	Baseline scenario	SG scenario	MP scenario	MMS scenario
Per capita building space in urban area in 2030 (square metres)	31.6	31.6	35	40
Urban housing demand in 2030 (billions of square metres)	30.85	33.15	34.16	36.9
Coverage of low-income housing <sup>34</sup> (%)	30	25	40	50
Added low-income housing from 2010 to 2030 (billions of square metres)	7.73	6.75	12.14	16.93
Cumulative investment demand (trillions of RMB)	23.2	20.2	36.4	50.8
Annual new investment demand (trillions of RMB)	1.2	1	1.8	2.5

**Figure 3.10** Investment in indemnificatory housing construction, various scenarios



**Figure 3.11** Total urban water supply and per capita daily water consumption, various scenarios



The simulation results affirm that investments will increase with urbanisation, with a stable rise in the proportion of GDP. Most will focus on infrastructure and improved public services, as well as technical innovations.

Total investments can be divided into two parts—new construction, and reconstruction and technical transformation. When developing the alternative scenarios, it was assumed that new construction

would be closely connected with urban expansion.

For total investments, the SG, MP and MMS scenarios all exceed the baseline, with a maximum of about RMB 92.3 trillion under the MMS scenario, which is about three times higher than the 2010 level, and a minimum of RMB 89.7 trillion under the SG scenario. The ratio of investment to GDP is highest under the MMS scenario, about 68 percent, and about 8.5 percent higher than 2010 level. Under the MP and SC

scenarios, the numbers are 63 percent and 61 percent, respectively. See figure 3.12, and box 3.9 for an example of current investment.

aim to enhance the overall efficiency, effectiveness and equity of urban systems, and mobilize national resources to balance economic and social development, and responsible environmental stewardship.

### Optimizing urbanisation

Under the baseline scenario in this report, China will have 980 million people living in cities by 2030, with a total GDP of RMB 132 trillion. To successfully negotiate a time of rapid changes, it will need to carefully select national policies and measures. These could

Each of the scenarios discussed in this report—for high, medium and low urbanisation—has its pros and cons. In general, a greater rate of urbanisation under the SG scenario will speed economic development, but put more strain on growing cities, through greater demands for land, water and energy, as well as serious pollution and traffic jams. These pressures are less significant under the MMS scenario, where

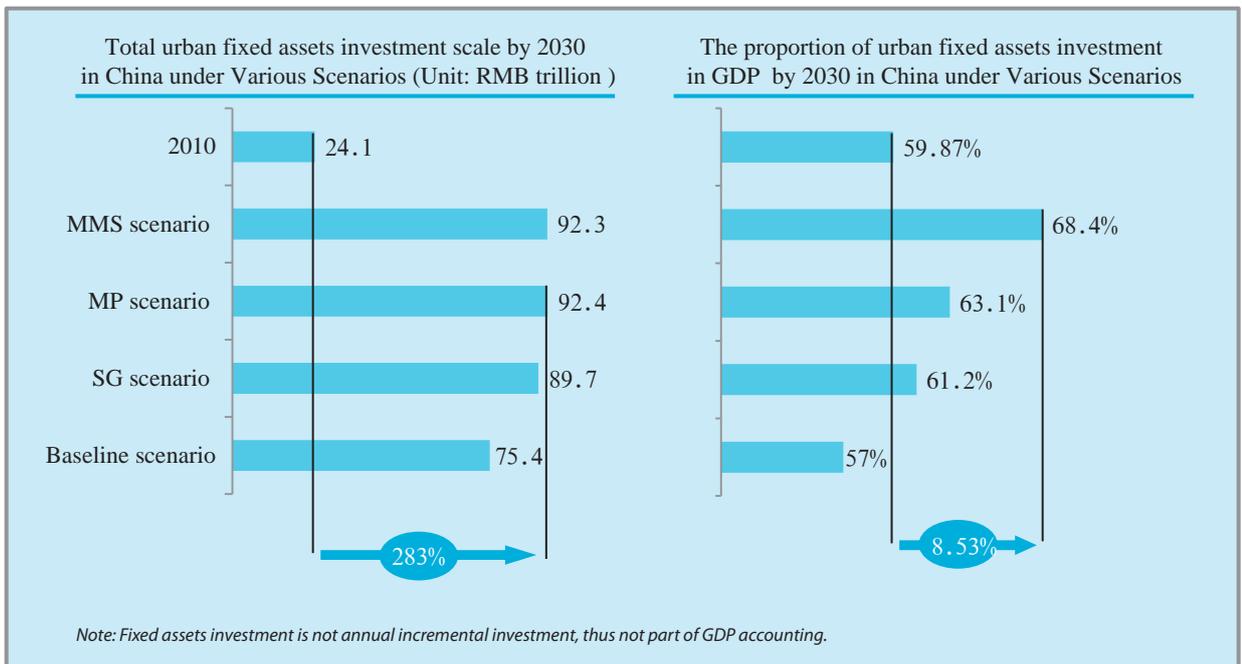
**Box 3.9: Designing an eco-city**

The Sino-Singapore Tianjin Eco-city is a joint Chinese-Singaporean project to establish a harmonious, environmentally friendly city in China. The Tianjin Municipal Government has set up an Eco-city Management Committee to oversee coordination between the new Eco-city zone and the rest of the city, taking advantage of the Binhai New Area’s business growth and experimental economic reforms, while drawing on Singapore’s public administration and operational management experience.

The Eco-city utilizes the first smart power grid in China, and requires 100 percent waste treatment and at least 20 percent renewable energy usage from its service providers. The city’s design incorporates human-scale elements such as bike rental hubs and a pedestrian-friendly layout. A Joint Coordination Council cultivates strong links with academia, and prominent domestic and foreign experts conduct research on urban planning and applications of new technology. More than 20 research units and professional design institutes have served as consultants. Green business development has encouraged nearly 900 enterprises and around RMB 66 billion in investments.

*See appendix for more information.*

**Figure 3.12** Total urban fixed assets investment scale and percentage of GDP, various scenarios



improved quality of life for residents will be achieved by increasing the efficient use of resources and guaranteeing livelihoods, albeit with a requirement for significant investment.

The most realistic pathway may entail a compro-

mise between the quality and scale of urbanisation. Moderation, in short, is the key to cities that are both sustainable and liveable. One key factor is the need for paths forward that are more participatory and people-centered.

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21. National Bureau of Statistics of China, 2011, "China City Statistical Yearbook 2011," China Statistics Press, Beijing. Urban GDP mentioned here equals to the total of GDP of municipal districts from all the cities.
22. Economic index prediction results are based on 2010 prices.

23. Per capita urban GDP of this report is calculated as the sum of the GDP of municipal districts divided by the total urban population.
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35. See endnote 2.



## CHAPTER 4

PATHWAYS TO BETTER CITIES,  
BETTER LIVES

## Key Messages

- Urbanisation is more than increased city size; quality urbanisation involves transforming rural-urban relations, industrial structure and the living environment.
- Equal access to public services is essential to integrating people within cities.
- Urban planning could manage resources for people now and in the future, balancing these against environmental capacities; low-carbon development should be a primary goal.
- Local governments can encourage public participation and regularly disclose information.
- Performance monitoring of urban governance could move from its emphasis on economic growth to incorporate indicators for resource conservation, environmental protection and social development.

Urbanisation in China offers immense opportunities if it is oriented around sustainable, liveable cities. As rural workers move to cities, they could add to a more productive labour force. The quality and efficiency of economic development could increase, and both investment and consumption could rise. People could enjoy more freedoms and choices, and better quality of life through equitable and adequate public services.

In setting out a path of strategic transformation, cities need to improve development performance, and participate and compete in the global economy, while at the same time increasing urban quality of life. Urban governance can adapt to the requirements of the market economy, and strike a sustainable balance between the use of resources and protection of the environment, including by adopting low-carbon development. Fostering unique urban cultures, such

as through the protection of historical heritage, and innovations in the pursuit of an ecological civilization and the governance framework, have proven value, and could be integral to urban planning.

## *Toward Sustainable and Liveable Cities*

Industrialized countries, especially in Europe, have accumulated valuable experiences over decades of urbanisation, comprising the parallel development of large, medium and small cities, and small towns. They do well in managing the transformation of old cities, constructing new ones, protecting the environment and cultural heritage, and continuously improving urban management. Their experiences could be studied for insights that could be relevant and adapted to China's context to inform the future development of its cities. A careful selection of the pros and cons of these experiences would be a worthwhile endeavour to help China enrich its urban experience with more people-centered and culture-based approaches.

China's development goals include urbanisation, industrialization, informatization and agricultural modernization.<sup>1</sup> Sustainable and liveable cities can contribute to these, as well as to balance and coordination among them. In this, urbanisation needs to be understood as more than simply increasing city populations and sizes. Quality urbanisation involves transforming rural-urban relations, industrial structure and the living environment. While each city will need to find its own path, based on local specificities, there are several broad issues to consider moving forward. In the sections that follow, a number of suggestions are made for the many options and available measures that could help China's urbanisation not only continue to be a major driving force for its future socio-economic development but also the key for improving human development.

### **SOCIAL MEASURES**

- Equal access to public services is essential to inte-

grating people within cities. Further, cities realize their full value when services enhance the quality of life for disparate groups of residents. Monopoly concentrations of urban resources need to give way to balanced distribution. This will help reduce large-scale intra-city and inter-city population movements, traffic congestion and environmental pollution, and contribute to rational urban layouts. It will foster a caring, stable society, where individuals feel they belong, are valued and can realize the potential of their lives.

- Services need to be accessible in two respects. Facilities such as parks, schools and commercial services must be located so that people can reach them. Public services also need to account for diverse demands and changing needs, such as from the growing number of migrant children who need to attend schools. These requirements should influence service distribution.
- To ensure public safety, services need to mitigate the impacts of natural disasters, reduce threats from fires and traffic accidents, and improve food safety. Social security systems help cushion the blows of health, employment or other crises that affect individuals and families. They could encompass social insurance, relief and welfare provisions, special care and placement, and mutual aid.

### **ECONOMIC MEASURES**

- Adjusting the industrial structure is important to address the challenges of a poor agricultural foundation, industries that are large but weak, the lagging service sector and overcapacity in some industries. The contribution of heavy industry to GDP has exceeded the peak value of industrialized developed countries.
- With government support, the service industry can grow to provide more jobs and relieve the burden of unemployment. Full use should be made of consumption and investment demands driven by urbanisation, with a focus on broadening the service industry. Given China's population of 170 million elderly people, with this number growing year by year, one necessary option is to develop care services. Other measures could

entail expanded health and education services, including for the elderly.

## GOVERNANCE MEASURES

- To best manage sustainable, liveable cities, urban governance needs to move from the present government-dominated model to one that emphasizes public participation. Experiences in many developed countries provide options for consideration. Governments could encourage public inputs to urban planning, construction and management, and regularly disclose important decisions, arrangements and policy measures as part of the public right to information.
- Active citizens could help in meeting public demands and diversifying modes of service provision, particularly as incomes rise and residents' expectations grow. City governments could consider incentives to encourage private and civil society forces to participate in meeting service demands.

- To better balance economic and environmental priorities, local governments need to end their heavy dependence on land transference fees for financing. City expansion must be grounded on the 'carrying capacity' of resources and the environment, while cities embrace innovation and scientific developments to move towards green, low-carbon, energy efficient development.

## ENVIRONMENTAL MEASURES

- Municipalities will need to better protect and manage the environment, in line with national policies. This could involve reducing noise, managing solid wastes, recycling and protecting water bodies, among other issues. Resources should be more efficiently used, particularly given widespread energy shortages that may continue to grow given the influx of people from rural areas.
- While climate change poses threats to urbanisation, cities have yet to adopt mitigation or adaptation policies. One useful step would be to sys-

### Box 4.1: Bicycles improve health and well-being in Hangzhou

One of the best solutions to urban transportation problems is to encourage alternative forms of travel, particularly bicycles. Prevalent use of bicycles not only reduces emissions and alleviates traffic, but improves health and well-being by promoting an active lifestyle. Cities can promote this form of travel by creating safe bike paths and providing public bicycle rental stations.

Hangzhou has one of the best public bicycle networks in the world, with public rental stations located throughout the city. Its public transportation network is well-integrated, with bike stations located close to bus stops and water taxi depots.

*See appendix for more information.*

### Box 4.2: Coordinating public services in Ningbo

Between 2006 and 2010, the government of Ningbo formed a comprehensive multi-level system to coordinate public services for residents, such as those for social security, social assistance, health and family planning, employment, ageing and land management. Public information channels help match the needs of residents with service providers, an approach that has received wide acclaim.

In December 2006, Ningbo launched a trial operation called the 'interconnection community', a self-service information platform guided by the government. It connects community residents with public commerce and service systems, and establishes a virtual community where residents can discuss and solve mutual problems. The prototype has since been extended to more than 3,000 communities throughout Beijing, Dalian, Jiangsu, Hainan and other provinces.

*See appendix for more information.*

tematically assess and manage opportunities and risks, across different climate and socio-economic dimensions. Another would be to encourage climate-related innovation in development strategies. Experiences in Hangzhou and Ningbo are worth studying; see boxes 4.1 and 4.2.

## EQUITY

- To reduce the destabilizing impacts of economic disparities, cities need to move from social polarization to social integration. In particular, the unjust treatment of migrant workers should end, starting with their full integration in the social security system, equal rights to education for their children, and laws and regulations to protect their rights and interests.
- Recent reforms to the household registration system to allow people to change from rural to urban permits show the way forward.<sup>2</sup> Cities at all levels could ease the transfer to urban residency based on their own capacity and development potential, and consider equality in access to public services and the improvement of social management. Cities could also extend specific assistance to empty-nesters, children left behind, and people facing gender and other forms of discrimination.

## URBAN PLANNING

- The transition from building more to building better calls for cities to embrace quality development, including through sound urban planning. This rests on effective management, with the ca-

pacities to address the mix of new and old problems that have come from rapid development. Improved awareness among local decision-makers and refined performance evaluation systems for local governments could strengthen planning.

- Planning could manage supplies of housing, livelihoods, transportation, public services, culture and leisure activities for people now and in the future, and balance these in terms of city resources and environmental capacities. It could encompass the active promotion and strategic management of the integration of urban and rural areas, such as by guiding industries to concentrate in industrial parks; protecting and maintaining historic architecture; encouraging people's participation and civic engagement in city management; and ensuring that better urban landscapes improve the living environment. See box 4.3 on green building in Shenzhen.
- The scale of urban cluster could be scientifically defined and distributed to promote a reasonable division of labour, complementary functions, and intensive development of cities of all sizes as well as small towns.
- Building standards need to improve, including for shantytowns, and be geared towards expansion as well as the maintenance of existing structures. Historical buildings and other relics require protection and repair. More attention could be paid to ensuring adequate and affordable residential housing; appropriate electricity and water supplies; available shops, schools and hospitals; updated infrastructure and information technology;

### Box 4.3: Green building in Shenzhen

Shenzhen has adopted many measures mandating green building techniques within its city limits. By requiring new construction projects to adhere to these standards, by 2011, Shenzhen's energy conservation measures covered 60.88 million square metres of buildings; 11.12 million square metres of building space used solar power. Citywide, total energy saved had reached 2.753 million tons of coal equivalent, a reduction of 8.66 billion kilowatt hours of energy use and 7.148 million tons of carbon dioxide emissions.

Shenzhen recently won five national awards as a green building pilot demonstration city, making it a model for other municipalities. The main building of the Shenzhen Institute of Building Research is China's most advanced green building, reducing yearly conventional power consumption by 66 percent compared to more typical buildings.

*See appendix for more information*

and a clean environment with green spaces (see boxes 4.4 and 4.5).

- Speeding up construction of public housing could redress disparities, where some people live in shantytowns and others in luxury high-rises. It could also support economic development and livelihoods, and contribute to environmental sustainability through measures such as energy efficient technology.
- Planning and construction processes could account for people's needs for comfort, convenience and visual aesthetics in defining the size and appearance of buildings, the width of roads, street landscapes and so on. Strong coordination between natural and artificial environments creates a pleasant environment that meets residents' physical and psychological needs. Green spaces, water bodies and other natural resources can be improved and increased, and integrated with artificial elements such as roads, buildings and facilities
- Solving traffic congestion is essential. This entails integrating urban transportation planning into overall urban planning; reducing demands for private cars as far as possible; and developing arterial road infrastructure, including environmentally friendly high-capacity systems..

In sum, several issues are particularly important for sustainable and liveable cities. Nationally, China needs to progressively transform systems to allow rural dwellers to become urban residents; improve the quality of education, pensions, health insurance and vocational training; and reduce economic disparities.

On the city level, municipalities need to recognize carrying capacities, speed up the integration of urban and rural areas, expand urban green areas and public spaces, reduce per capita emissions and promote technologies required to become digital cities. An urban public culture could be fostered and cultural inheritances protected. Suzhou and Genhe have been successful in fostering urban liveability, and can serve as reference points for other cities; see boxes 4.6 and 4.7.

## How Can City Governance Change?

Beyond being a place to live, a city has the potential to enhance human development by concentrating productive activities, innovation and socio-cultural contributions. These attributes are also challenges as cities seek to manage public spaces, resources and affairs, in light of the demands of diverse groups in the short and long term. Constant improvements in city governance determine whether or not the growth, combination and transmutation of various city potentials will productively contribute to economic and social development.

China has yet to fully consider how city management structures could change to support sustainable and liveable cities. The existing systems for household registration, land management, social security, finance and taxation, and administration will likely maintain current interests and imbalances between

### Box 4.4: Scaling up green spaces in Tehran

Tehran, a desert city with a population of more than 12 million, has significantly scaled up its green spaces. In the past two decades, the Tehran Parks and Green Space Organization (TPGSO) has established 1,500 new parks, 7,000 hectares of urban forest, 35,000 hectares of peri-urban forest and many green corridors along the city's highways. These improvements have had broad benefits, including better pollution regulation, city beautification and noise control.

Recognizing that the city's environmental issues cannot be solved by municipal action alone, TPGSO has also established public education programmes to train green space experts, and disseminates pamphlets and literature. City residents now rank destruction of green space as the second most serious environmental problem facing the city, behind air pollution.

*See appendix for more information.*

### Box 4.5: A high-tech building demonstrates how to save energy

Since 1994, the Chinese Academy of Engineering has researched different dimensions of sustainable development. It brings together new thinking on industry, ecology and economic development, offering evidence to assist Chinese policy makers.

In 2002, the academy began developing its main facility in Beijing. Scientific energy saving and environmental friendliness were primary construction objectives, entailing the systematic integration of energy efficiency measures. So far, these have resulted in annual reductions of 265.2 tons of carbon dioxide emissions, and the conservation of 340,000 kilowatt hours of electricity, 6,900 tons of water, 661.1 gigajoules of heat and 112.2 tons of coal equivalent.

Measures to reduce heat loss have included thicker insulation in the walls and windows made of low-radiation, double-hollow, self-cleaning glass and aluminium-clad wood. The green space around the 23,000-square-metre building is approximately 15,000 square metres, which increases ambient humidity and in the summer helps reduce air temperatures.

More than 20 technologies raise water, electricity, gas and clean energy efficiencies. In sentry boxes, for example, thin-film solar cells generate and store power during the day and illuminate the boxes at night. Throughout the facility, intelligent lighting systems automatically adjust brightness according to operational needs. The heating system incorporates waste heat recovery measures, and is connected to the municipal heat exchange system. Better water management comprises a rainwater collection system as well as a recycling process that can handle up to 20 tons of wastewater per day.

To optimize energy conservation, the academy and a company cooperatively developed an energy efficiency management platform with advanced sensing, information and control technologies. It collects data on working conditions, ambient environment and user demands, maximizing energy and resource efficiency, while maintaining a comfortable workplace and ensuring equipment operation.

The academy has also disseminated public information on the building's conservation achievements to foster awareness of energy-saving behaviour, and broadened education by introducing training for energy efficiency management engineers. It sees the building as a display platform for enterprises engaged in research and development on new energy-saving building technologies.

### Box 4.6: Genhe's history of balancing the economy and environment

The city of Genhe has long tried to balance economic and environmental imperatives, such as through protecting the urban drinking supply and ensuring the quality of water in nearby rivers meets local standards. The city encourages scientific and technological innovation to drive development. Businesses must balance the use of resources with replenishment, contributing to sustainable ecological, economic and social benefits.

Several years after the implementation of the Natural Forest Protection Project, 3.8 million cubic meters of woodlands have been preserved, and forest cover has increased from 75 percent to more than 87 percent.

*See appendix for more information.*

urban and rural areas, and restrict the progress of the citizenization of rural migrants, and integration of cities and the countryside. Strategic city planning and development will be ever more important as urbanisation continues to accelerate, pressuring resources, services and the quality of life. Local governance as a whole will have a great impact on economic development, energy use, changes in climate and social stability, with implications for China as well for the

rest of the world.

Moving towards sustainable and liveable urbanisation involves particular attention to enhancing public participation in governance, decentralizing from the monopoly allocation of resources by the central Government, deepening social integration, strengthening the rule of law and transparency, and consistently applying standards and upholding account-

### Box 4.7: Protecting cultural heritage in Suzhou

Suzhou is famous throughout China for its history and culture. A popular saying goes: “Paradise in heaven, Suzhou and Hangzhou on earth.” Suzhou has 2,938 cultural heritage items, with six included in UNESCO’s “Representative List of the Intangible Cultural Heritage of Humanity.” These include Wuge, an oral literature tradition in the Wuyu dialect; Kunqu, one of the oldest traditional operas; Pingtan, performances that carry on the literary, artistic, linguistic, ethical and sociological traditions of Jiangnan culture; and Suzhou embroidery, characterized by colourful threadwork.

Suzhou is also renowned for its classical gardens, 60 of which have been preserved. Nine have been classified as World Heritage Sites, and the Humble Administrator’s Garden has the highest rating of 5-A in the national tourist attraction ranking. Given its long and respected past, Suzhou has been declared one of 24 Historical and Cultural Cities by the Chinese State Council, ensuring that its unique features will not be lost.

*See appendix for more information.*

ability. Ultimately, all stakeholders need to be able to participate in planning and sharing the benefits of sustainable and liveable cities.

## Foundations for transformation

Urban governance is a complex process, with a variety of management models oriented around interactions among local officials, enterprises and city residents. Coordination instead of command or control is required to manage these interactions, recognizing the interdependence of diverse actors.

A number of industrialized countries have adopted ‘small government, big society’ models that Chinese cities could consider. These emphasize the shared responsibilities and participation of multiple stakeholders in urban development, including governments, enterprises and citizens. China’s reforms are now helping to shift municipalities from ‘management’ to ‘governance’, breaking the traditional mode of the planned economy and gradually introducing concepts of market mechanisms. The local government is becoming more of a ‘referee’. In the case of the Sino-Singapore Tianjin Eco-City, the Chinese and Singaporean governments developed it as a model of a sustainable and liveable city. It fosters participation and the application of market concepts (see box 3.9).

Overall, however, many aspects of urban management in China need improvement. There are weak-

nesses in public service delivery, and inadequate attention to the diverse needs of stakeholders and the degree of public participation. Given China’s urbanisation challenges, key elements in assessing municipal governance are whether or not the city has followed objective laws and an appropriate pace of urbanisation, whether or not it adheres to the aims of sustainability and liveability, and how it addresses its own unique problems.

Closer alignment with sustainable, liveable urban development requires several basic commitments from city management. As a foundation, municipalities should protect citizens’ basic rights, including those of migrant workers. All people within city borders should enjoy the right to work, access social welfare, get an education, obtain health care and receive other social benefits.

Cities must deepen the move from government guidance to public management, and from resource monopoly by a few to a more balanced distribution. This entails actively developing avenues for participation by enterprises and citizens whenever possible and applicable, and listening to demands from a wide variety of multiple stakeholders, including vulnerable groups, in developing and implementing plans and programmes.

Adequate planning and programmes further depend on improved government management of public affairs, enhanced systems for programme implementation, close attention to the choice and

execution of goals, and systems for communication and feedback across government entities. Consultations with experts from a cross-section of disciplines could be encouraged as part of serious, scientific decision-making.

Improved laws and legal safeguards could include statutes on urban and rural planning, environmental protection, renewable energy, public information and so on. Once adopted, laws need to be strictly enforced.

Stronger monitoring and feedback depends on deepening NGO and citizens' participation, contributing roles by the media, and effective supervision of administrative departments by the National People's Congress and the Chinese People's Political Consultative Conference.

## *Shifting roles and responsibilities*

The successful move towards sustainable and livable cities in China depends in part on breaking through regulations that currently restrict capacities for innovation in public management and the participation of multiple stakeholders. These require revision, on the understanding that urban governance is not a set of regulations, but a continuous interactive network. Municipalities require room to balance social costs and benefits of economic growth, manage public goods and improve needed management abilities.

Reforming city management involves changes in government functions to manage the range, methods and measures of urban development. China has already begun a shift from unlimited, direct interventionist governments to limited, service-oriented governments, with a greater emphasis on innovation. The main functions of city governments are becoming the management of urban ecology, human settlements, infrastructure, culture, and the management of public goods and services.

One important responsibility for governments is continued intervention and investment to ensure that China improves its skills and quality of education. This is essential as the move to an ageing society means fewer working-age people will be available for physical labour. Another key responsibility is for investments in culture-related priorities, which include the preservation of historic urban areas as well as cultural services and infrastructure (see box 4.8).

As part of the process of change, government responsibility in urban governance should be well defined and supervised, including in terms of government roles in managing public goods and services. Market incentives and private sector management tools could be introduced in the public service. Gradually, governments could withdraw from involvement in enterprises that can be run by the private sector. Efficient public policies, clear property rights, effective strategic planning and the fair allocation of public resources will be important steps.

Other important inputs entail equipping citizens for collective action and fostering relationships among stakeholders. An equal, cooperative relationship between government and civil society depends on broadening channels for public participation. City governments should take full consideration of public opinion, such as by mobilizing public contributions to policy-making.

Information about what takes place within governments should be widely available, a process that could be helped by loosening media regulations, and further deepening and widening public participation. Investment on civic education could encourage citizens to overcome passive attitudes and embrace the value of public participation.

Stronger public participation in particular requires cultivating the abilities of NGOs. These groups can be more flexible than government organizations. They have played important roles in community culture, environmental protection and assistance to vulnerable people. Some well-known international NGOs have made significant contributions in disseminating advanced environmental protection concepts,

### Box 4.8: Cultural planning for urban sustainability

During China's dramatic economic development and massive urbanisation, sustainability and liveability are rightly being embraced as essential goals for survival and quality of life. Living culture and creativity are not adequately considered, however.

In cities around the world, the relation between culture and sustainability is now widely integrated in urban planning practices, and reflected in many international planning and policy documents. Culture has not only been recognized as the fourth 'pillar' of sustainability, but it is also often characterized as the 'glue' that binds the other three (social, economic and environmental). The four-pillar model of sustainability recognizes that a cultural perspective in planning and policy-making is critical to empowering local residents to participate in them. The approach can be applied with equal effectiveness to considerations of China's current challenges and future well-being. It implies that China's understanding and practice of urban planning should expand beyond land use, physical structures, heritage and culture, and economic functions to include cultural and social planning

China, like other countries, requires a significant shift both nationally and locally to educate and engage its governments, institutions and population on the urgent need to achieve both sustainability and liveability. This requires creativity at every level. The central leadership could help by authorizing and prioritizing such a national imperative. Individuals and communities must also be engaged and empowered to create and contribute sustainable solutions. Training in cultural planning and management of cultural resources, and the integration of this practice in urban planning and management could be important new tools.

A singular advantage to an inclusive and incremental cultural planning process is that it offers a guided opportunity to build a shared vision and implementation plan related to culture and sustainability—and a full spectrum of other objectives. Cultural and social planning processes help both governments and citizens to acquire and practice necessary goal-setting and collaboration skills. They could even assist in articulating a collective vision for a new 'China Dream'.

The multidisciplinary nature of sustainable development requires that policies transcend boundaries and integrate culture into new and existing community-building and development plans, ensuring that culture is reflected particularly in policies related to the economy, environment and social cohesion.

and building awareness and capacities (see box 4.9).

But China's regulations have not kept up with the potential of NGOs. A dual management system for registration requires groups to be supervised by both the Ministry of Civil Affairs and a relevant government department. Many cannot obtain registration because they cannot find appropriate government departments, or because the departments constrain their ability to work independently. Regulatory changes will be required related to registration as well as taxation, fund-raising and social transparency.

### Monitoring performance

The current performance evaluation system for local governance is focused mainly on economic growth, with little attention to resource conservation, envi-

ronmental protection and social development, and there are no incentives for sustainable planning and development. The current system of organizations and regulations has given the government great discretionary power, and failed to establish checks and balances, and systems of monitoring and supervision. This often leads to the 'principal agent problem' for state-owned assets.<sup>3</sup>

Better monitoring would start by giving multiple stakeholders the right to offer feedback on government performance, allowing the private sector to engage in the competitive supply of public goods and services, ensuring a legal environment for fair competition, and reasonably configuring city resources (land, space, financial and operating rights, etc.) so they are broadly available. There could be clear provisions on government roles and functions, and brakes on the single-minded pursuit of large-

## Box 4.9: WWF China's Low-Carbon City Initiative

In 2007, Worldwild Fund for Nature (WWF) China established the Low-Carbon City Initiative to explore alternative urban models and avoid the 'lock-in' effect from entrenched fossil-fuel energy systems. Baoding and Shanghai became pilot cities.

The Baoding project has focused on developing information exchange networks and building capacity in renewable energy policy, strategy and investment; presenting recommendations for low-carbon development planning to the municipal government and industrial sectors; and offering technical assistance to government agencies for baseline, monitoring and management systems. The project has led research on renewable energy industry planning, and developed an action plan for low-carbon development, green construction, greenhouse gas inventories, and carbon emission management and monitoring systems.

Over the past four years, the low-carbon industry of Baoding has grown over 40 percent annually and is now a provider of global climate solutions. With strong support from local government, in 2008 Baoding became the first city in China to surpass its carbon intensity target, projecting a 51 percent reduction in carbon dioxide emissions per unit of GDP by 2020 over a 2005 baseline; the national target is 40-45 percent. In 2010, the Chinese Government selected Baoding as a National Low-Carbon Pilot City based on its outstanding progress. By 2012, Baoding had become one of the first cities to develop its carbon inventory.

The Shanghai project has emphasized improving the energy efficiency of large commercial buildings by establishing an energy auditing system, developing energy efficient building policies and producing the first NGO version of the 2050 Shanghai Low-Carbon Development Roadmap.

The Low-Carbon City Initiative is now exploring methodologies that can be replicated in an expanded number of Chinese cities, recognizing that cutting carbon in urban areas could make significant contributions to curbing greenhouse gas emissions overall.

In general, WWF China has promoted low-carbon urban development from both the supply side, in terms of expanding renewable energy, and the demand side, such as through energy efficiency in buildings, transport and industry. Guidelines have highlighted the roles of businesses and commercial stakeholders, while public campaigns in approximately 20 cities promote a low-carbon lifestyle.

scale, high-speed urbanisation, without regard to social and environmental consequences.

Urban governance monitoring tends to involve top-down and bottom-up systems. Both can add value. In terms of the former, the central Government could further strengthen monitoring related to broad participation in planning; the supervision of programme implementation; feedback for timely warning of illegalities, and the prevention and reduction of losses; the conservation of natural resources; and the implementation of scientific and democratic decision-making in local government.

Bottom-up mechanisms could encourage feedback and supervision from businesses and civil society. Laws and regulations could support engagement in budgeting, defining, for example, where public or expert consultation is necessary for approving funding. Cities could encourage the formation of social

networks and codes of ethics, and permit individuals or social groups to legally contest illegitimate practices such as corruption.

The current GDP-based approach to performance evaluation needs to be reformed by introducing the many additional dimensions of sustainable and liveable cities, such as the balanced use of resources, energy conservation and the fair distribution of services. Over the past two years, most local governments have begun exploring different forms of government performance management. Widely used tools developed within China include the target responsibility assessment, performance evaluation of government departments, moral councils and citizens' councils. Innovations adopted from other countries comprise the Balanced Scorecard, 360-degree assessments, the performance prism, the generic assessment framework and benchmarking. In June 2011, the State Council approved performance management

pilots in several cities and areas towards accumulating experiences for broader replication.<sup>4</sup>

In 2004, the Ministry of Human Resources and Social Security (the previous Ministry of Personnel) studied government performance evaluations inside and outside of China, issuing the first report on reforms and experiences among local governments. The report identified six typical models, encompassing the overall advancement of performance appraisal model in Qingdao, Shandong Province; the strategy-oriented performance evaluation model in Pizhou, Jiangsu Province; the target responsibility system in Guizhou Province; the trinity performance evaluation model in Nantong, Jiangsu Province; the results-oriented model in the Yangpu district of Shanghai; and the cadres performance evaluation mode in Luoyang, Henan Province. The report presented a local

government performance evaluation index system with three levels of indicators (see table 4.1).<sup>5</sup>

Cities can learn from each other in designing and implementing performance evaluation systems. But it is important to have indicators that best reflect local conditions. These could measure current issues, and factor in long-term economic, environmental and social goals that support sustainable development. A formal system of laws and regulations goes beyond random checks to help ensure regular evaluations are appropriately supervised and implemented.

Any assessment system aimed at sustainable, livable cities maximizes public interests. It should be people-oriented, and based on long-term, sustainable development objectives. Experts and the public should participate in its design and implementation.

**Table 4.1: Chinese local government performance evaluation index system**

	First level	Second level	Third level
Government performance	Inputs	Economy	GDP per capita, labour productivity, proportion of foreign investment in GDP
		Society	Average life expectancy, percentage of income spent on food, average education level
		Environment and demography	Percentage of environmental and ecological loss in GDP Proportion of non-agricultural population, natural population growth rate
	Functions	Economic regulation	Growth rate of GDP, registered urban unemployment rate, fiscal balance
		Market supervision	Improvement of laws and regulations, enforcement of law, corporate satisfaction
		Social administration	Proportion of people in poverty, crime rates, mortality rates due to traffic and work-place accidents
		Public service	Availability of infrastructure, openness of information, citizen satisfaction
	Potential	State-owned company management	Hedge rate and value-added rate of state-owned assets, proportion of other state-owned assets in GDP, value-added rate of realized profits in state-owned enterprises
		Human resources management	Proportion of bachelor degrees or above, the education level of executive team
Corruption		Number of corruption cases, score of public appraisal	
		Administrative efficiency	Percentage of administrative expenses in fiscal expenditure, proportion of administrative persons in entire staff

Source: Sang Zhulai, 2009, "Evaluations Report of China's Government Performance," The CPC Central Party School Press, Beijing.

This process can be encouraged by, for example, posting the principles and methods of the assessment on an official website where citizens can voice opinions and suggestions. Through public satisfaction surveys, people can directly evaluate government performance.

The selection of assessment tools entails some basic principles. First, any tool should be legitimate and transparent. Are relevant interest groups involved? Is it supported by the legal and regulatory system? Does the process of decision-making and implementation entail a public feedback and monitoring mechanism? See box 4.10 on some new measures related to air pollution in Beijing.

Second, the tool should be economical and relevant. Are costs reasonably controlled? Is it adapted to local conditions?

Third, the tool should be consistently applied and geared towards the long term. It could, for example, have a long-term monitoring, tracking and reporting mechanism.

Fourth, the tool should allow for comparison and replication. Is there any benchmark of performance assessment? How can best practices be identified and adopted in similar cities? Can the evaluation system be adjusted as actual situations change?

Assessments geared to the long term help curtail short-term behaviours that may not support the sustained, balanced management of the economy, society and environment. Assessments need to be standardized and institutionalized, and based on scientific foundations.

## *Enacting effective policies*

Urban policies have a central role in transforming China's urbanisation path. They must be people-oriented, aim at high-quality urbanisation that supports sustainable development and reflect the needs

of individual cities.

A people-oriented approach helps guarantee that every citizen has equal rights. Policies could ensure that social services, urban safety, food safety and infrastructure are universally accessible and meet the diverse needs of different social groups. They could promote livelihood opportunities, and back improvement in incomes for both urban and rural residents.

The greater integration of urban and rural development could build on policies to gradually encourage rural residents to move to cities, but in a more orderly and planned manner than is presently the case. Other efforts could include the creation of parks to concentrate industries, and optimized urban layouts that maximize the benefits radiating from cities to adjoining areas. Coordinated policies could help cities and rural areas better adapt to local ecologies, and stimulate the potential of each to ensure the steady and balanced use of resources.

Urban policies need to recognize that environmental carrying capacity is limited. Science and technology can play a role in increasing efficiency and protecting resources, but other measures will be required to focus on improving the quality of the environment and urbanisation, and in general advancing sustainable development.

Low-carbon development should be one of the main goals. While there are many environmental initiatives related to energy efficiency, recycling and so on, only low-carbon development is a strategic objective of national socio-economic development, with a mandatory requirement for emissions mitigation. In the 12th Five-Year Plan, non-fossil fuel resources are expected to rise to 11.4 percent of primary energy use. Per unit of GDP, energy use should decrease by 16 percent and carbon dioxide emissions by 17 percent.<sup>6</sup> Urban policies could be aligned with low-carbon goals, identify specific measures to achieve them, establish and improve accounting systems for emissions and energy saving, and include reasonable low-carbon targets in governance performance evaluations.

### Box 4.10: Public calls for better air quality standards

Since October 2011, hazy weather has affected people in a number of Chinese cities, bringing great concerns about health. People are now familiar with PM2.5—small particles that make up a dangerous form of air pollution. So far, however, China's national standards have not reflected these, measuring only the presence of larger particles or PM10.



The United States Embassy in China has won recognition from Chinese society for publishing data on PM2.5. Writer Yuanjie Zheng launched a questionnaire on air quality in Beijing on her personal micro-blog, with more than 6,000 responses. Eighty-nine percent of participants said Beijing's air quality is becoming worse. Some environmental organizations and citizens measure PM2.5 and post the results on social networking sites.

When citizens can already obtain PM2.5 data from many sources besides official ones, they question government responsiveness. In January 2013, with Beijing again suffering under a blanket of haze, then Vice Premier Keqiang Li told a research forum that “the Government should release the data of PM2.5 in real time to the public based on the principles of openness and transparency. Since we are in an Internet age characterized by information-sharing, citizens would know the truth even though the data is not open. Why would we deceive ourselves as well as others?”

Under the pressure of public opinion, the Ministry of Environmental Protection in 2012 introduced newly revised ambient air quality standards, which include indicators of PM2.5 and ozone concentrations. These will take effect in 2016. Some cities are beginning to publish new data, including Beijing.

Reducing haze will take time, but it is important to take steps that reassure people they will be protected and progress will occur. Openness and transparency can help avoid panic and assist in bringing together the Government and the public to find solutions to control pollution.

Source: Reports from various media, mainly The Southern Metropolis Daily, 23 November 2011, “PM2.5 hemorrhaging API—the anxiety and debate led by an ‘invisible’ API,” and Beijing Youth Daily, 31 January 2013, “Bring hope for all towards haze weather in an open and transparent way.”

Policies can also discourage high consumption for a small number of people in favour of consumption for all citizens, with an emphasis on environmental constraints and social justice. Specific initiatives could aim to boost consumption of green products, and minimize the use of environmentally harmful goods.

Strategic urbanisation could ease China's regional imbalances, particularly between the eastern and western regions. This requires the central Government's macroeconomic policy coordination. Cooperation between dense urban clusters (such as the Yangtze River Delta, Pearl River Delta, the Bohai Sea region, etc.) could evolve to avoid disorderly competition, redundant construction and the waste of resources. Objective urban development laws could gradually guide the radiation of large urban clusters.

Since China's cities vary widely in terms of administration, scale, population, geography, climate and environment, urbanisation policies must adapt to local conditions. They could build on scientific assessments and aim at developing the comparative advantages of different cities. Prominent city features and characteristics of urban culture, architecture and industrial development could receive focused attention. Urban policies also need to preserve and enhance historical and cultural assets, respect diversity and promote creative industries.

Given the complexities of urbanisation, effective policy-making would integrate expertise from varied sources, including from the natural, social and engineering sciences. Coordinating these inputs and balancing multiple expectations depends on appropriate urban governance, bolstered by scientific decision-making, extensive expert discussion, adequate social consultation and public participation. For example, in order to achieve emissions reduction targets, an integrated urban planning policy-making framework needs to incorporate many elements, such as urban green spaces, forestry and rural ecological spaces, industrial production, building and transportation, water and waste treatment, and energy-saving measures.

## *Weighing Costs and Benefits*

As China transitions to more sustainable development, it requires new perspectives on and a comprehensive understanding of the interrelationships between economic, social and environmental costs and benefits. Since these three are inextricably linked, responses to them need to be well coordinated. Arriving at the right balance requires an assessment of costs and balances. The concept of 'cost' should carefully consider benefits as well, in terms of offsetting the costs and/or putting in place improvements that will last over the long term. This will encourage investments particularly in areas that advance human development in lasting ways through better health, education and quality of life.

Many benefits can come from the transition to a sustainable and liveable city. On the economic front, transition could stimulate an upgrade of industrial structure, promote technological innovation and enhance the core competitiveness of a city. On the social front, it could advance just development, improve infrastructure and the quality of public services, and enhance quality of life and residents' happiness. On the environmental front, it could reduce pollution, encourage repair and restoration, and generate a clear understanding of the carrying capacity of the environment.

The costs of transition are direct and indirect. Traditionally, only economic costs have been considered; environmental and social costs were overlooked even though they can be great, to the point of threatening human survival. In some cases, as when pollution must be cleaned up, the costs are many times the original economic benefits. Social development costs are not limited to the loss of human potential and lack of public happiness. When they result in social disharmony, they can destroy economic gains and environmental resources.

Being able to weigh costs and benefits realistically helps cities decide when transition should start and how to implement it. This can be a complex process. Existing GDP calculations do not consider environmental or social issues. And only some elements of

sustainable development can be captured by standard quantitative measurements, such as economic and income growth. Factors such as the cost of pollution control and the cost of integrating rural residents in a city are more complicated to assess. Measuring qualitative dimensions, such as quality of life, remains a difficult question.

Better calculations need to build on more comprehensive economic, social and environmental statistical methods and tools. There are some attempts to link economic and environmental accounting, such as Green GDP, which is an index of economic growth with environmental consequences factored in. Green GDP monetizes the loss of biodiversity, and accounts for costs of climate change. But it is difficult to assess its value due to a lack of data to help quantify the effects and benefits.

In 2006, Ministry of Environmental Protection, China's State Environmental Protection Administration and the National Bureau of Statistics issued the first national report on green accounting.<sup>7</sup> It revealed that Chinese economic losses caused by environmental pollution in 2004 were 511.8 billion yuan, over 3 percent of GDP. Under the technical level of environmental protection in 2004, to deal with all pollutants discharged would require a one-time investment of about 1.08 trillion yuan, about 6.8 percent of GDP.

At the same time, the Government would need to spend an additional 287.4 billion yuan for annual costs, accounting for 1.8 percent of GDP. The 10th Five-Year Plan estimated that the cost of environmental pollution accounted for 1.18 percent of GDP. This calculation was later dropped due to the lack of international green GDP accounting standards.

In analysing the efficiency, fairness and cost-benefits of transition, some issues require special attention. China needs to turn to cleaner production and more prudent consumption modes, for example. These could improve the effectiveness of economic activity, reduce waste, conserve resources, and help achieve carbon and energy intensity targets.

The transition to sustainable and liveable cities is a long-term, ongoing process. Old and new, internal and external forces will interact with each other, shaping different paths of transformation. In the context of globalization, the process will share similarities with experiences in industrialized countries, but it will also be unique to China and its institutional evolution. China has a major opportunity to successfully manage the world's largest, most rapid shift to cities. If it fully embraces sustainability and liveability, it will have much to offer to other countries around the world.

1. Hu Jintao's report delivered at the 18th National Congress of the CPC, 8 November 2012 (available at [http://news.xinhuanet.com/english/special/18cpcnc/2012-11/17/c\\_131981259.htm](http://news.xinhuanet.com/english/special/18cpcnc/2012-11/17/c_131981259.htm), last accessed April 2013).
2. Hu Jintao, 2012, "Accelerate the reform of household registration system to promote urbanisation of agricultural transfer population" (available at <http://news.sina.com.cn/c/2012-11-08/104725536891.shtml>, last accessed March 2013).
3. The 'principal-agent' problem refers to the challenges of motivating one party (the agent) to act in the best interests of another (the principal) rather than in his/her own interests.
4. Beijing, Jilin Province, Fujian Province, Guangxi Zhuang Autonomous Region, Sichuan Province, Xinjiang Uygur Autonomous Region, Hangzhou, Shenzhen City, the Ministry of Land and Resources, the Ministry of Agriculture, the General Administration of Quality Supervision, and the Inspection and Quarantine Agency
5. For more on China's government performance evaluation, originally initiated by the previous Ministry of Personnel, see People's Daily, 2 August 2004, "33 indexes evaluate government performance" (available at [http://english.people.com.cn/200408/02/eng20040802\\_151609.html](http://english.people.com.cn/200408/02/eng20040802_151609.html), last accessed April 2013).
6. The plan also stipulates significant reductions in the total emissions of major pollutants: chemical oxygen demand and sulphur dioxide by 8 percent, and ammonia nitrogen and nitrogen oxide by 10 percent. It calls for the forest coverage rate to increase to 21.66 percent, and national forest stocks to increase by 600 million cubic metres. Research suggests that if China adopts more stringent energy-saving technology, with corresponding policies and measures, and can secure effective international technology transfers and financial support, its carbon emissions will peak in 2030, entering an absolute reduction period.
7. Central government website, 7 September 2006, "The China Green National Accounting Study Report 2004" (available at [http://www.gov.cn/gzdt/2006-09/07/content\\_381190.htm](http://www.gov.cn/gzdt/2006-09/07/content_381190.htm), last accessed June 2013).



## CHAPTER 5

## URBANISATION: TOWARD A FUTURE OF BALANCED DEVELOPMENT AND AN ECOLOGICAL CIVILIZATION

## Key Messages

- The urban transformation in China is a transition in progress, with many opportunities for guiding its future.
- The complexity of this transformation urgently requires integrated policies and strategies that can simultaneously address emerging challenges.
- As China looks at its future, a compromise between the speed and quality of urbanisation appears to be the most desirable and viable option.
- Some challenges are more urgent than others; decisive actions on some can make a significant impact on human development.
- Without strong governance mechanisms and institutions for implementation, the policies needed to act on increasingly complex urban challenges will not be successful.
- In China's transition to more sustainable development, new perspectives and a comprehensive understanding of the interrelationships between economic, social and environmental costs and benefits are urgently required.

The year 2013 is auspicious for a report on China's cities and how its people are faring in the midst of an extraordinary urban transformation. Several factors coincide to make this examination timely and urgent.

First, Chinese authorities have declared their inten-

tion to place greater emphasis on the qualitative aspects of development, and to promote industrialization, informatization, urbanisation and agricultural modernization simultaneously. This requires a closer look at the role that cities—small, medium and large—will need to play in this new vision. As the report shows, cities, particularly large ones and

the clusters that they have formed, have contributed to thriving economic growth and development in recent decades. The urgency now is to ensure that all cities can continue to make a positive difference, rather than becoming a drag on efforts to attain more sustainable and balanced development. In this new phase, small and medium cities will need to play greater and more active and complementary roles than in the past. This suggests that China should scientifically plan for the scale and layout of cities and urban clusters.

Secondly, with more people now living in cities than in rural areas for the first time in history, the Government is fully aware of the need to turn its attention to making sure that cities are more liveable, humane and safer. This is a daunting task, with many facets and possible trajectories, as this report tries to highlight. It is directly linked to China's aspiration to switch to a more balanced model of growth, as expressed in its 12th Five-Year Plan. How China succeeds—or not—in advancing quality growth and human development in its cities will, in many ways, dictate the options and degree of success in its aspirations for more balanced growth and development.

Lastly, this report's reflections coincide with a number of ongoing global debates, including the post-2015 discussions around sustainable development, and the links between poverty, environment and inclusive green growth, as well as climate change negotiations. Because of the importance of China on the international stage, what happens here will certainly have an influence elsewhere. China has already strengthened international cooperation related to urbanisation. In May 2012, Li Keqiang, who was Vice Premier at that time, signed the "Joint Declaration on the EU-China Partnership on Urbanisation" with European Commission President Jose Manuel Barroso. Relevant State Council departments actively promote cooperation and exchanges with UN-HABITAT, the World Bank, the Asian Development Bank, the OECD and other similar agencies, and also engage with the BRICS countries (Brazil, the Russian Federation, India, China and South Africa).

## *Aiming for an Ecological Civilization*

The report takes a sweeping look at the urban transformation of the last few decades, and its drivers, impacts and growing challenges. One conclusion is that in addition to the speed of growth, the nature of the urbanisation process has altered and is still in transition. This provides an opportunity to guide the process as it continues to shape cities and their roles in the next two or three decades. The overall strategy to shift to a more balanced model of economic growth and development provides a new framework to inform this phase of urbanisation.

A transition is in progress from an urbanisation propelled by industrialization to one now influenced by a quest for inclusion and integration of all urban residents into city life—in other words, a process pushed by 'urban citizenization'. There are many implications for the future. The demand for unskilled and low-skilled labour attracted hundreds of millions of rural people to the cities as China's period of reform and opening up gained momentum. As China has entered the late stage of industrialization, the scope for additional physical expansion of the manufacturing sectors is diminishing. There must be new drivers to advance urbanisation and respond to sustained demand for urban services from the 260 million migrants already in cities. Conversion of more migrants from rural to urban settings will likely further stimulate investment in urban infrastructure, housing and industrial development.

Industrial expansion in the past has powered a nearly two-digit growth rate, but the quality of urbanisation in terms of liveability and sustainability is a major concern to the leadership of China, as expressed in recent statements. A shift to development characterized by a reduced rate of economic growth will make cities more liveable and sustainable for all urban citizens. A balance between urbanisation and economic growth was called an 'upgraded version' of the Chinese economy by Premier Li Keqiang in one of his recent statements.

## Pursuing Integrated Policies to Manage Emerging Challenges

The scale and speed of urbanisation in China is expected to continue for the next two decades. If the challenges are immense and the future full of uncertainties, one thing is clear: success depends on cities becoming liveable and sustainable. The forward trajectory will have distinct Chinese characteristics, differing from paths in both developed and other developing countries, but there may be experiences and lessons learned to be shared.

Public policies have a big role to play in shaping the future. As the report shows, the great waves of urbanisation in China have been driven largely by major policy reforms to guide urban development. There is an urgent need now for a new generation of integrated urban policy reforms that can cope with complex urban challenges. Because of the magnitude and speed of many changes, the window of opportunity for addressing many of these is relatively small. Making upfront investments and bold decisions today could mean lower costs in the future, with a last chance to avoid lost opportunities and higher costs.

Many recent reports on cities in China focus on resource pressures and constraints, climate change and environmental impacts. This report builds on these issues, but goes one step further to probe the interrelated consequences of urban transformation on people and human development. It maintains that addressing different dimensions separately rather than in an integrated manner may not bring desired effects, or could even be counterproductive. A portfolio of integrated policy approaches to simultaneously address some key emerging challenges is required to achieve multiple benefits.

A sample of challenges is presented here. Although not strictly urban in nature, they are magnified in cities, with serious implications for human development in China and beyond, and its aspirations for an ecological civilization.

- A slowdown in economic growth, which according to many analysts will most likely be the future trend, is bound to exert pressures for faster restructuring of the economy in order to counteract negative fallout. The current imbalances between primary, secondary and tertiary industries will need a closer look to determine a more balanced contribution by each sector.
- The demographic transition taking place will have great future impacts, positive and negative, and will pressure social services and economic productivity. Can measures be taken today to mitigate negative effects? Demographic transition has contributed greatly to economic growth and the savings rate in recent decades. Further unlocking human potential through increased investments in health and education, and reducing exclusion and discrimination through targeted support to vulnerable and poor populations could be important priorities. These measures will help enhance human development and sustain high growth.
- Growing inequalities emerging on many fronts through the transition to a market economy are a major concern to government authorities. Can more targeted and aggressive policies in cities be designed to ensure that there is equal access by all to opportunities and social services?
- Urban-rural links resulting from expanding city growth and emerging demands on the one hand, and the rush of the rural population to the cities on the other need to be studied in greater detail. Better understanding will help policies build on positive synergies between the two and reinforce mutual benefits. Adhering to the policies of industry nurturing agriculture; cities supporting rural areas; and giving more, taking less and loosening control would help promote rural-urban integration in planning, infrastructure and public services. Improving the conditions of the rural population and the integration of cities and the countryside would certainly be one of the best encouragements for more orderly and controlled migration to cities.
- The negative consequences of a deteriorating ur-

ban environment, with severe impacts on human and ecosystem health, need urgent attention. Measures to address these issues require a different metric of costs and benefits. Investing in environmental improvements could have payoffs and benefits for human and ecosystem health that are often not quantified. Better methods could help gauge their costs in a more realistic manner.

- A last consideration is the synergy of China's urban transformation with the global economy and environmental sustainability.

All of these complex trends need to be tackled by integrated policy packages and approaches that target multiple objectives and seek benefits across the spectrum of issues involved in urban sustainability and liveability.

## *Compromising between the Speed and Quality of Urbanisation*

As China looks at the future, it is clear that it needs to make an urgent choice of which paths and scenarios it will pursue.

The uniqueness of China's urban transformation simply means that there are no obvious lessons or best practices to adopt, no simple precedents to examine, no set examples for replication. In many ways, China is on its own when looking for solutions and ways to implement them. The superlatives abound in every aspect of its urban transformation. As one journal recently declared, "Perhaps Rome cannot be built in a day. But at China's current rate of construction, it would take roughly two weeks."<sup>1</sup> As this report points out, under the baseline scenario described in chapter 3, the expected growth of the urban population in the next 20 years is by approximately 310 million people, more or less the whole current population of United States of America.

China's distinct case calls for a certain degree of cau-

tion by those tempted to quickly criticize, and express frustration and impatience with the immense problems of many Chinese cities. But it also points to the stark reality that unless bold, creative and decisive action is promptly taken, cities may turn into major obstacles to China's development aspirations, instead of acting as the engines for progress. One important step may be to consciously choose the type of urbanisation China will embrace. This report offers some alternative scenarios, not as predictions, but rather as trajectories for what could happen under various circumstances.

The most desirable pathway may be achieved through strategies and policies that respond to human development concerns while allowing cities to thrive and contribute to economic growth. The report suggests that such a pathway is not only feasible, but with potential payoffs and benefits that could offset some of the costs of pursuing it. According to the scenarios, considerable investments will be required, but these could yield significant results across all fronts—including environmental protection, social services and appropriate infrastructure. As the report also argues and repeatedly illustrates, getting urbanisation right calls for cities to be socially equitable, economically dynamic and environmentally friendly.

Given the sheer scale of urbanisation in China, natural resources and ecological systems will have difficulties supporting industrialization and mass consumption for up to 1 billion urban Chinese—the expected city population by 2030 if the urbanisation rate reaches 70 percent. The Chinese leadership has called for the construction of an ecological civilization to minimize or avoid the negative impacts of industrialization and urbanisation. Under this concept, 'respect' for nature instead of 'conquest' of nature forms the ethical basis for man and nature in harmony. Industrial production, for example, needs to give greater importance to a circular process from raw materials to products and recyclable materials, instead of a linear process of raw material to products to waste.

## Taking Decisive Action to Improve China's Human Development

Being able to provide adequate social services; ensuring equal access to them by all urban residents, including migrants; forecasting and preparing for the impacts of changing urban demographics; tackling growing divides and inequalities; and addressing the major environmental degradation that has come with fast-paced urbanisation are some critical areas in urgent need of attention.

Aware of the urgency, Chinese authorities are already taking decisive actions across many fronts, introducing new policies and experimenting with innovative ideas, and beginning to compile a new national plan to guide urbanisation.<sup>2</sup> But given the rate of growth and change, it has been difficult to match the demand for services. And escalating challenges are expected to exert ever more pressure.

The system of public social services in particular has been strained by growing demand due to the massive influx of migrants. This growth is expected to continue for the next two decades, posing even heavier demands. Will the system be able to close current gaps and provide universal access, as essential to integrating people within cities? One important contributor to growing inequality—the unequal treatment of the migrant population—can be eased by tackling this problem. But large investments will be required.

The household registration system has been the key policy instrument to adjust the process of urbanisation since the establishment of the People's Republic of China. Before the late 1970s, when the reform and opening-up policy was initiated, urbanisation was under strict control by the Government through top-down planning. All newcomers to cities were provided with urban registration for access to services, but at that time, the growth of cities was slow. Starting in the mid-1980s, rural migrants were allowed to work in cities, yet were not granted urban citizenship sta-

tus. Despite being cut-off from social services as a result, rural people still moved to cities for higher salaries and other economic benefits. Today, to promote urban citizenization for migrants, the nation has begun to consider the full liberalization of restrictions in small towns and cities, the orderly release of limits in medium-sized cities, a gradual relaxation and reasonable requirements for settling in large cities, and over time the acceptance of qualified agricultural residents as registered urban citizens.<sup>3</sup>

Additional pressures from demographic changes include a quickly ageing population, implying greater demands and obligations for health care and social security, and perhaps other social services. The growth in people looking for employment, including migrants, will be immense. It is not very clear how to meet their needs in the short term, but in the medium and long term, a restructuring of the economy and policies to help match competencies with the supply of jobs will be the only solution.

For the environment, decisive action is urgently required to mitigate negative impacts on human health, ecosystems and the services they provide, economic competitiveness and other issues.

Imbalances in urban expansion and lack of appropriate planning constitute the major sources of urban 'diseases', such as poor air quality, polluted water and soil, disorderly development of urban spaces, excessive agglomerations of people, traffic congestion, high housing prices, frequent incidents of compromised food and drug safety, poor social management and inadequate social services, and degraded environments in villages near cities and urban-rural fringes where most migrants live. Divides are widening between the eastern and western regions of China, and between large and small/medium cities in terms of geographical and size distribution. Most rural migrants go to the east and/or to large cities, in particular municipalities and provincial capitals where the political power is based and determines resource allocation. To reduce these imbalances, urban services must be evenly distributed among regions and cities, and within cities. For instance,

top-quality universities and medical services could be located outside municipalities and provincial capitals. In many cities, as illustrated throughout the report, there are already excellent examples of corrective and innovative actions. But these need to be significantly scaled up to make a difference to the future of China's cities. Some are highlighted here.

Best practices in promoting low-carbon development and ecological cities are already found in many places in China. Solar water heating devices are widely installed in residential and public buildings in almost all Chinese cities. Electricity is progressively priced to discourage wasteful consumption. Public transport has priority in urban infrastructure construction. Twenty years ago, metro services were very limited in Chinese cities. Now all large cities have developed underground transport. The networks in Beijing and Shanghai, for instance, are among the most complex and longest in the world. Fast rails connect cities, effectively reducing road and air transport.

The challenge is that these and other best practices need additional heavy investments and most likely concomitant institutional and governance requirements for massive scale up. Despite achievements in mass transit, for example, many Chinese cities regularly experience heavy traffic congestion.

## *Urbanisation Depends on Effective Governance*

In setting out on a path of transformation, cities should aim for top performance in scientific and technological development, participation in high-end competition in the global economy, and liveability that rivals that of urban areas in the most advanced countries in the world. Achieving this will require a renewed and urgent effort to strengthen institutions and governance, including in key areas such as population administration, land management, finance and taxation, urban housing systems, public administration and environmental management.

institutions and decision-making processes, leading to adjustments and experimentation in city management and governance. There have been trends towards more decentralization, multilevel governance schemes, experimentation with popular participation and many other solutions. As the pressures continue to increase, a close look at the adequacy of current governance structures is essential, as these structures must be equipped to make it possible for China to steer urban transformation towards liveability and sustainability.

The report cites various areas in need of reform. They include city management, and the incentives and performance monitoring of public officials. For the former, more open and transparent decision-making processes could benefit from citizen participation and ownership. In terms of the latter, the performance of public officials is curtailed by both the lack of financing options for much needed public services and an absence of incentive structures putting a premium on human development improvements. The lack of financing options results in an overdependence on income from land transference transactions, which impedes the formulation of well-planned budgets with strategies designed to meet certain goals and objectives. Incentive structures, particularly for city public officials, need a thorough evaluation to determine whether the current system is really enhancing the capacity of the decision-making process to find appropriate solutions, or exacerbating current problems. Incentives for policy implementation, both by government officials as well as by private citizens, with a focus on resource efficiency, in particular need to be strengthened. Performance monitoring of urban governance could move from its emphasis on economic growth to incorporate indicators for resource conservation, environmental protection and social development.

There are other areas with great potential for renewed efforts and reform. There is, for example, substantial potential to increase corporate social responsibility and transform consumer behaviour to support urban liveability and sustainability. While large-scale enterprises in general operate at international standards with respect to employer-employee relations and

environmental awareness, many medium and small-scale companies do not always provide a decent working environment and pay to their employees, and often violate environmental regulations. Many consumers in cities are driven to pursue standards of living found in more industrialized cities, generating environmental and other consequences that China would like to avoid. Wasteful, unsustainable consumption patterns include the use of vehicles that squander fuel, unnecessarily large houses, and excessive heating or air-conditioning. Extra packaging wastes natural resources and damages the environment. In some cases, packing is more expensive than the actual goods. There are many such examples.

The shift in emphasis to a more balanced model of development, one concerned with ensuring improvements in the quality of life, may require new skills and competencies for public officials. Greater attention to urban form and open and green spaces requires stronger skills in urban design, for example. There is increasing interest in preserving the tradition and culture of cities and preventing their homogenization, while at the same time promoting an innovative and creative society. This may call for new leadership skills and values. Similarly, strong skills in city management and public relations could help maintain economic dynamism so cities can compete and contribute to the growing web of urban clusters.

### *Understanding Social, Economic and Environmental Interactions*

China confronts economic, social and environmental challenges to making cities more sustainable and liveable. Addressing emerging needs requires immense upfront investments based on some objec-

tive criteria. Arriving at the right decisions will require careful assessments of costs and benefits to account for both positive and negative consequences. The establishment of a sustainable urban public finance system and an investment and financing mechanism would be one step towards the financial security that would permit all residents to be covered by basic public services and encourage construction of appropriate urban infrastructure.

Making the right investments to promote economic development, such as upgrading and restructuring industry and promoting technological innovation, can result in high payoffs through additional jobs, greater competitiveness and complementarities with other cities and within urban clusters. In the social area, investments to make social services more reliable and of higher quality, and available to all citizens could yield benefits through better health and well-being. And making well-targeted investments in the environmental area could lead to huge payoffs in increased life expectancy, lower health care costs and a more pleasant living environment. There are hundreds if not thousands of other measures that could be part of a balanced mix to enhance the benefits of investments and mitigate any costs.

Lastly, one word of caution. The topic of urban transformation in China is immensely complicated and multifaceted. This report addresses only a handful of the issues at stake, and highlights others as crucial for further research and analysis. One relates to China's cultural heritage— specifically its architectural heritage. More and more, culture is being recognized as essential not only for sustainability, but also for liveability and even societal success. Strategies to protect and nurture culture and creativity can contribute positively to a wide range of social, cultural and economic development objectives.

1. Economist Intelligence Unit, 2011, "Building Rome in Day: The Sustainability of China's Housing Boom," a report from the Economist Intelligence Unit's Access China Service (available at [http://www.eurosinoinvest.com/fileadmin/downloads/esi\\_vt/eiu\\_buildingromeday.pdf](http://www.eurosinoinvest.com/fileadmin/downloads/esi_vt/eiu_buildingromeday.pdf), last accessed June 2013).
2. From the end of 2010, the National Development and Reform Commission, the Ministry of Finance, and the Ministry of Land and Resources, Ministry of Housing and Urban-Rural Development and 14 other government departments started the urbanisation planning work, and drafted a planning document based on a large number of preliminary studies, field research and thematic seminars. It is currently undergoing a process of extensive review and revision.
3. "Report on the Urbanisation Construction Work by State Council," released by Xu Shaoshi, chairman of the National Development and Reform Commission, at the third meeting of the 12th National People's Congress Standing Committee, 26th June 2013 (available at [http://www.npc.gov.cn/npc/xinwen/jdgz/bgjy/2013-06/27/content\\_1798658.htm](http://www.npc.gov.cn/npc/xinwen/jdgz/bgjy/2013-06/27/content_1798658.htm), last accessed July 2013).

# STATISTICAL APPENDIX

**Table 1** Human Development Index, 2010

Regions	Index of life expectancy	Index of education	Index of GNI	HDI
Nation	0.868	0.676	0.569	0.693
Beijing	0.952	0.837	0.694	0.821
Tianjin	0.932	0.779	0.692	0.795
Hebei	0.870	0.676	0.561	0.691
Shanxi	0.869	0.699	0.547	0.693
Inner Mongolia	0.861	0.689	0.634	0.722
Liaoning	0.892	0.737	0.618	0.740
Jilin	0.889	0.715	0.576	0.715
Heilongjiang	0.886	0.710	0.554	0.704
Shanghai	0.953	0.808	0.699	0.814
Jiangsu	0.896	0.719	0.650	0.748
Zhejiang	0.913	0.700	0.645	0.744
Anhui	0.871	0.640	0.516	0.660
Fujian	0.882	0.676	0.610	0.714
Jiangxi	0.860	0.651	0.519	0.662
Shandong	0.893	0.686	0.613	0.721
Henan	0.864	0.664	0.540	0.677
Hubei	0.868	0.696	0.558	0.696
Hunan	0.866	0.677	0.539	0.681
Guangdong	0.894	0.696	0.624	0.730
Guangxi	0.872	0.634	0.516	0.658
Hainan	0.891	0.660	0.536	0.680
Chongqing	0.881	0.667	0.556	0.689
Sichuan	0.866	0.645	0.520	0.662
Guizhou	0.809	0.586	0.452	0.598
Yunnan	0.784	0.604	0.476	0.609
Tibet	0.762	0.498	0.487	0.569
Shaanxi	0.865	0.699	0.554	0.695
Gansu	0.826	0.631	0.480	0.630
Qinghai	0.791	0.613	0.537	0.638
Ningxia	0.845	0.658	0.552	0.674
Xinjiang	0.828	0.660	0.542	0.667

Source: Calculated by technical team of National Human Development Report 2013

Note: This chart does not cover Taiwan, Province of China, Hong Kong SAR or Macau SAR; the same applies to all statistical charts in this appendix..

**Table 2** Average life expectancy, 2010

Unit:year

Regions	Average	Men	Women
Nation	74.83	72.38	77.37
Beijing	80.18	78.28	82.21
Tianjin	78.89	77.42	80.48
Hebei	74.97	72.70	77.47
Shanxi	74.92	72.87	77.28
Inner Mongolia	74.44	72.04	77.27
Liaoning	76.38	74.12	78.86
Jilin	76.18	74.12	78.44
Heilongjiang	75.98	73.52	78.81
Shanghai	80.26	78.20	82.44
Jiangsu	76.63	74.60	78.81
Zhejiang	77.73	75.58	80.21
Anhui	75.08	72.65	77.84
Fujian	75.76	73.27	78.64
Jiangxi	74.33	71.94	77.06
Shandong	76.46	74.05	79.06
Henan	74.57	71.84	77.59
Hubei	74.87	72.68	77.35
Hunan	74.70	72.28	77.48
Guangdong	76.49	74.00	79.37
Guangxi	75.11	71.77	79.05
Hainan	76.30	73.20	80.01
Chongqing	75.70	73.16	78.60
Sichuan	74.75	72.25	77.59
Guizhou	71.10	68.43	74.11
Yunnan	69.54	67.06	72.43
Tibet	68.17	66.33	70.07
Shaanxi	74.68	72.84	76.74
Gansu	72.23	70.60	74.06
Qinghai	69.96	68.11	72.07
Ningxia	73.38	71.31	75.71
Xinjiang	72.35	70.30	74.86

Source: National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing.

Note: Data are from the Sixth Census.

**Table 3** Number of people educated at different levels per 100,000 people, 2010

Unit: person

Regions	Primary school	Junior high school	Senior high school and technical secondary school	Higher than junior college
Nation	26,779	38,788	14,032	8,930
Beijing	9,956	31,396	21,220	31,499
Tianjin	17,049	38,150	20,654	17,480
Hebei	24,661	44,400	12,709	7,296
Shanxi	21,855	45,126	15,733	8,721
Inner Mongolia	25,418	39,218	15,125	10,208
Liaoning	21,407	45,328	14,788	11,965
Jilin	24,059	42,069	16,866	9,890
Heilongjiang	24,078	45,081	14,991	9,067
Shanghai	13,535	36,461	20,966	21,952
Jiangsu	24,176	38,670	16,143	10,815
Zhejiang	28,819	36,681	13,562	9,330
Anhui	27,948	38,014	10,774	6,697
Fujian	29,801	37,886	13,876	8,361
Jiangxi	30,007	37,789	12,326	6,847
Shandong	24,963	40,158	13,908	8,694
Henan	24,108	42,460	13,212	6,398
Hubei	22,871	39,618	16,602	9,533
Hunan	26,785	39,528	15,420	7,595
Guangdong	22,956	42,913	17,072	8,214
Guangxi	31,680	38,764	11,033	5,977
Hainan	22,736	41,741	14,666	7,768
Chongqing	33,790	32,982	13,213	8,643
Sichuan	34,627	34,889	11,247	6,675
Guizhou	39,373	29,789	7,282	5,292
Yunnan	43,388	27,480	8,376	5,778
Tibet	36,589	12,850	4,364	5,507
Shaanxi	23,417	40,135	15,773	10,556
Gansu	32,504	31,213	12,687	7,520
Qinghai	35,265	25,374	10,427	8,616
Ningxia	29,826	33,654	12,451	9,152
Xinjiang	30,075	36,096	11,582	10,635

Source: National Bureau of Statistics, 2011, "China Population and Employment Statistical Yearbook 2011," China Statistics Press, Beijing.

**Table 4** Education index, 2010

Regions	Enrolment in senior high school (%)	Enrolment in higher education (%)	Average education years (year)	Expected education years (year)	Average education index	Expected education index
Nation <sup>a</sup>	82.5	26.5	8.2	12.5	0.627	0.696
Beijing	98.0	60.0	11.0	14.3	0.84	0.797
Tianjin	95.0	55.0	9.7	14.1	0.743	0.781
Hebei <sup>b</sup>	85.0	26.5	8.2	12.6	0.624	0.701
Shanxi <sup>a</sup>	86.8	28.1	8.7	12.7	0.661	0.707
Inner Mongolia <sup>b</sup>	88.3	23.1	8.5	12.6	0.649	0.699
Liaoning <sup>a</sup>	92.6	43.5	9.1	13.5	0.691	0.751
Jilin <sup>b</sup>	91.9	32.0	8.8	13.0	0.675	0.724
Heilongjiang	87.7	34.0	8.8	13.0	0.668	0.722
Shanghai	91.7	70.0	10.1	14.6	0.773	0.808
Jiangsu <sup>a</sup>	96.0	42.0	8.6	13.6	0.656	0.753
Zhejiang <sup>a</sup>	92.5	45.0	8.2	13.6	0.622	0.754
Anhui	80.0	24.3	7.5	12.4	0.57	0.687
Fujian	83.4	26.6	8.2	12.6	0.626	0.698
Jiangxi	76.0	25.5	7.8	12.3	0.594	0.683
Shandong	95.0	28.0	8.2	13.0	0.624	0.721
Henan <sup>a</sup>	89.1	23.7	7.9	12.6	0.601	0.701
Hubei	87.2	32.9	8.5	12.9	0.645	0.718
Hunan	85.0	25.0	8.2	12.6	0.628	0.697
Guangdong	86.2	28.0	8.6	12.7	0.657	0.706
Guangxi <sup>a</sup>	69.0	19.0	7.7	11.8	0.585	0.657
Hainan	70.0	24.5	8.1	12.1	0.62	0.671
Chongqing	80.0	30.0	8.0	12.6	0.608	0.700
Sichuan	76.0	25.0	7.6	12.3	0.583	0.682
Guizhou	55.0	20.0	6.8	11.5	0.516	0.636
Yunnan <sup>a</sup>	65.0	20.0	7.0	11.8	0.535	0.653
Tibet	60.1	23.4	4.8	11.7	0.363	0.652
Shaanxi	85.3	31.0	8.6	12.8	0.656	0.711
Gansu	70.0	22.0	7.5	12.0	0.571	0.666
Qinghai <sup>b</sup>	67.1	26.2	7.0	12.1	0.537	0.670
Ningxi <sup>a</sup>	84.7	25.1	7.8	12.5	0.594	0.697
Xinjiang	69.1	25.0	8.1	12.1	0.622	0.671

Source: Calculated by technical team of National Human Development Report 2013.

Notes a and b: For Yunnan, data for enrolment in senior high school and higher education are from local statistical bulletins. For Qinghai, data for enrolment in senior high school and higher education are from local middle and long-term development plans; other data are from the local 12th Five-Year Plan.

**Table 5** GDP and GNI per capita, 2010

Regions	GDP			GNI		
	Yuan(¥)	Current \$	PPP \$	Yuan(¥)	Current \$	PPP \$
Nation	29,992	4,430	5,316	29,962	4,426	5,311
Beijing	71,938	10,626	12,751	71,866	10,615	12,739
Tianjin	70,996	10,487	12,584	70,925	10,476	12,572
Hebei	28,351	4,188	5,025	28,322	4,183	5,020
Shanxi	25,743	3,803	4,563	25,717	3,799	4,558
Inner Mongolia	47,213	6,974	8,369	47,166	6,967	8,360
Liaoning	42,189	6,232	7,478	42,147	6,226	7,471
Jilin	31,557	4,661	5,594	31,526	4,657	5,588
Heilongjiang	27,048	3,995	4,794	27,021	3,991	4,790
Shanghai	74,548	11,012	13,214	74,474	11,001	13,201
Jiangsu	52,642	7,776	9,331	52,589	7,768	9,322
Zhejiang	50,899	7,518	9,022	50,848	7,511	9,013
Anhui	20,749	3,065	3,678	20,728	3,062	3,674
Fujian	39,906	5,894	7,073	39,866	5,889	7,066
Jiangxi	21,180	3,129	3,754	21,159	3,125	3,751
Shandong	40,854	6,035	7,241	40,813	6,028	7,234
Henan	24,552	3,627	4,352	24,528	3,623	4,348
Hubei	27,877	4,118	4,941	27,849	4,114	4,936
Hunan	24,411	3,606	4,327	24,386	3,602	4,323
Guangdong	44,070	6,510	7,811	44,026	6,503	7,804
Guangxi	20,759	3,066	3,680	20,738	3,063	3,676
Hainan	23,769	3,511	4,213	23,746	3,507	4,209
Chongqing	27,475	4,058	4,870	27,448	4,054	4,865
Sichuan	21,362	3,155	3,786	21,341	3,152	3,783
Guizhou	13,229	1,954	2,345	13,215	1,952	2,342
Yunnan	15,699	2,319	2,783	15,684	2,317	2,780
Tibet	16,875	2,493	2,991	16,858	2,490	2,988
Shaanxi	27,103	4,003	4,804	27,076	3,999	4,799
Gansu	16,097	2,378	2,853	16,081	2,375	2,850
Qinghai	23,966	3,540	4,248	23,942	3,537	4,244
Ningxia	26,694	3,943	4,732	26,668	3,939	4,727
Xinjiang	24,884	3,676	4,411	24,859	3,672	4,406

Source: GDP data calculated by RMB are from National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing. Other data are from this report.

Note: The US \$ exchange rate used was 6.77; PPP US \$ and PPP GNI were calculated with indicators in the World Bank open database (available at <http://data.worldbank.org/>, last accessed May, 2013). For more details, see the annex on calculating the HDI.

**Table 6** HDI and GNI ranks, 2010

Regions	HDI	HDI rank	GNI per capita (PPP \$)	GNI per capita rank	GNI per capita rank minus HDI rank
Nation	0.693		5,311		
Beijing	0.821	1	12,739	2	1
Shanghai	0.814	2	13,201	1	-1
Tianjing	0.795	3	12,572	3	0
Jiangsu	0.748	4	9,322	4	0
Zhjiang	0.744	5	9,013	5	0
Liaoning	0.740	6	7,471	8	2
Guangdong	0.730	7	7,804	7	0
Inner Mongolia	0.722	8	8,360	6	-2
Shandong	0.721	9	7,234	9	0
Jilin	0.715	10	5,588	11	1
Fujian	0.714	11	7,066	10	-1
Heilongjiang	0.704	12	4,790	16	4
Hubei	0.696	13	4,936	13	0
Shaanxi	0.695	14	4,799	15	1
Shanxi	0.693	15	4,558	18	3
Hebei	0.691	16	5,020	12	-4
Chongqing	0.689	17	4,865	14	-3
Hunan	0.681	18	4,323	21	3
Hainan	0.680	19	4,209	23	4
Henan	0.677	20	4,348	20	0
Ningxia	0.674	21	4,727	17	-4
Xinjiang	0.667	22	4,406	19	-3
Sichuan	0.662	23	3,783	24	1
Guangxi	0.662	24	3,751	25	1
Anhui	0.660	25	3,674	27	2
Guangxi	0.658	26	3,676	26	0
Qinghai	0.638	27	4,244	22	-5
Gansu	0.630	28	2,850	29	1
Yunnan	0.609	29	2,780	30	1
Guizhou	0.598	30	2,342	31	1
Tibet	0.569	31	2,988	28	-3

Source: Calculated by technical team of National Human Development Report 2013.

**Table 7** HDI for China from 1980 to 2011, based on the new method

Years	Health index	Education index	Income index	HDI value
1980	0.742	0.372	0.239	0.404
1985	0.762	0.396	0.298	0.448
1990	0.780	0.437	0.345	0.490
1995	0.795	0.482	0.414	0.541
2000	0.808	0.535	0.469	0.588
2005	0.822	0.579	0.533	0.633
2006	0.826	0.588	0.549	0.644
2007	0.829	0.599	0.568	0.656
2008	0.833	0.610	0.580	0.665
2009	0.836	0.619	0.592	0.674
2010	0.840	0.623	0.606	0.682
2011	0.843	0.623	0.618	0.687

Source: UNDP database (available at <http://hdr.undp.org/en/humandev/>, last accessed May, 2013).

Note: As UNDP uses its own survey to evaluate HDI, the results are slightly different from results in Table 1.

**Table 8** Wastewater discharge and treatment, 2010

Regions	Number of facilities for treatment of wastewater (set)	Total volume of water discharge (millions of tons)	Industrial wastewater meeting discharge standards (millions of tons)	The attainment rate of industrial wastewater discharge (%)	Total volume of sanitary sewage (million of tons)
Nation	80,332	23,747	22,636	95.3	37,978
Beijing	481	82	81	98.8	1,282
Tianjin	912	197	197	100.0	485
Hebei	4,008	1,142	1,126	98.6	1,483
Shanxi	2,633	499	472	94.7	684
Inner Mongolia	956	395	357	90.2	530
Liaoning	2,793	715	662	92.6	1,467
Jilin	659	387	344	89.0	758
Heilongjiang	1,192	389	361	92.7	797
Shanghai	1,749	367	360	98.0	2,116
Jiangsu	6,973	2,638	2,586	98.1	2,917
Zhejiang	8,214	2,174	2,092	96.2	1,774
Anhui	2,084	710	695	98.0	1,137
Fujian	3,153	1,242	1,225	98.7	1,143
Jiangxi	2,014	725	683	94.2	881
Shandong	5,142	2,083	2,050	98.4	2,281
Henan	3,105	1,504	1,464	97.4	2,083
Hubei	2,093	946	915	96.8	1,762
Hunan	3,155	956	896	93.7	1,725
Guangdong	9,651	1,870	1,742	93.1	5,359
Guangxi	2,405	1,652	1,601	96.9	1,474
Chongqing	1,498	452	428	94.7	829
Sichuan	4,437	934	902	96.5	1,627
Guizhou	1,755	141	109	77.3	467
Yunnan	2,044	309	284	91.8	611
Tibet	16	7	2	29.5	31
Shaanxi	4,827	455	444	97.5	702
Gansu	672	154	128	83.3	359
Qinghai	103	90	54	59.9	136
Ningxia	359	220	173	78.7	187
Xinjiang	971	254	146	57.3	583

Source: National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing.

**Table 9** Age composition and dependency ratio of the urban population, 2010

Region	Total population (millions of people)	Population of different ages (millions of people)			Proportion (%)		
		0-14	15-64	65+	0-14	15-64	65+
Nation	403.76	49.39	323.36	31.02	12.23	80.09	7.68
Beijing	15.56	1.31	12.90	1.35	8.43	82.91	8.66
Tianjin	8.86	0.69	7.40	0.77	7.74	83.53	8.73
Hebei	14.39	1.88	11.38	1.13	13.04	79.10	7.86
Shanxi	9.41	1.38	7.39	0.64	14.67	78.48	6.84
Inner Mongolia	8.01	1.06	6.36	0.59	13.22	79.40	7.38
Liaoning	22.02	2.10	17.61	2.31	9.52	79.98	10.50
Jilin	10.20	1.02	8.25	0.92	10.01	80.94	9.05
Heilongjiang	14.12	1.36	11.43	1.33	9.63	80.97	9.40
Shanghai	17.64	1.48	14.36	1.80	8.41	81.39	10.20
Jiangsu	30.17	3.39	24.25	2.53	11.24	80.38	8.39
Zhejiang	20.39	2.45	16.59	1.35	12.01	81.37	6.62
Anhui	12.18	1.62	9.59	0.98	13.28	78.68	8.04
Fujian	12.55	1.67	10.15	0.73	13.29	80.89	5.82
Jiangxi	7.50	1.27	5.68	0.56	16.92	75.65	7.43
Shandong	28.36	3.94	22.26	2.17	13.88	78.47	7.65
Henan	18.33	2.85	14.17	1.31	15.53	77.30	7.17
Hubei	17.93	2.12	14.46	1.35	11.84	80.64	7.52
Hunan	12.74	1.74	10.03	0.96	13.70	78.76	7.54
Guangdong	52.39	6.49	43.35	2.55	12.38	82.75	4.87
Guangxi	8.35	1.24	6.54	0.58	14.85	78.25	6.90
Hainan	2.32	0.37	1.82	0.14	15.97	78.12	5.91
Chongqing	8.68	1.00	6.91	0.76	11.57	79.65	8.78
Sichuan	15.92	1.89	12.60	1.43	11.88	79.15	8.97
Guizhou	5.54	0.95	4.18	0.41	17.12	75.56	7.32
Yunnan	6.32	0.88	4.98	0.47	13.84	78.73	7.44
Tibet	0.27	0.03	0.23	0.01	11.64	84.68	3.68
Shaanxi	8.84	1.08	7.03	0.73	12.17	79.60	8.23
Gansu	5.26	0.70	4.13	0.43	13.35	78.56	8.09
Qinghai	1.37	0.20	1.06	0.11	14.67	77.27	8.05
Ningxia	2.06	0.33	1.59	0.14	16.05	77.04	6.91
Xinjiang	6.07	0.91	4.68	0.48	14.97	77.11	7.92

Source: National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing.

Note: Data are from the Sixth Census.

**Table 10** Number of cities at prefecture level and above, 2011

Region	Total	Grouping by urban population at end of year					
		Above 4 million	2-4 million	1-2 million	0.5-1 million	0.2-0.5 million	less than 0.2 million
Nation	288	14	31	82	108	49	4
Beijing	1	1					
Tianjin	1	1					
Hebei	11		2	2	6	1	
Shanxi	11		1	1	7	2	
Inner Mongolia	9			3	3	3	
Liaoning	14	1	1	2	9	1	
Jilin	8		1	1	4	2	
Heilongjiang	12	1		2	7	1	1
Shanghai	1	1					
Jiangsu	13	1	7	3	2		
Zhejiang	11	1	1	3	5	1	
Anhui	16		2	6	6	2	
Fujian	9		1	3	1	4	
Jiangxi	11		1	2	5	3	
Shandong	17		5	8	4		
Henan	17	1		8	6	2	
Hubei	12	1	1	3	6	1	
Hunan	13		1	4	6	2	
Guangdong	21	2	2	7	6	4	
Guangxi	14		1	6	4	3	
Hainan	2			1	1		
Chongqing	1	1					
Sichuan	18	1		11	4	2	
Guizhou	6		1	1	2	2	
Yunnan	8		1		3	3	1
Tibet	1						1
Shaanxi	10	1		2	6	1	
Gansu	12		1	2	4	4	1
Qinghai	1			1			
Ningxia	5				1	4	
Xinjiang	2		1			1	

Source: National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing.

**Table 11** Tap water supply in urban areas by region, 2011

Regions	Production capacity of tap water supply (year end, millions of cubic metres per day)	Total annual volume of water supply (millions of cubic metres)	Per capita daily consumption of tap water for residential use (litres)	Urban water penetration (%)
Nation	266.7	51,342	171	97.0
Beijing	15.9	1,584	173	100.0
Tianjin	4.3	745	129	100.0
Hebei	10.0	1,731	124	100.0
Shanxi	4.2	818	111	97.5
Inner Mongolia	3.6	628	94	91.4
Liaoning	13.5	2,660	126	98.4
Jilin	7.6	1,003	113	92.7
Heilongjiang	8.6	1,519	128	90.8
Shanghai	11.5	3,113	184	100.0
Jiangsu	27.6	4,770	212	99.6
Zhejiang	15.2	2,736	196	99.8
Anhui	8.2	1,580	169	96.6
Fujian	6.8	1,377	188	99.1
Jiangxi	4.4	936	175	97.9
Shandong	16.2	3,135	130	99.7
Henan	10.4	1,846	109	92.6
Hubei	13.5	2,576	213	98.3
Hunan	9.9	1,816	203	95.7
Guangdong	35.1	8,216	241	98.4
Guangxi	6.4	1,545	242	93.9
Hainan	1.7	368	249	96.1
Chongqing	4.3	898	145	93.4
Sichuan	8.1	1,822	192	91.8
Guizhou	2.4	467	143	91.6
Yunnan	3.2	677	125	95.1
Tibet	0.6	124	228	91.9
Shaanxi	3.8	768	163	95.7
Gansu	3.7	557	146	92.5
Qinghai	0.8	218	197	99.9
Ningxia	1.3	301	163	95.5
Xinjiang	3.9	809	160	99.2

Source: National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing.

**Table 12** Green areas and forest resources in urban areas by region, 2011

Regions	Area of green land (hectare)	Green covered area as portion of complete area (%)	Per capita public green areas (square metres)	Stock volume of forest (millions of cubic metres)	Coverage of forest (%)
Nation	2,242,856	39.2	11.8	13,721	20.4
Beijing	63,540	45.6	11.3	10	31.7
Tianjin	21,728	34.5	10.3	2	8.2
Hebei	71,103	42.1	14.3	84	22.3
Shanxi	32,513	38.3	10.2	76	14.1
Inner Mongolia	41,059	34.1	14.5	1,177	20.0
Liaoning	95,968	39.8	10.6	202	35.1
Jilin	38,740	34.2	10.5	844	38.9
Heilongjiang	72,166	36.3	11.5	1,521	42.4
Shanghai	122,283	38.2	7.0	1	9.4
Jiangsu	237,486	42.1	13.3	35	10.5
Zhejiang	105,200	38.4	11.8	172	57.4
Anhui	75,977	39.5	11.9	138	26.1
Fujian	50,802	41.4	11.7	484	63.1
Jiangxi	45,063	46.8	13.5	395	58.3
Shandong	165,577	41.5	16.0	63	16.7
Henan	69,596	36.6	8.9	129	20.2
Hubei	62,062	38.4	10.1	209	31.1
Hunan	49,593	36.8	8.8	349	44.8
Guangdong	410,600	41.1	14.4	302	49.4
Guangxi	64,461	37.4	11.0	469	52.7
Hainan	49,784	41.8	12.5	73	52.0
Chongqing	43,854	40.2	17.9	113	34.9
Sichuan	77,406	38.2	10.7	1,596	34.3
Guizhou	30,521	32.3	7.3	240	31.6
Yunnan	31,940	38.7	10.3	1,554	47.5
Tibet	2,943	24.1	10.7	2,246	11.9
Shaanxi	28,164	38.7	11.4	338	37.3
Gansu	16,337	27.9	8.3	194	10.4
Qinghai	3,894	31.1	9.7	39	4.6
Ningxia	18,399	37.5	16.0	5	9.8
Xinjiang	44,097	36.6	9.5	301	4.0

Source: National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing.

**Table 13** Ambient air quality in major cities, 2011

(Unit: milligrams per cubic metre)

City	Particulate matters	Sulphur dioxide	Nitrogen dioxide	Days of air quality equal to or above Grade II (days)	Proportion of days of air quality equal to or above Grade II in the whole year (%)
Beijing	0.113	0.028	0.056	286	78.4
Tianjin	0.093	0.042	0.038	320	87.7
Shijiazhuang	0.099	0.052	0.041	320	87.7
Taiyuan	0.084	0.064	0.023	308	84.4
Hohhot	0.076	0.054	0.039	347	95.1
Shenyang	0.096	0.059	0.033	332	91.0
Changchun	0.091	0.026	0.043	345	94.5
Harbin	0.099	0.041	0.046	317	86.8
Shanghai	0.080	0.029	0.051	337	92.3
Nanjing	0.097	0.034	0.049	317	86.8
Hangzhou	0.093	0.039	0.058	333	91.2
Hefei	0.113	0.022	0.025	303	83.0
Fuzhou	0.069	0.009	0.032	360	98.6
Nanchang	0.088	0.056	0.038	347	95.1
Jinan	0.104	0.051	0.036	320	87.7
Zhengzhou	0.103	0.051	0.047	318	87.1
Wuhan	0.100	0.039	0.056	306	83.8
Changsha	0.083	0.040	0.047	341	93.4
Guangzhou	0.069	0.028	0.049	360	98.6
Nanning	0.073	0.026	0.033	351	96.2
Haikou	0.041	0.008	0.016	365	100.0
Chongqing	0.093	0.038	0.031	324	88.8
Chengdu	0.100	0.031	0.051	322	88.2
Guiyang	0.079	0.049	0.030	349	95.6
Kunming	0.065	0.037	0.044	365	100.0
Lhasa	0.040	0.009	0.023	364	99.7
Xi'an	0.118	0.042	0.041	305	83.6
Lanzhou	0.138	0.048	0.042	244	66.8
Xining	0.105	0.043	0.026	316	86.6
Yinchuan	0.095	0.038	0.030	333	91.2
Urumqi	0.132	0.079	0.068	276	75.6

Source: National Bureau of Statistics, 2012, "China Statistical Yearbook 2012," China Statistics Press, Beijing

**Table 14** Carbon dioxide emissions, 1978-2011

Year	Total carbon dioxide emissions (100 million tons)	Emissions per capita (tons)	Emissions intensity/GDP (tons per \$100)
1978	14.62	1.53	9.87
1979	14.95	1.54	8.46
1980	14.67	1.50	7.75
1981	14.52	1.46	7.48
1982	15.80	1.57	7.78
1983	16.67	1.63	7.30
1984	18.15	1.75	7.05
1985	19.67	1.87	6.41
1986	20.69	1.94	6.95
1987	22.10	2.04	8.17
1988	23.70	2.15	7.66
1989	24.09	2.15	7.00
1990	24.61	2.17	6.89
1991	25.85	2.25	6.81
1992	26.96	2.31	6.38
1993	28.79	2.44	6.54
1994	30.58	2.57	5.47
1995	33.20	2.76	4.56
1996	34.63	2.84	4.05
1997	34.70	2.82	3.64
1998	33.24	2.68	3.26
1999	33.18	2.65	3.06
2000	34.05	2.70	2.84
2001	34.88	2.74	2.63
2002	36.94	2.89	2.54
2003	45.25	3.51	2.76
2004	52.88	4.08	2.74
2005	57.90	4.44	2.57
2006	64.14	4.89	2.36
2007	67.92	5.15	1.94
2008	70.38	5.31	1.56
2009	76.87	5.77	1.54
2010	83.33	6.23	1.41
2011	89.79	6.68	1.23

Source: Data on 2010 and 2011 emissions are from the BP Statistical Review of the World 2011 and 2012; others are from the World Bank's open database (available at <http://data.worldbank.org/>; last accessed May, 2013).

**Table 15** Provincial goals for energy conservation in the 11<sup>th</sup> and 12<sup>th</sup> five-year plans

Regions	2005 (actual)		2010		Target in 2015	
	GDP energy consumption (tons coal equivalent/10,000 RMB)	GDP energy consumption (tons coal equivalent /10,000 RMB)	Targets in the 11th Five-Year Plan (%)	Actual rate during the 11th Five-Year Plan (%)	Unit of GDP energy consumption (tons coal equivalent / 10,000RMB)	Decrease during the 12th Five-Year Plan from a 2010 basis (%)
Nation	1.28	1.03	20	19.06	0.869	16
Beijing	0.79	0.58	20	26.59	0.483	17
Tianjin	1.05	0.83	20	21.00	0.677	18
Hebei	1.98	1.58	20	20.11	1.314	17
Shanxi	2.89	2.24	22	22.66	1.877	16
Inner Mongolia	2.48	1.92	22	22.62	1.628	15
Liaoning	1.73	1.38	20	20.01	1.145	17
Jilin	1.47	1.15	22	22.04	0.962	16
Heilongjiang	1.46	1.16	20	20.79	0.971	16
Shanghai	0.89	0.71	20	20.00	0.584	18
Jiangsu	0.92	0.73	20	20.45	0.602	18
Zhejiang	0.90	0.72	20	20.01	0.588	18
Anhui	1.22	0.97	20	20.36	0.814	16
Fujian	0.94	0.78	16	16.45	0.658	16
Jiangxi	1.06	0.85	20	20.04	0.71	16
Shandong	1.32	1.03	22	22.09	0.851	17
Henan	1.40	1.12	20	20.12	0.937	16
Hubei	1.51	1.18	20	21.67	0.994	16
Hunan	1.47	1.17	20	20.43	0.983	16
Guangdong	0.79	0.66	16	16.42	0.544	18
Guangxi	1.22	1.04	15	15.22	0.881	15
Hainan	0.92	0.81	12	12.14	0.727	10
Chongqing	1.43	1.13	20	20.95	0.947	16
Sichuan	1.60	1.28	20	20.31	1.071	16
Guizhou	2.81	2.25	20	20.06	1.911	15
Yunnan	1.74	1.44	17	17.41	1.222	15
Tibet	1.45	1.28	12	12.00	1.148	10
Shaanxi	1.42	1.13	20	20.25	0.948	16
Gansu	2.26	1.80	20	20.26	1.531	15
Qinghai	3.07	2.55	17	17.04	2.295	10
Ningxia	4.14	3.31	20	20.09	2.812	15
Xinjiang	(no figure)		8.91		10	

Source: National Development and Reform Commission ([http://www.sdpc.gov.cn/zjgx/t20110909\\_433514.html](http://www.sdpc.gov.cn/zjgx/t20110909_433514.html)).

**Table 16** Provincial emissions control plans for chemical oxygen demand during the 12th Five-Year Plan

Region	2010(10,000 tons)		2015(10,000 tons)		Rate of change (%)	
	Emissions	Industrial and residential emission	Controlled emissions	Industrial and residential emission	Changes	Industrial and residential emission
Beijing	20.0	10.9	18.3	9.8	-8.7	-9.8
Tianjin	23.8	12.3	21.8	11.2	-8.6	-9.2
Hebei	142.2	45.6	128.3	40.7	-9.8	-10.8
Shanxi	50.7	31.2	45.8	27.9	-9.6	-10.6
Inner Mongolia	92.1	27.5	85.9	25.4	-6.7	-7.5
Liaoning	137.3	47.0	124.7	42.1	-9.2	-10.4
Jilin	83.4	28.8	76.1	26.1	-8.8	-9.4
Heilongjiang	161.2	47.8	147.3	43.4	-8.6	-9.3
Shanghai	26.6	22.5	23.9	20.1	-10.0	-10.5
Jiangsu	128.0	86.3	112.8	75.3	-11.9	-12.8
Zhejiang	84.2	61.4	74.6	53.7	-11.4	-12.5
Anhui	97.3	55.6	90.3	52.0	-7.2	-6.5
Fujian	69.6	45.8	65.2	43.1	-6.3	-6.0
Jiangxi	77.7	51.9	73.2	48.3	-5.8	-7.0
Shandong	201.6	62.7	177.4	54.6	-12.0	-12.9
Henan	148.2	62.0	133.5	55.8	-9.9	-10.0
Hubei	112.4	62.1	104.1	59.0	-7.4	-5.0
Hunan	134.1	71.8	124.4	66.8	-7.2	-7.0
Guangdong	193.3	130.6	170.1	113.8	-12.0	-12.9
Guangxi	80.7	58.1	74.6	53.6	-7.6	-7.8
Hainan	20.4	9.2	20.4	9.2	0.0	0.0
Chongqing	42.6	29.4	39.5	27.5	-7.2	-6.5
Sichuan	132.4	75.0	123.1	71.3	-7.0	-5.0
Guizhou	34.8	28.1	32.7	26.4	-6.0	-6.1
Yunnan	56.4	48.0	52.9	45.0	-6.2	-6.2
Tibet	2.7	2.3	2.7	2.3	0.0	0.0
Shaanxi	57.0	36.4	52.7	33.5	-7.6	-7.9
Gansu	40.2	25.5	37.6	23.7	-6.4	-6.9
Qinghai	10.4	8.1	12.3	9.6	18.0	18.0
Ningxia	24.0	13.3	22.6	12.5	-6.0	-6.3
Xinjiang	56.9	26.2	56.9	26.2	0.0	0.0
<b>Total</b>	<b>2551.7</b>	<b>1328.1</b>	<b>2335.2</b>	<b>1214.6</b>	<b>-8.5</b>	<b>-8.5</b>

Source: State Council of China, September 2011, "Comprehensive Working Plan of Energy Conservation and Emission Reduction During the 12th Five-Year Plan" (available at [http://www.gov.cn/zwggk/2011-09/07/content\\_1941731.htm](http://www.gov.cn/zwggk/2011-09/07/content_1941731.htm), last accessed May 2013).

**Table 17** Provincial emissions control plans for sulphur dioxide during the 12th Five-Year Plan

Region	Emissions in 2010 (10,000 tons)	Controlled targets in 2015(10,000 tons)	Rate of change(%)
Beijing	10.4	9.0	-13.4
Tianjin	23.8	21.6	-9.4
Hebei	143.8	125.5	-12.7
Shanxi	143.8	127.6	-11.3
Inner Mongolia	139.7	134.4	-3.8
Liaoning	117.2	104.7	-10.7
Jilin	41.7	40.6	-2.7
Heilongjiang	51.3	50.3	-2
Shanghai	25.5	22	-13.7
Jiangsu	108.6	92.5	-14.8
Zhejiang	68.4	59.3	-13.3
Anhui	53.8	50.5	-6.1
Fujian	39.3	36.5	-7
Jiangxi	59.4	54.9	-7.5
Shandong	188.1	160.1	-14.9
Henan	144	126.9	-11.9
Hubei	69.5	63.7	-8.3
Hunan	71	65.1	-8.3
Guangdong	83.9	71.5	-14.8
Guangxi	57.2	52.7	-7.9
Hainan	3.1	4.2	34.9
Chongqing	60.9	56.6	-7.1
Sichuan	92.7	84.4	-9
Guizhou	116.2	106.2	-8.6
Yunnan	70.4	67.6	-4
Tibet	0.4	0.4	0
Shaanxi	94.8	87.3	-7.9
Gansu	62.2	63.4	2
Qinghai	15.7	18.3	16.7
Ningxia	38.3	36.9	-3.6
Xinjiang	63.1	63.1	0
Xinjiang Production and Construction Corps	9.6	9.6	0
Total	2,267.8	2,067.4	-8.8

Source: State Council of China, September 2011, "Comprehensive Working Plan of Energy Conservation and Emission Reduction During the 12th Five-Year Plan" (available at [http://www.gov.cn/zwggk/2011-09/07/content\\_1941731.htm](http://www.gov.cn/zwggk/2011-09/07/content_1941731.htm), last accessed May 2013).

**Table 18** Provincial emissions control plans for nitrogen dioxide during the 12th Five-Year Plan

Region	Emissions in 2010 (10,000 tons)	Targets for 2015 (10,000 tons)	Rate of change(%)
Beijing	19.8	17.4	-12.3
Tianjin	34.0	28.8	-15.2
Hebei	171.3	147.5	-13.9
Shanxi	124.1	106.9	-13.9
Inner Mongolia	131.4	123.8	-5.8
Liaoning	102.0	88.0	-13.7
Jilin	58.2	54.2	-6.9
Heilongjiang	75.3	73.0	-3.1
Shanghai	44.3	36.5	-17.5
Jiangsu	147.2	121.4	-17.5
Zhejiang	85.3	69.9	-18.0
Anhui	90.9	82.0	-9.8
Fujian	44.8	40.9	-8.6
Jiangxi	58.2	54.2	-6.9
Shandong	174.0	146.0	-16.1
Henan	159.0	135.6	-14.7
Hubei	63.1	58.6	-7.2
Hunan	60.4	55.0	-9.0
Guangdong	132.3	109.9	-16.9
Guangxi	45.1	41.1	-8.8
Hainan	8.0	9.8	22.3
Chongqing	38.2	35.6	-6.9
Sichuan	62.0	57.7	-6.9
Guizhou	49.3	44.5	-9.8
Yunnan	52.0	49.0	-5.8
Tibet	3.8	3.8	0.0
Shaanxi	76.6	69.0	-9.9
Gansu	42.0	40.7	-3.1
Qinghai	11.6	13.4	15.3
Ningxia	41.8	39.8	-4.9
Xinjiang	58.8	58.8	0.0
Total	2,273.6	2,021.6	-11.1

Source: State Council of China, September 2011, "Comprehensive Working Plan of Energy Conservation and Emission Reduction During the 12th Five-Year Plan" (available at [http://www.gov.cn/jzwgk/2011-09/07/content\\_1941731.htm](http://www.gov.cn/jzwgk/2011-09/07/content_1941731.htm), last accessed May 2013).

**Table 19** Key indicators of emissions reduction by sector in the 12th Five-Year Plan

Indicators	Unit	2010	2015	Changes (%)
<b>Industry</b>				
Industrial COD emissions	10000 t	355	319	-10
Industrial SO <sub>2</sub> emissions	10000 t	2,073	1,866	-10
Industrial NH <sub>3</sub> -N emissions	10000 t	28.5	24.2	-15
Industrial NO <sub>x</sub> emissions	10000 t	1,637	1,391	-15
SO <sub>2</sub> emissions of thermal power sector	10000 t	956	800	-16
NH <sub>3</sub> -N emissions of thermal power sector	10000 t	1,055	750	-29
SO <sub>2</sub> emissions of steel industry	10000 t	248	180	-27
NO <sub>x</sub> emissions of cement industry	10000 t	170	150	-12
COD emissions of paper industry	10000 t	72	64.8	-10
NH <sub>3</sub> -N emissions of paper industry	10000 t	2.14	1.93	-10
COD emissions of textile dyeing and printing industry	10000 t	29.9	26.9	-10
NH <sub>3</sub> -N emissions of textile dyeing and printing industry	10000 t	1.99	1.75	-12
<b>Agriculture</b>				
Agricultural COD emissions	10000 t	1,204	1,108	-8
Agricultural NH <sub>3</sub> -N emissions	10000 t	82.9	74.6	-10
<b>Cities</b>				
Urban sewage treatment rate	%	77	85	8

Source: Notification from the State Council of China (available at [http://www.gov.cn/zwgk/2012-08/21/content\\_2207867.htm](http://www.gov.cn/zwgk/2012-08/21/content_2207867.htm), last accessed May 2013).

**Table 20** Key indicators of energy conservation in the 12th Five-Year Plan

Indicators	2010	2015	Changes (%)
<b>Industry</b>			
Energy consumption per unit of industrial added value, (industrial enterprises above designated size) (%)			-21
Thermal power coal consumption (gram coal equivalent/Kilowatts-hours)	333	325	-8
Electricity consumption proportion of thermal power plant (%)	6.33	6.2	-0.13
Integrated line loss rate of grid (%)	6.53	6.3	-0.23
Integrated energy consumption per ton of steel (kilograms coal equivalent)	605	580	-25
Integrated AC power consumption of aluminum ingots (kilowatt hour per ton)	14013	13300	-713
Integrated energy consumption of copper smelting (kilograms coal equivalent per ton)	350	300	-50
Integrated energy consumption of crude oil processing (kilograms coal equivalent per ton)	99	86	-13
Integrated energy consumption of ethene (kilograms coal equivalent per ton)	886	857	-29
Integrated energy consumption of ammonia (kilograms coal equivalent per ton)	1402	1350	-52
Integrated energy consumption of caustic soda (membrane) (kilograms coal equivalent per ton)	351	330	-21
Integrated energy consumption of cement clinker (kilograms coal equivalent per ton)	115	112	-3
Integrated energy consumption of plate glass (kilograms coal equivalent per weigh box)	17	15	-2
Integrated energy consumption of paper and board (kilograms coal equivalent per ton)	680	530	-150
Integrated energy consumption of paper pulp (kilograms coal equivalent per ton)	450	370	-80
Integrated energy consumption of ceramics for daily use (kilograms coal equivalent per ton)	1190	1110	-80
<b>Buildings</b>			
Retrofitting building area of northern heating district (100 million square metres)	1.8	5.8	4
Implementation rate of urban green building standards (%)	1	15	14
<b>Transportation</b>			
Integrated energy consumption of unit railway workload (tons coal equivalent/millions tons per kilometre)	5.01	4.76	-5
Unit turnover energy consumption of operating vehicles (kilograms coal equivalent/100 tons per kilometre)	7.9	7.5	-5
Unit turnover energy consumption of operating boats (kilograms coal equivalent/1,000 tons per kilometre)	6.99	6.29	-10

**Table 20** Key indicators of energy conservation in the 12th Five-Year Plan

Indicators	2010	2015	Changes (%)
Unit turnover energy consumption of civil aviation (kilograms coal equivalent/tons per kilometre)	0.45	0.428	-5
Public institutions			
Energy consumption of unit area in public buildings (kilograms coal equivalent / square metre)	23.9	21	-12
Energy consumption per capita (kilograms coal equivalent)	447.4	380	15
Energy efficiency of end-use equipment			
Coal-fired industrial boiler (operation) (%)	65	70~75	5~10
Three-phase asynchronous motor (design) (%)	90	92~94	2~4
Input power ratio of air compressor (kilowatt/ (square metre•min-1))	10.7	8.5~9.3	-1.4~-2.2
Loss of power transformation(kilowatt)	no-load:43 load:170	no-load:30~33 load:151~153	-10~-13 -17~-19
Average fuel consumption of cars (passenger) (liters per 100 kilometres)	8	6.9	-1.1
Air conditioner (energy efficiency ratio)	3.3	3.5~4.5	0.2~1.2
Refrigerator (energy efficiency indicator) (%)	49	40~46	-3~-9
Home use gas water heater (thermal efficiency) (%)	87~90	93~97	3~10

Source: Notification from the State Council of China (available at [http://www.gov.cn/zwgk/2012-08/21/content\\_2207867.htm](http://www.gov.cn/zwgk/2012-08/21/content_2207867.htm), last accessed May 2013).

**Table 21** Investment demand for energy conservation and emissions reduction in the 12th Five-Year Plan

Project	Investment demand (100 million RMB)	Capacity of energy conservation(10,000 tons)
Energy conservation	9,820	30,000 (coal equivalent)
Emissions reduction	8,160	420 (COD), 277(SO <sub>2</sub> ), 40 (NH <sub>3</sub> -N), 358(NO <sub>x</sub> )
Recycling economies	5,680	Help to achieve goals above
Total	23,660	

Source: Notification from the State Council of China (available at [http://www.gov.cn/zwqk/2012-08/21/content\\_22\\_07867.htm](http://www.gov.cn/zwqk/2012-08/21/content_22_07867.htm), last accessed May 2013).

**Table 22** Future of China's renewable energy development

	2010	2015	2020
Annual consumption of renewable energy (100 million tons coal equivalent)	2.55	4.78	
Proportion of renewable energy in total energy consumption (%)	7.8	9.5	15
Hydropower capacity (100 million kilowatts)	2.16	2.9	4.2
Grid wind power capacity (100 million kilowatts)	0.31	1	2
Solar power capacity (10,000 kilowatts)	80	2,100	5,000
Accumulated area of solar heating (100 million square metres)	0.17	4	8
Annual bio-energy consumption (10,000 tons coal equivalent)	550	5,000	

*Source: National Energy Administration, 12th Five-Year Plan of Renewable Energy Development.*

**Table 23** Standards for urban residential water consumption

<b>Geographical designation</b>	<b>Daily water consumption (litres per person per day)</b>	<b>Areas covered</b>
1	80-135	Heilongjiang, Jilin, Liaoning and Inner Mongolia
2	85-140	Beijing, Tianjing, Hebei, Shandong, Henan, Shanxi, Shaanxi, Ningxia and Gansu
3	120-180	Shanghai, Jiangsu, Zhejiang, Fujian, Jiangxi, Hubei, Hunan and Anhui
4	150-220	Guangxi, Guangdong and Hainan
5	100-140	Chongqing, Sichuan, Guizhou and Yunnan
6	75-125	Xinjiang, Tibet and Qinghai

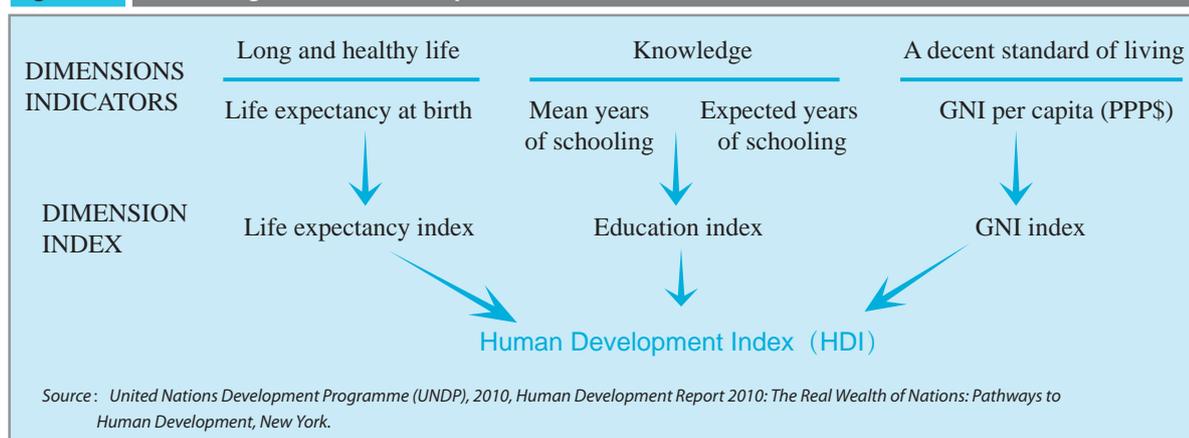
Source: Ministry of Construction, 2002, "Standard of Urban Residents Water Consumption," China Architecture & Building Press, Beijing.

# TECHNICAL APPENDIX

## APPENDIX A: CALCULATING THE HUMAN DEVELOPMENT INDEX

The Human Development Index (HDI) is a summary measure of human development that captures the average achievements in a country on three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. The HDI is the geometric mean of normalized indices measuring achievements in each dimension (figure A.1).

**Figure A.1** Calculating the human development indices



The global Human Development Report 2010 adjusted the HDI calculation methodology and indicators chosen for calculation. For the indicator of education, mean years of schooling and expected years of schooling replaced adult literacy and gross enrolment ratio; for the indicator of decent life, per capita GNI replaced per capita GDP. The detailed adjustment can be shown in table A.1. This report uses the new methodology to calculate China's national and provincial HDI values.

**Table A.1: Description of HDI indicator adjustment**

First level index	Second level index	Dimension	Third level index before 2010	Third level index unit before 2010	Third level index after 2010	Third level index unit after 2010
HDI	Life expectancy (Hh)	Long and healthy life	Life expectancy	Year	Life expectancy at birth	Year
	Education index (He)	Education	Adult literacy	%	Mean years of schooling	Year
			Gross enrolment Ratio	%	Expected years of schooling	Year
	Income index (Hls)	Decent life	Per capita GDP	US \$	Per capita GNI	PPP \$

Source: Jeni Klugman, Francisco Rodriguez and Hyung-Jin Choi, 2011, "The HDI 2010: New Controversies, Old Critiques," human development research paper.

## DATA SOURCES AND CALCULATION METHODS FOR THIS REPORT

- Life expectancy at birth: China Statistical Yearbook 2012, data from the Sixth National Census.
- Mean years of schooling: The calculation uses mean years of schooling for people over age 25. Since China does not publish this indicator, the following formula is used to calculate it. Data are from the China Statistical Yearbook 2012.<sup>1</sup>

Mean years of schooling = Share of population with primary school education\*6+ Share of population with junior high school education \*9+ Share of population with senior high school education \*12+ Share of population with junior college or above education \*16

- Expected years of schooling: The calculation uses expected years of schooling for children at age five. Since China does not publish this indicator, the following formula is used to calculate it. Data are from the China Statistical Yearbook 2012 and regional education planning documents.

Expected years of schooling = Gross enrolment ratio of primary school\*6+ Gross enrolment ratio of junior high school\*9+ Gross enrolment ratio of senior high school\*12+ Gross enrolment ratio of junior college or above\*16

- Per capita GNI: China's statistical system doesn't incorporate GNI data. China's GDP and GNI data of 2010 are used here, and derived from the World Bank open database. According to the ratio of GDP and GNI, and given the assumption that provincial ratios are the same as at the national level, provincial per capital GNI can be calculated using the following formula.

**Provincial Per Capita GNI(PPP \$)= Provincial Per Capita GDP(PPP \$)\*National GNI(PPP \$)/ National GDP(PPP \$)**

Provincial per capita GDP data are derived from the China Statistical Yearbook 2011 and then converted them into US dollar value according to purchasing power parity.

## CREATING THE HDI SUB-INDICES

The first step in calculating the HDI is to create sub-indices for each of the three dimensions. Minimum and maximum values (goalposts) need to be set in order to transform the indicators into indices between 0 and 1. Because the geometric mean is used for aggregation, the maximum value does not affect the relative comparison (in percentage terms) between any two countries or periods of time. The calculation of China's provincial HDI values refers to the goalshots of national HDIs calculated globally, as shown in table A.2.

**Table A.2: Goalshots for the HDI in this report**

Dimension	Observed maximum	Minimum
Life expectancy	83.2(Japan, 2010)	20
Mean years of schooling	13.1(Czech Republic,2005)	0
Expected years of schooling	18.0(capped at)	0
Combined education index	0.978(New Zealand,2010)	0
Per capita income (PPP \$)	107,721(Qatar,2011)	100

*Source:United Nations Development Programme (UNDP), 2010 and 2011, Human Development Report 2010: The Real Wealth of Nations: Pathways to Human Development and Human Development Report 2011: Sustainability and Equity: A Better Future for All, New York.*

<sup>1</sup> National Bureau of Statistics of China, Department of Population, Society and Scientific Statistics, 2003, "Discussion on the Methodologies of Calculating Mean Years of Schooling," Research on Statistical System Reform, vol. 5.

## AGGREGATING THE SUB-INDICES TO PRODUCE THE HDI

The HDI is the geometric mean of the three sub-indices:

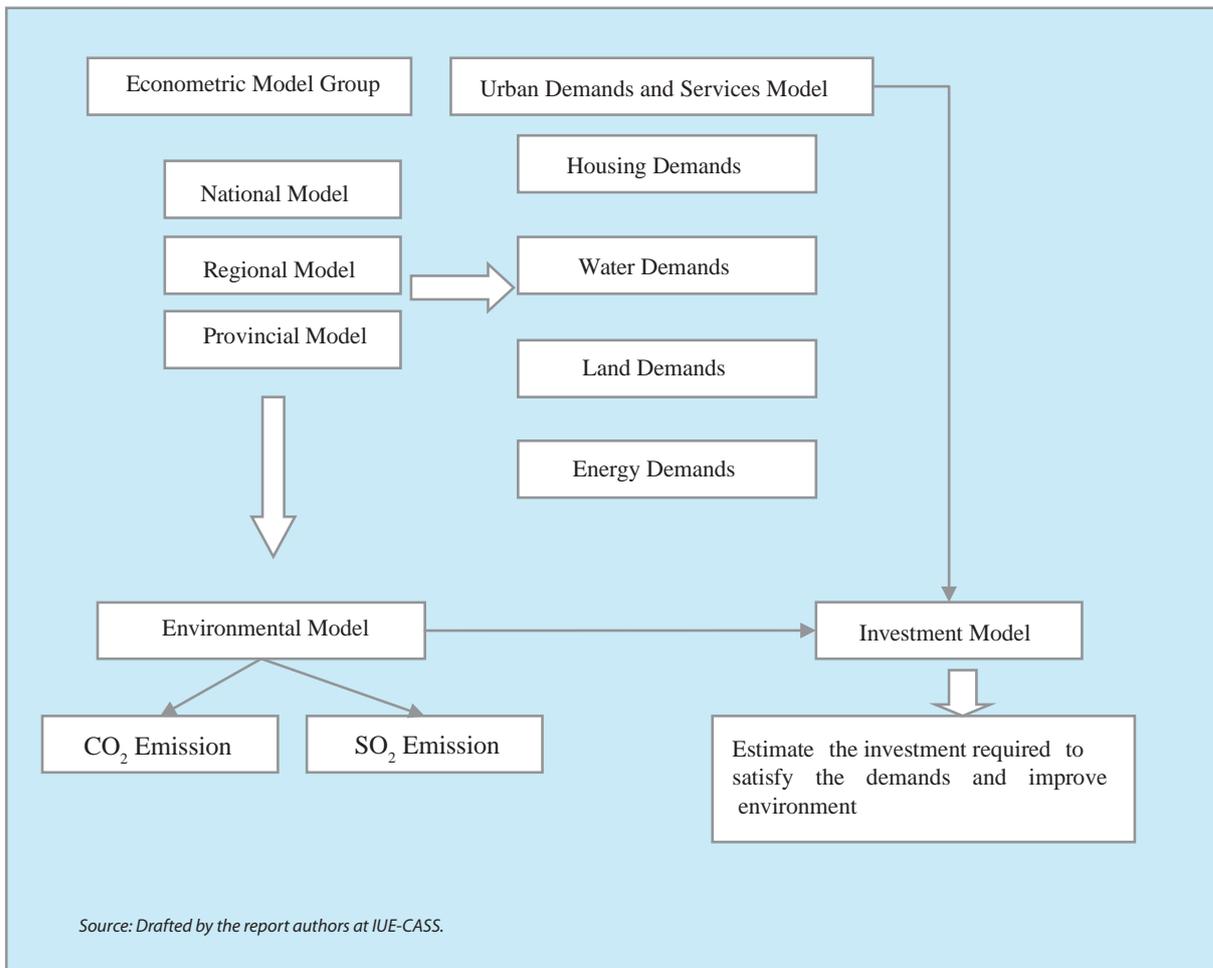
$$\text{HDI} = I_{\text{Life}}^{1/3} * I_{\text{Income}}^{1/3} * I_{\text{Education}}^{1/3}$$

Using this methodology, China's 2010 provincial HDI values can be shown in statistical tables (Statistical Table 1 and 6). The national HDI result of 0.693 for 2010 is a little different from the number released by the global Human Development Report 2011, where the value is 0.682. This difference stems from the source and method of data collection. This report mainly uses the data of the China Statistical Yearbook and Census, while the global report adopts data released by international agencies such as the World Bank.

## APPENDIX B: METHODOLOGY FOR SCENARIO ANALYSIS

For making projections for the future urbanisation scenarios used in this report, the research team constructed a series of ‘top-down’ econometric models. These helped generate forecasts on several key indicators at the national, regional and provincial levels. An integrated macro-econometric model was created to forecast China’s future socio-economic development, basic urbanisation needs and environmental stress indicators under different urbanisation scenarios. The basic framework of the model is shown in figure 1.

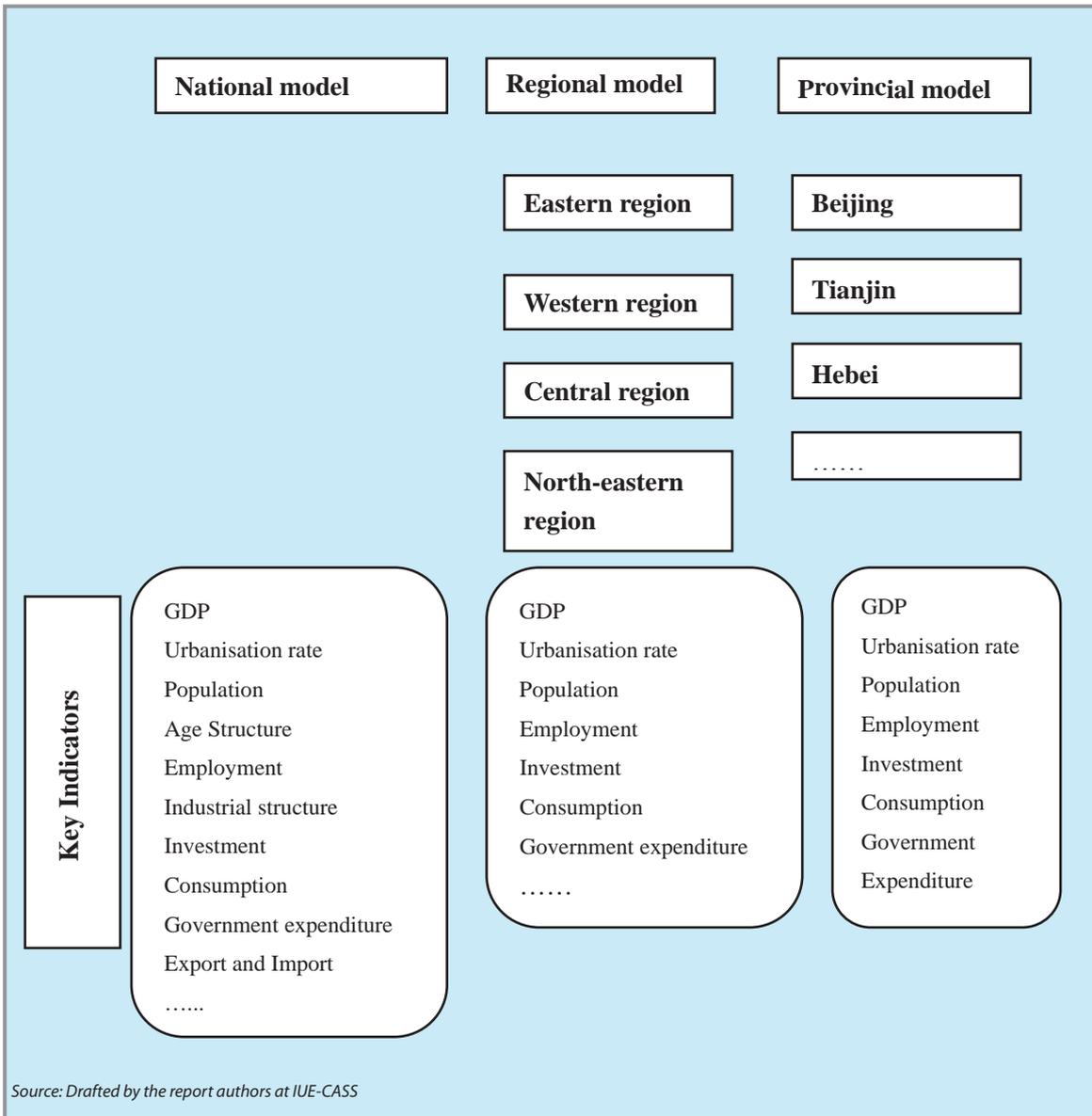
**Figure B.1** General model system framework



The whole model system is a collection of macro-econometric models at three levels. The methodology is similar among these three. By constructing linked econometric equations and using other forecast techniques (e.g., a logistics model used in forecasting urbanisation rates), some projections of key indicators were derived based on some assumptions (as shown in figure 2). Due to limited availability of some data, several indicator forecasts were achieved only at the national level.

The national model consists of several modules, including a production module, price module, income and consumption module, government module, population and employment module, trade module, resource and environment module, and urban service demand module. Based on some exogenous assumptions of several key indicators, using regression or other techniques, a forecast of these indicators until 2030 was derived. Assumptions included the saturation rate of future urbanisation, the natural population growth rate, the GDP growth rate, price level and so on. At provincial level, additional constraints were taken into consideration to make the

**Figure B.2** Key indicators from the integrated model



forecasts of some indicators consistent with the national level. Aggregation of provincial results produced regional projections. Some national forecasts were used as inputs at the provincial and regional levels.

The sample range of the integrated econometric model is 1978 to 2010. Data used in the model came from various statistical yearbooks and other sources, with various methods used to address missing and abnormal data. All economic data were adjusted per real value on a 2010 basis.

## APPENDIX C: SURVEY ON SATISFACTION WITH URBAN SUSTAINABLE AND LIVEABLE DEVELOPMENT

To better analyse and understand the requirements of ordinary people, UNDP China conducted an online survey on public satisfaction with urban development. It took place from 22 March to 18 May 18, 2012. A total of 318 people filled in the questionnaire online; all responses were effective. The results indicate major challenges and achievements in terms of sustainable, liveable development in cities.

Most survey participants were young; 44 percent were under the age of 25, and 46 percent were between the ages of 26 and 40. City dwellers accounted for 95 percent of respondents. Fifty-three percent were urban workers. There was insufficient reflection of the opinions of the migrant population.

Figure C.1 outlines issues where a relatively high proportion of respondents said they were 'not very satisfied' or 'least satisfied'.

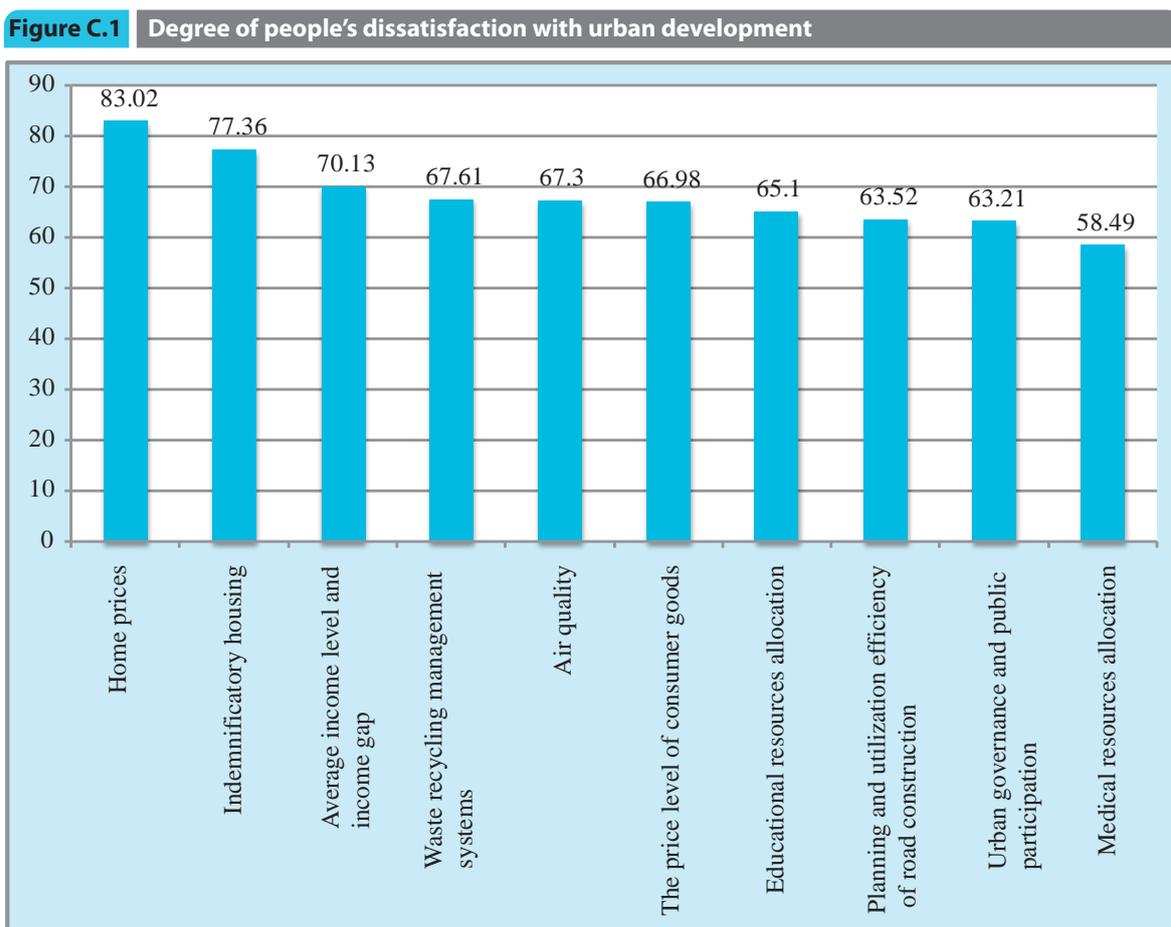
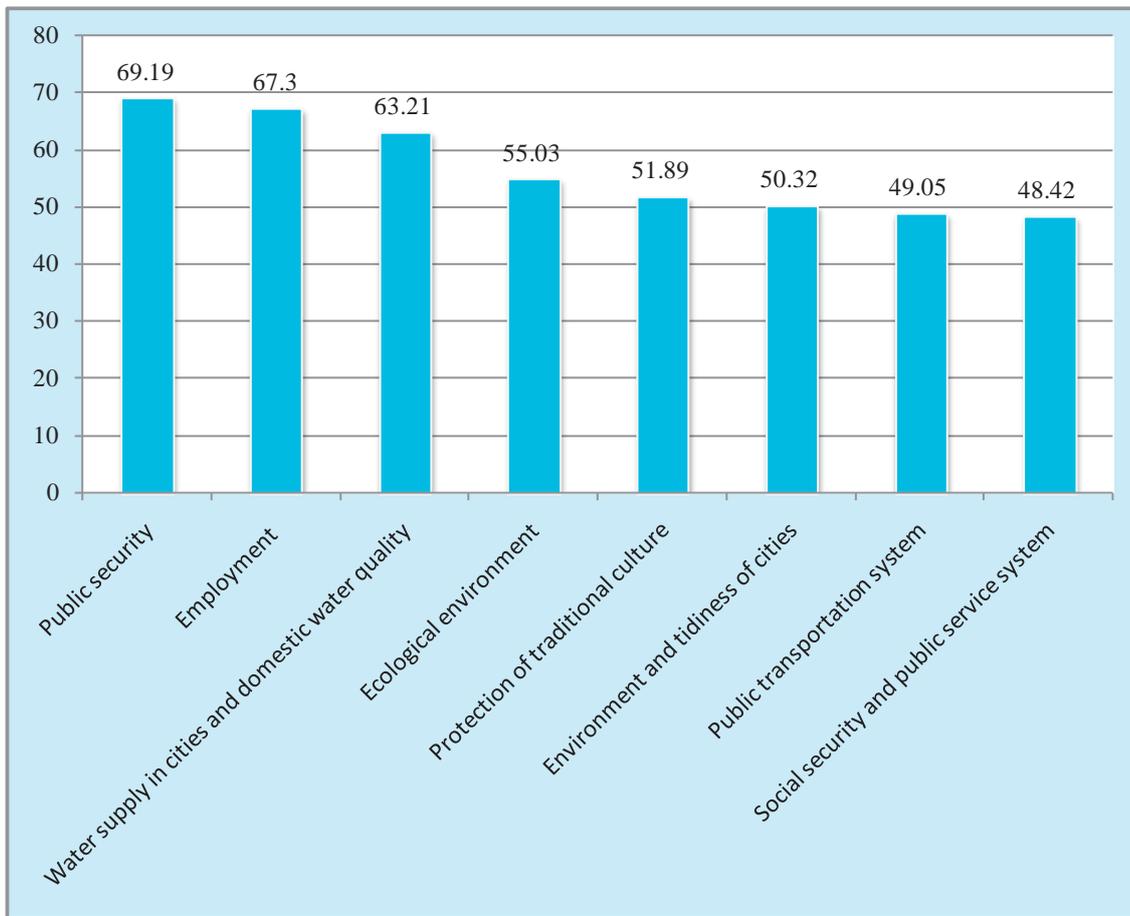


Figure C.2 shows aspects of urban life where a relatively high proportion of respondents said they were 'basically satisfied', 'very satisfied' or 'satisfied'.

The survey results suggest that ordinary people are very unsatisfied with home prices in cities; nearly 51 percent of respondents chosen the option 'very unsatisfied'. Only around 23 percent of respondents were satisfied with the construction of indemnificatory housing and income level. Home prices are rising out of proportion to residents' incomes, driven by speculative purchasing, which poses a serious challenge to sustainable urban development. Since the consumer price index has remained at a high level for consecutive periods, over 40 percent of

**Figure C.2** Degree of people's satisfaction with urban development

respondents were 'not very satisfied' with the prices of consumer goods.

The responses indicate that the social security system still needs to be improved. A majority of urban residents were not satisfied with the allocation of educational and medical resources. Similarly, public services and infrastructures need to be better, although nearly 70 percent of respondents were satisfied with public security. A similar portion were satisfied with employment rates. Traffic jams in big cities have been widely criticized, and less than 50 percent of respondents were satisfied with public transportation.

From an environmental perspective, the phenomena of cities 'besieged' by garbage and air pollution have become hot issues. Most respondents were not satisfied with the waste recovery/management system and air quality. Although water shortages seriously hinder the sustainable development of many cities in China, over half of the respondents were satisfied with water supplies. The environment and tidiness of cities still need to be improved, and only around 50 percent of respondents were satisfied on these fronts.

The online survey suggests that despite some achievements, there are various challenges to building sustainable and liveable cities. Economic, social and environmental challenges are interacting together to jointly restrain future development. How to turn challenges into opportunities for the construction of sustainable and liveable cities has become a key issue for urbanisation.



# APPENDIX

## NHDR International Case Studies

### *Environmental Protection: Istanbul*

#### CITY AT A GLANCE

Status: Most Populous City in Turkey

Founded: 660 BCE (Byzantium)

Population (2011): 13.483million

Density: 2523/km<sup>2</sup> (6535/mi<sup>2</sup>)

Area: 5343 km<sup>2</sup> (2062.9mi<sup>2</sup>)

HDI (National, 2010): 0.679

#### SECTOR OVERVIEW

One of the most harmful impacts of urban expansion is the loss of ecosystem services, broadly defined as benefits obtained from the environment. For example, a forest ecosystem provides clean air (trees), meat and skins (animals), honey and pollination (insects), etc. For the purposes of this case study, ecosystems may be loosely divided into three categories: 1) urban ecosystems, characterized by dense human habitation and landscape alteration, 2) rural ecosystems, characterized by comparatively sparse human habitation and extensive agricultural activity, and 3) wild ecosystems, characterized by minimal human interference. These systems often overlap, particularly where humans harvest resources from wild ecosystems (e.g. logging and mining) and when rural areas are slowly absorbed by urban sprawl.

An urban ecosystem comprises flora, fauna, insects, animals, waterways, soil and people. Threats to a healthy urban ecosystem increase with a city's popu-



lation, becoming increasingly difficult to manage as the city grows. Proper ecosystem management is therefore vital to a city's long-term sustainability. This can be premised on the understanding that ecosystems such as forests and water not only yield benefits such as resources and pollution control, but also provide recreational amenities that make cities more livable.

According to the 2005 UN Millennium Ecosystem Assessment,<sup>1</sup> ecosystem services include those that are supporting (nutrient dispersal and cycling, seed dispersal and primary production), provisioning (food, water, minerals, etc.), regulating (carbon sequestration, waste decomposition/detoxification, pollination, etc.) and cultural (inspiration, recreation and scientific discovery). Supporting services form the foundation for the other three categories.

#### THE STORY

Istanbul has always had a close relationship with

water, being situated along the Bosphorus Strait, which connects the Black and Marmara seas, and acts as Asia's sea channel to the Mediterranean. The city boasts a natural harbor, the Golden Horn, which shelters ships, provides fish for local residents and was historically famous for its aesthetic appeal.

During the 1930s, a large influx of immigrants caused rapid expansion of both residential and industrial development around the Golden Horn. Much of this was illegal and lacked proper municipal oversight. <sup>2</sup> <sup>3</sup> Enterprises commenced operation without proper disposal mechanisms, depositing waste directly into the waterway. An historic floating bridge at the mouth of the Golden Horn exacerbated the situation by blocking water flow, thus concentrating heavy pollutants. The effects of this buildup were severe: raised chemical oxygen demand and pH levels, anoxic sediment buildup, severe hydrogen sulfide odor, raised bacterial concentrations, reduced flora and fauna, increased disease incidence, significantly reduced property values and loss of civic pride. <sup>4</sup>

This severe environmental degradation prompted a drastic clean-up effort in 1984. The project addressed the situation in five steps.

First, the city demolished and relocated nearly all industries, shops and homes to establish conditions amenable to restoration. This process was understandably unpopular with residents and businesses, but absolutely vital to the larger goal. Public support also rose along the process as the industries were being replaced by parkland that allows the shoreline to regain some of its recreational values. Over 5000 new dwellings and a new organized industrial zone was constructed for the displaced residents and businesses around 15 km west to the Golden Horn.

Second, the city constructed a new disposal system that took advantage of the unique currents in

the Bosphorous to ensure that waste would enter the Black Sea instead of the Marmara. <sup>5</sup> The former's regulating ecosystem services were deemed more suitable for waste decomposition. Advanced mechanisms, including secondary and tertiary biological treatment, were added to the system. <sup>6</sup>

Third, the Golden Horn was thoroughly dredged to remove trapped toxic sediment. Prior efforts had proven ineffectual without first removing the polluting industries and residences, revealing the importance of shutting down pollution sources. This stage

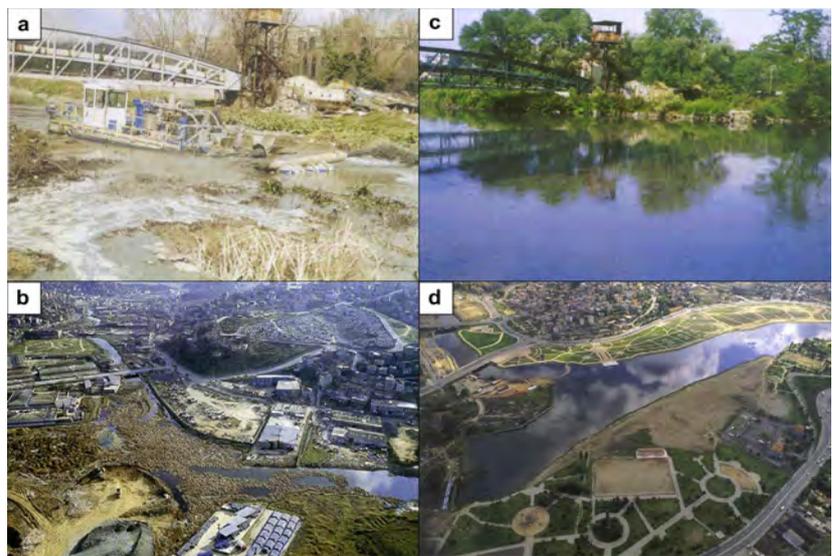


Figure 1 Effects of the Golden Horn restoration project. a,b: before and during dredging operations; c,d: after dredging operations and park development.

Source: Coleman, H., G. Kanat, and F. Ilter Aydinol Turkdogan, 2009, "Restoration of the Golden Horn Estuary (Halic)," *Water Research*, 42, pp 4989-5003.

eliminated an overwhelming odor, improved navigation within the estuary, and saw construction of a temporary recreation field over the landfill where the sludge was deposited. These effects were fundamental for reestablishing cultural identification with the area.

Fourth, the Galata Bridge was dismantled and replaced with a less obstructive structure. <sup>7</sup> This greatly reduced anoxic sediment buildup and allowed many species to repopulate the estuary.

Finally, the city sought to restore the Golden Horn to its former status as a social and cultural locus.

Commercial and recreational development emphasized restaurants, cafes, museums, boating tourism, parks, and an extensive tram system servicing the entire historic peninsula. The project's success was highly publicized, particularly when the mayor swam through the Golden Horn's waters to showcase its cleanliness. These efforts reengaged citizens with the beauty and history of the area, fostering the public stewardship necessary for long-term sustainable environmental rehabilitation. The Golden Horn cleanup

underscores the importance of a strong multi-tiered response to severe environmental degradation. It illustrates important aspects of municipal environmental protection and restoration: strictly dealing with pollution sources, expanding waste treatment facilities, fostering stakeholders' identification with a clean natural environment, and establishing a balance between careful municipal planning and strict urbanisation restrictions to ensure that growth does not outpace infrastructure expansion.

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## Green Space: Tehran

### CITY AT A GLANCE

Status: Capital of Iran

Founded: 6000 BCE (Capital in 1795)

Metropolitan Population (2012): 13.8 28 million

Density(2012): 10854/ km<sup>2</sup> (28106/ mi<sup>2</sup>)

Metropolitan Area: 1274 km<sup>2</sup> (492 mi<sup>2</sup>)

HDI(National (2010): 0.702

Green Space per Capita: 13.3 m<sup>2</sup>

### SECTOR OVERVIEW

The social, economic and environmental advantages of urban green spaces have been exhaustively documented. Public parks and natural recreation facilities encourage social gatherings, fostering civic pride and positive perceptions of a city or neighbourhood.<sup>1</sup> Simply viewing natural landscape features, such as trees and vegetation, alleviates anxiety and is linked directly with health.<sup>2</sup>

Green spaces directly stimulate the horticulture industry.<sup>3</sup> Indirect benefits can include business growth,<sup>4</sup> greater productivity and job satisfaction, increased retail activity and higher property values.<sup>5</sup> Urban agroforestry can produce food and medical materials, boosting food security and reducing transportation costs from outlying agricultural districts. Environmental benefits encompass biodiversity conservation, pollution filtering, oxygen production, noise reduction, heat regulation, soil stabilization, groundwater recharge and carbon sequestration.<sup>6</sup>

Environmental quality has become so vital to city livability and long-term sustainability that open nature areas and integrated green spaces have become underlying assumptions for effective urban planning.<sup>7</sup>



<sup>8</sup>The World Health Organization recommends a minimum of nine square metres of open green space per urban resident,<sup>9</sup> while the general standard within developed nations is 20 square metres.<sup>10</sup>

### THE STORY

Settlements have existed in the Tehran plain for more than 10,000 years,<sup>11</sup> but the city itself first attracted a large population when people fled the Mongols' destruction of the nearby city of Rhages in 1221.<sup>12</sup> The Iranian capital now hosts more than 12 million residents, and in the last few decades, rampant urbanisation has largely destroyed the city's gardens and green areas.<sup>13</sup> Tehran also suffers from infamously



poor air quality<sup>14</sup> and a limited water supply. There are no nearby rivers, and the city lies approximately 100 kilometres from the Caspian Sea. It is bordered on two sides by hills and mountains, which limit fresh airflow. Without many regulating ecosystem services (see case study on Environmental Protection: Istanbul), the city struggles to cope with rising population pressures.

The municipality is aware of the vital importance of green space. The Tehran Parks and Green Space Organization (TPGSO) has therefore carried out long-term projects that have included peri-urban forest development and the establishment of green space along highways. It incorporates progressive social and cultural aims such as equitable park distribution across the city, promotion of gender equality through establishing parks exclusively for women who are entitled to spend their leisure time in safe environment, multi-purpose green spaces and adherence to sustainability principles.

TPGSO has been making steady progress, establishing 1,500 new parks, 7,000 hectares of urban forests and 35,000 hectares of peri-urban forests over the

past two decades. Urban green space per capita increased to 13.3 square metres in early 2012, up from 0.5 in 1986,<sup>15</sup> partly as a result of developed highway green spaces.<sup>16</sup> Urban managers have been encouraged to establish vertical green spaces (see Figure X), yielding co-benefits such as city beautification, noise control and regulating ecosystem services.<sup>17</sup>

Recognizing that environmental problems cannot be solved merely by municipal action, TPGSO enacted an extensive public education programme, whereby 7,800 'green space experts' attended training courses. It published seven books with a circulation of 240,000, and distributed 255 unique informational and instructive booklets. This has moved public perception, as destruction of green space is now ranked as the second most serious environmental problem facing the city, behind air pollution. TPGSO both recognizes the public's right to a clean environment and its vital role in safeguarding green spaces, adhering to a core principle of sustainability outlined in Principle 10 of the Rio Declaration.<sup>18</sup>

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# Innovation Promotion: Singapore

## CITY AT A GLANCE

Status: Republic of Singapore (City-State)

Population (2012): 5.3124 million

Density(2012): 7315/ km<sup>2</sup> (18943/ mi<sup>2</sup>)

GDP per capita (2012,PPP): 61064 International Dollars

Area: 710km<sup>2</sup> (274 mi<sup>2</sup>)

HDI (National, 2010): 0.895



## SECTOR OVERVIEW

Humanity faces daunting challenges ranging from natural resource scarcity and climate change to worldwide economic instability. Innovation can address these, while providing economic, environmental, and social benefits. Innovative companies attract talent and create jobs; new modes of thinking can contribute greatly to better living conditions and greener lifestyles.

Municipalities can create an environment that promotes innovation. This attracts international companies and nurtures local enterprises. Research and development spending is a proven method to spur business development, including through university-industry collaborations. Intellectual property rights protections are an important complement.

## THE STORY

The Asian financial crisis of 1997 led Singapore to reevaluate its growth strategies. In 2001, it created a high-level Economic Review Committee, which outlined three key development strategies, one of which was to remake Singapore into a creative and entrepreneurial nation.<sup>1 2</sup> According to the Global Innovation Index 2011, Singapore ranked first in Asia and third globally, behind Switzerland and Sweden,<sup>3</sup>

having moved up from seventh in 2010.<sup>4</sup>

A first step was to boost Singapore's R&D spending. By 2008, it equaled 2.66 percent of its GDP,<sup>5</sup> up from only 0.28% in 1981,<sup>6</sup> and higher than the OECD average of 2.35 percent.<sup>7</sup> This attracted business investments and funding from other sources.

Singapore also made it easy to do business. In 2012, the World Bank ranked it as the top global location in ease of doing business for the seventh consecutive year.<sup>8</sup> Startup costs are low, and it takes only about six working days to establish a new firm. Singapore also pays great attention to the stability of the business environment, ensuring an efficient political structure, well-established judicial system, transparency in business, and mature domestic institutions with good corporate governance practices.<sup>9</sup>

Over time, Singapore has become a global leader in university-industry collaboration, which is vital in transforming knowledge into industrial productivity. Universities in Singapore started the first government-initiated Research and Development Assistance Scheme in 1981. In 1992, the Industry and Technology Relations Office of the National University of Singapore was created to start full-fledged technology transfer operations.<sup>10</sup> The Singapore Science Park became an R&D hub in 1980, and the One

North project was announced in 2001 as a 20-year, 500-acre research district to help make Singapore a global talent hub.<sup>11</sup>

Realizing that Singapore needs to be transformed into a knowledge-intensive society, the Government has been striving for a sustainable competitive advantage by focusing on both creating and protecting innovation. Founded in 2001, the Intellectual Property Office of Singapore is responsible for legislation and registration of intellectual property matters, promoting better protection mechanisms and

developing global networks and copyright treaties.<sup>12</sup> Singapore's Ministry of Law has recently announced that it will boost Singapore's role as Asia's intellectual property hub in terms of intellectual property transactions and management, filings and dispute resolutions.<sup>13</sup> It is identified that, in order to establish such an intellectual property hub, Singapore will need to build a globally competitive intellectual property workforce with specialized skilled sets and provide a conducive and progressive environment for intellectual property activities.

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## Transportation: Mexico City

### CITY AT A GLANCE

Status: Capital of Mexico

Founded: 1325 (Tenochtitlan)

Population (2012): 8.85million (Federal District)  
19.8 million (Metropolitan)

Area: Federal District 1485km<sup>2</sup> (573.4 mi<sup>2</sup>)  
Metropolitan Area: 2018 km<sup>2</sup> (779.2 mi<sup>2</sup>)

HDI (National, 2010): 0.750

### SECTOR OVERVIEW

Heavy reliance on motorized vehicles releases tremendous quantities of emissions that degrade air quality, and can render a city hazardous to human health. Traffic congestion slows travel speeds and increases time spent on transportation.

Quality transportation infrastructure improves people's mobility, reduces emissions, increases air quality and supports business development. <sup>1</sup> Public transportation should be inexpensive and/or subsidized, cover most of the greater metropolitan area, link with intercity rail and airline services, and integrate Bus Rapid Transport (BRT) components where applicable.

An ideal transport system includes ample off-street parking, dedicated bike lanes, public bicycle rental stations and strictly enforced traffic regulations. Government regulations such as disincentives for car usage—Singapore's 120 percent vehicle tax <sup>2</sup> and Turkey's 65 percent fuel tax <sup>3</sup> being two examples—reduce vehicles on the roads and help control emissions.

### THE STORY

Mexico City adopted strict vehicle standards and transportation measures to address air quality, which



has improved markedly since monitoring began in the late 1980s. Its actions included the removal of lead from gasoline, catalytic converter installation for automobiles, sulphur reduction in diesel fuels, strengthened vehicle maintenance and inspection, and tighter driving restrictions, such as the One Day Without a Car programme. <sup>4</sup>

The city also boasts the largest subway system in Latin America, extending 207 kilometres over 11 lines with 175 stations. Fares are heavily subsidized, making it one of the most inexpensive public transport systems in the world. Subway coverage is supplemented by an urban-suburban rail system, inexpensive city buses with BRT components such as dedicated lanes, <sup>5</sup> a privatized bus network and electric trolleys. A 2009 article by the World Resources Institute estimates that the Metrobús rapid transport system alone cuts carbon emissions by approximately 47,000 tons each year. <sup>6</sup>

To further reduce traffic and encourage alternative transport, the city expanded the availability of bicycle lending stations, and, in 2007, enacted Cycle-Ride Sundays. The programme completely closes city streets to car traffic in an effort to promote bicycle travel. <sup>7</sup>

Mexico City won the 2013 Sustainable Transport Award from the Institute for Transportation and De-

velopment Policy. The award decision cited improvements such as expanded bus coverage, implementation of BRT components, increased public bicycle

availability, and both on- and off-street parking reforms.<sup>8</sup>

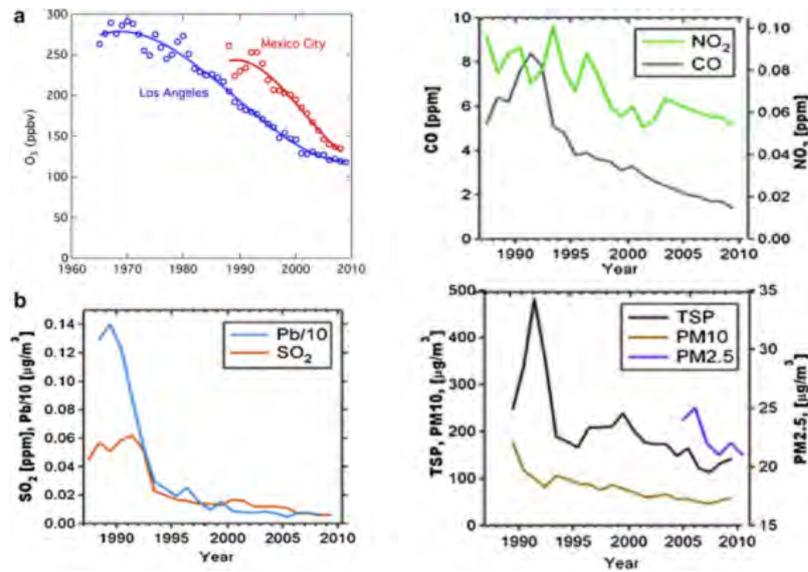


Figure 1

a) Comparison of air quality trends for O<sub>3</sub> in Mexico City and Los Angeles.

The data are 3-yr averages of the 4th highest annual maxima; they are from Fig. 1 for Los Angeles and from SMA-GDF (2009) for MCMA. The curves are polynomial fits to the respective data set.

b) Air quality trends in Mexico City.

Plots show the average of the 5th annual maximum from all stations with valid data for a given year. Data sources are same as in Fig. 8a.

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# Urban Design: Portland, OR

## CITY AT A GLANCE

Status: Largest City in Oregon 29th Largest City in USA

Founded: 1845

Population (2010): 584,000  
2,29 0,000 (Metropolitan)

Area: 376.5km<sup>2</sup> (145.4 mi<sup>2</sup>)

HDI (National, 2010): 0.902

Nickname: City of Roses

## SECTOR OVERVIEW

Urban design for sustainable, liveable cities entails organizing a city based on the principles of human-scale planning, environmental stewardship, social equity and economic viability.<sup>1</sup> Since it crosses disciplines, it requires input from experts in diverse fields, as well as the participation of city resident in shaping their living environment. Effective urban design integrates high-density neighbourhoods with public buildings, open spaces, mixed-use land, and pedestrian walkways that encourage both exercise and interaction. Physical and visual access to greenery (see case study on Green Space: Tehran) is a key component.

Sustainable, liveable cities are structured foremost to provide the best possible life for residents and visitors. They protect safety, health, and mobility, while allowing scope for economic development. Such an approach is readily evident when, for example, car usage is discouraged to protect human health because public transport is readily available. In contrast, a poorly designed city might favour unchecked economic growth over decent living conditions.

The efficacy of sound urban design is readily evident in a broad array of benefits, including crime preven-



tion,<sup>2</sup> improved health,<sup>3</sup> aesthetic appeal,<sup>4</sup> greater rental value<sup>5</sup> and increased property values.<sup>6</sup>

## THE STORY

Located in America's Pacific Northwest, Portland is situated at the north end of the Willamette Valley. The Willamette and Columbia rivers give the city access to the Pacific Ocean. This configuration together with roads to the agricultural Tualatin Valley once made Portland the region's foremost port city, until railroads provided an alternative to navigating the dangerous Columbia River rapids.

Portland has a history of urban planning stretching back as far as 1903, when landscape architects were invited to prepare a plan for the Lewis and Clark Exposition. An official City Planning Commission was established in 1919, and a new city plan, drafted in 1921, wisely anticipated the emergence of the automobile as a key factor in city design by calling for better traffic arteries. A 1920 city referendum placed controls on property use, building height, and open spaces, making Portland one of only three American cities at the time with such zoning restrictions.<sup>7</sup>

Modern Portland is undeniably green, with more than 66 square metres of green space per resident.<sup>8</sup> This

is due primarily to excellent long-term taxation and planning, as stated nearly 70 years ago: “As a result of the wise administration of this [public tax] fund, Portland has one of the best potential recreation schemes in the country as far as both the amount of land devoted to parks and desirable location of such parks with respect to future development of adjacent area, are concerned.” This prediction turned out to be accurate, as Portland now consistently places high in environmental and liveability rankings, heralded in the United States as one of the best bicycling cities<sup>9</sup> and<sup>10</sup> hiking destinations,<sup>11</sup> and most sustainable metropolitan areas.<sup>12</sup>

Portland’s impressive reputation is due not only to green space and extensive bike paths, but also other urban design features like pedestrian friendliness, effective public transportation,<sup>13</sup> and a feeling among residents, visitors and employees that they are safe at all hours.<sup>14</sup> Portland State University takes advan-

tage of the city’s progressive policies and furthers sustainable development<sup>15</sup> by, for example, promoting green building on campus.<sup>16</sup> The university also partners with local businesses, such as the region’s renowned breweries,<sup>17</sup> to foster innovation and economic development. (see case study on Innovation Promotion: Singapore).

Although Portland has not been immune to the global economic downturn, it manages to maintain its focus on human-friendly urban design while keeping unemployment below and job growth above national averages.<sup>18</sup> This is due partly to the city’s location along the Columbia River—it is now the third largest export port on the West Coast—as well as a host of job training and business incentive programmes.<sup>19</sup> The city also implements measures to advance female and minority inclusion in the workforce and government services.<sup>20</sup>

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# Waste Disposal: Amsterdam

## CITY AT A GLANCE

Status: Capital of the Netherlands

Founded: 1275

Population (2012): 1.56 million (City)  
2.3 million (Metropolitan)

City Area: 219 km<sup>2</sup> (84.6 mi<sup>2</sup>)

Metropolitan Area: 1,815 km<sup>2</sup> (701 mi<sup>2</sup>)

HDI (National,2010): 0.890



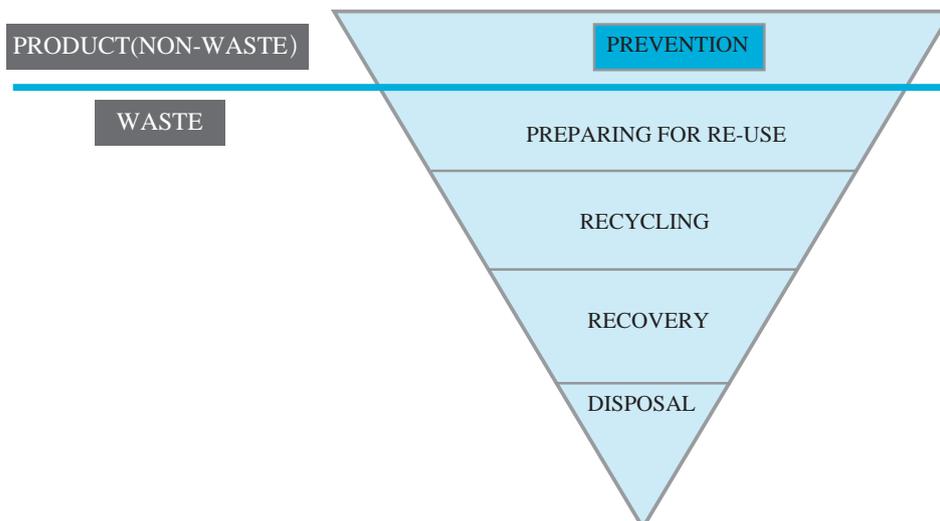
## SECTOR OVERVIEW

An effective municipal waste system improves public health, protects ecosystem services, safeguards against toxic effluents and emissions, and reclaims as much energy and material from waste as possible. Conversely, improper waste disposal degrades the local environment (see case study on Environmental Protection: Istanbul), reduces property values, and can pose a serious health and safety risk.

Landfilling is the most popular waste disposal technique in nations with large areas of undeveloped land. The main benefit is the low cost, as short-term

expenses need only cover site preparation, waste collection and transportation, and site closure. Yet the long-term expenses can be dramatic, as landfill sites render urban areas both unappealing <sup>1</sup> and hazardous. <sup>2</sup> Sealed landfills are unsuitable for further development without expensive reclamation efforts (Jain et al. 2013). <sup>3</sup>

Incineration, or energy recovery, presents its own benefits and hazards. Area requirements are drastically reduced, as the waste need only be delivered to the plant, and reclaimed energy can offset operational costs. Effective infrastructure is vital: incomplete combustion of any substance releases toxic



chemicals. These emissions include volatile organic compounds, nitrous oxides and polycyclic aromatic hydrocarbons, all prime contributors to smog.<sup>4</sup>

## THE STORY

The Netherlands is a very small country, with a land area of only 33,893 square kilometres (CIA 2013).<sup>5</sup> Land usage is carefully balanced among urban, industrial and agricultural purposes, so landfills are not viable options. Municipal waste landfilling has fallen from 160 kg in 1995 to only 8 kg in 2008.<sup>6</sup> To reduce waste streams, most Dutch cities have implemented the national recycling programme, but Amsterdam's Afval Energie Bedrijf (AEB, Waste and Energy Company)<sup>7</sup> has instead constructed a waste-to-energy power plant financed and owned exclusively by the municipality. The city eschews the national programme in favour of its clean incineration system, making the AEB plant unique in the Netherlands.

In Amsterdam, only glass and paper products are separated for recycling, while everything from plastic to metal is incinerated in a highly modernized facility that captures all byproducts and releases only water vapor. In addition to its primary waste dispos-

al function, the facility provides three outputs: electricity, raw materials and heat. Metals are recovered from the bottom ash, while chemical resources are extracted from the plant's flue-gas capture system and used to produce construction materials. Finally, the plant cogenerates power and heat, providing warmth to 40,000 households.

Amsterdam's trams and metros run on electricity produced at the AEB plant,<sup>8</sup> yielding an ongoing return on the city's investment. Lack of space for segregated bins and citizens' reluctance to separate waste have been factors influencing the city's continued use of its incineration facility.

The AEB plant has a net energy yield of 30 percent, comparable to the 2006 global average for coal plant efficiency (EurActiv 2006).<sup>9</sup> Today's most advanced coal plants realize a maximum efficiency of 49 percent,<sup>10</sup> but use a controversial fossil fuel source rather than recovering energy from municipal solid waste. AEB claims the plant mitigates climate change by reducing Amsterdam's heat and energy dependency on fossil fuels.

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# Air Quality: London

## CITY AT A GLANCE

Status: Capital of the United Kingdom

Population (2012): 8.31 million

Density(2012): 5285km<sup>2</sup> (13690/mi<sup>2</sup>)

Area: 1572.1 km<sup>2</sup> (607 mi<sup>2</sup>)

HDI (National, 2010): 0.849



## SECTOR OVERVIEW

Polluted air can cause discomfort, disease and even premature deaths among urban residents, particularly the elderly, young children and those with respiratory problems. The damage is not limited to humans, as air pollution also harms ecosystems.<sup>1</sup>

Air pollution comes from human and natural sources. The former include power plants, factories, combustion-based heating devices, motor vehicles, waste decomposition, etc. The later comprise volcanic activity, wildfire smoke and so on.

Historically speaking, air quality is generally the first consequence of post-industrial wealth creation. Many countries have successfully lifted their people out of poverty at the cost of immense environmental and atmospheric damage. In line with modern research on the severe long-term health impacts,<sup>2</sup> people are becoming concerned about and actively involved in combating air pollution.

## THE STORY

In December 1952, the Great London Smog shrouded the city for five days. Visibility was reduced to only one metre due to abysmal concentrations of smoke and sulphur dioxide. The effects of the smog were unprecedented: 12,000 deaths in the immediate aftermath and a further 8,000 thereafter.<sup>3</sup> Widespread

coal combustion was recognized as a primary cause; coal accounted for 61 percent of London's energy usage, with 28 percent used for domestic purposes.

Triggering serious public concern, air pollution was soon regarded as the direct cause of the premature deaths during and after the smog. Serious measures were enacted to control it, though the government initially resisted due to economic pressures (Brown 2002).<sup>4</sup> Special acts were issued to ban smoke-emitting fuels, raise minimum heights of industrial chimneys and move power plants away from cities; urban air pollution declined dramatically (Figure 3).<sup>5</sup>

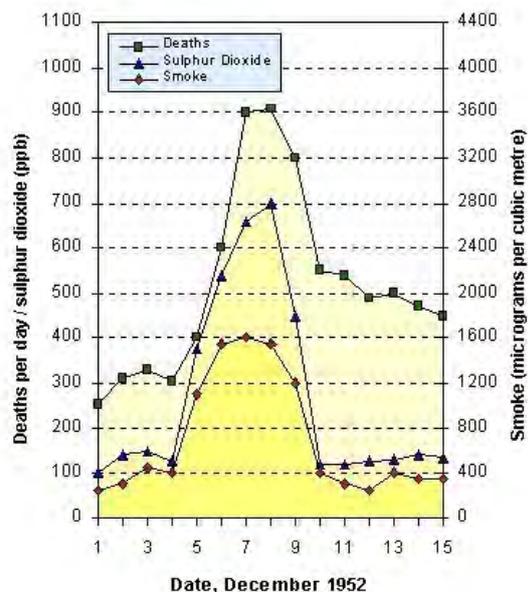


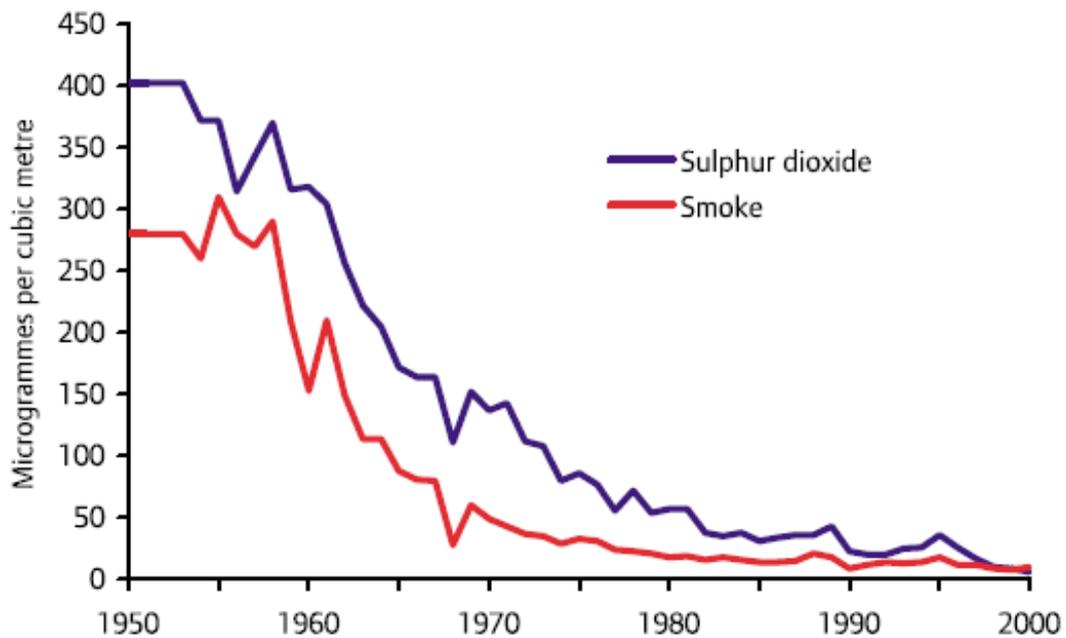


Figure 2 A couple wearing smog masks took an afternoon stroll along The Embankment in London

The first Clean Air Act was passed in 1956. It focused on reducing smoke, but at the same time helped to reduce sulphur dioxide levels, and is best remem-

bered for setting up zones in which only smokeless fuels could be burned. The act is considered a milestone in environmental protection because it limited pollution from both domestic fires and industrial processes.

The 1968 Clean Air Act accepted that total removal of sulphur dioxide was impossible, so it required the adoption of taller chimneys for industries burning coal, liquid or gas fuels. The higher altitude helped disperse atmospheric pollutants, thus improving municipal air quality (Air-Quality.org undated). The 1993 Clean Air Act consolidated the previous acts and relevant enactments. Though it didn't establish fixed mandatory targets, it enabled the Secretary of State to establish maximum emission rates for household and industrial furnaces.



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# Governance: Seoul

## CITY AT A GLANCE

Status: Capital of the Republic of Korea

Founded: 18BCE (Baekje)

Population (2012): 10.442million

Area: 605.21 km<sup>2</sup> (233.67 mi<sup>2</sup>)

HDI (National, 2010): 0.877

Governance: Bicameral elected local government body, 13.5% female upper level and 18.6% female lower level (2009)



## SECTOR OVERVIEW

Governance includes the institutions, systems and processes whereby local authorities interact with citizens and civil organizations. Urban governance is not the sole responsibility of these authorities, but rather an ongoing process through which both private citizens and public institutions manage their common affairs. <sup>1</sup> Various mechanisms can allow citi-

zens to articulate interests and mediate differences. <sup>2</sup>

Good governance is characterized by combining the eight traits illustrated in Figure 1 to form a system that is inclusive, transparent, responsive and accountable. Inclusiveness fosters trust among a city's stakeholders. Transparency establishes mechanisms that invite watchful citizens to guard against

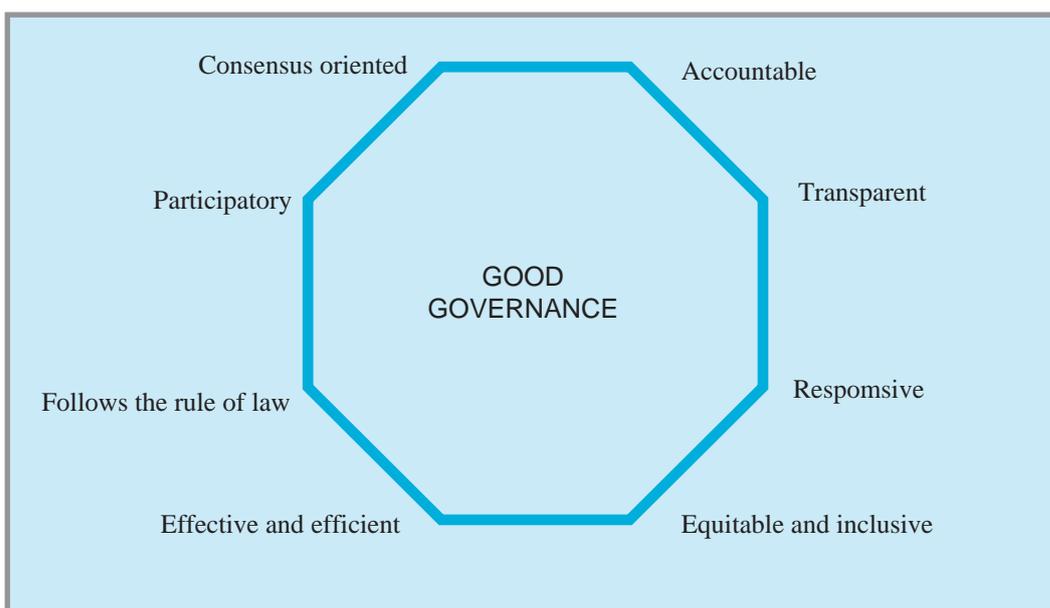


Figure 1

Source: UNESCAP, 2013, "What Is Good Governance?" United Nations Economic and Social Commission for Asia and the Pacific, (available at <http://www.unescap.org/pdd/prs/ProjectActivities/Ongoing/gg/governance.asp> last accessed 15 Feb 2013).

civic corruption and favouritism. Responsive governance systems plan for risks, and ensure that access to land and social services for marginalized groups and women are provided. Accountability offers assurance that even high-level government officials are not immune to the legal consequences of their actions. Convergents comprise sustainability, security, civic engagement and legality.<sup>3</sup>

While the sheer size and complexity of Asia's megacities presents daunting challenges, smaller urban areas are growing fastest in the region. They typically lack adequate infrastructure, planning and a financial base. Much urban growth occurs on the periphery of dense metropolitan centres, where settlements, though part of the city in practice, often fall outside its administrative jurisdiction. Highly vulnerable communities often cannot access basic urban services or participate in metropolitan planning processes. This presents a coordination challenge between municipal and central government authorities.

## THE STORY

Seoul has a bicameral local government body comprising the upper level local government or Seoul Metropolitan Government and 25 independent districts or *gu* at the lower level of government. Seoul Metropolitan Government deals with area-wide policy issues and services, while district offices implement those policies and provide district-level services. Since municipal elections were introduced in 1995, mayors and district heads are elected by popular vote every four years.<sup>4</sup> In 2009, women made up 13.5 percent of the upper level government and 18.6 percent of the lower level government.<sup>5</sup>

Seoul is surrounded by several neighbouring local governments such as Incheon Metropolitan City and Gyeonggi Province. To ensure cooperation, these governments have established cross-jurisdictional associations, committees, corporations and funds. The key elements of success in achieving results,

such as reduced income disparity between districts, improved air quality and green space, and extensive cultural activities,<sup>6</sup> have been a strong willingness to cooperate by local and central government bodies, financial support through fiscal devolution measures, active citizen participation and dedicated institutional arrangements for cooperation.<sup>7</sup>

In response to the financial crisis of 1997, the Republic of Korea has enacted broad administrative reforms to design a system governed by market principles and democratic values.<sup>8</sup> Since then, Seoul has been recognized as a global leader for progressive governance and a model for developing nations,<sup>9 10</sup> as well as earning repeated recognition for its outstanding e-government system.<sup>11</sup>

Seoul won first place in the 2010 UN Public Service Awards for its Women-Friendly City Project. Launched in 2007, it sought to incorporate women's needs in the design and execution of public policy. To solicit the views of a wide variety of women, the Citizen Participation component specifically targeted women's policy experts, home workers, students and civil society representatives. Thanks to these wide-ranging efforts to incorporate the perspectives and needs of women into a broad array of city planning policies, 83.2 percent of respondents to the city's Citizens' Evaluation of Administrative Services survey reported satisfaction in 2008, up from 68.2 percent in 2007 when the project was launched.<sup>12</sup> It is also expected that the project will encourage economic activities of women, with sufficient labor force participation among women being crucial for the city's sustainable development.

In 2011, Seoul won second place in the UN Public Service Awards for its Open Tax Court for Citizens, which has greatly improved the transparency of the city's taxation and administration. The system makes the examination process for tax protests visible to the public, and assigns a special tax advocate to speak in defence of citizens in taxation disputes.

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## Future Design: Masdar City

### CITY AT A GLANCE

Status: Experimental Cleantech City

Founded: 2006

Area: 6 km<sup>2</sup> (2.32mi<sup>2</sup>)

HDI (National, 2010): 0.815



### SECTOR OVERVIEW

Retrofitting existing cities with sustainable design elements is a complex and costly process, but vital to the welfare of both current and future generations. Burgeoning urban populations and growing environmental awareness have rendered sustainability and resource efficiency top priorities for municipal authorities, as widespread fossil fuels use contributes to both local air pollution (see case study on Air Pollution: London) and global warming.<sup>1</sup>

Prevalent fossil fuel combustion technologies are unsustainable, but a return to pre-industrial technology is clearly impossible.<sup>2 3 4</sup> The solution is to adapt modern technologies to fit the necessities of stringent conservation and environmentalism. This requires not only constant research and development of alternative energy sources and efficient technology, but also the dispersal and display of successful innovations.

### THE STORY

Masdar City is a planned experimental clean-tech cluster in Abu Dhabi, United Arab Emirates, with an anticipated completion date of 2025.<sup>5</sup> It has been designed as a hub for clean technology companies, to gather international expertise and to provide a

launching point where advanced eco-friendly technologies can be tested in an urban setting and revealed to an international audience.<sup>6</sup> From its outset, the project has been based on a carbon-neutral development model;<sup>7</sup> it will rely on alternative energy and transportation systems.

Some technological innovations in Masdar City include the Middle East's largest photovoltaic plant,<sup>8</sup> an electric vehicle fleet and futuristic Personal Rapid Transport pod system,<sup>9</sup> a 45-metre tall wind tower that hosts data collection instruments and redirects high-altitude cooling winds to the city below,<sup>10</sup> and a proposed windstalk energy system that eschews the traditional turbine blades<sup>11</sup> while producing sustainable energy and collecting scarce rainwater.<sup>12</sup> The city also utilizes proven sustainability methods such as waste stream reduction and recovery,<sup>13</sup> and water treatment and reuse,<sup>14</sup> and uses sustainable materials such as palm wood.

Abu Dhabi's harsh climate makes the project more difficult, but the city gains in international significance by proving that if an eco-city can be viable in the desert, it is also highly feasible in a temperate climate.<sup>15</sup> Masdar City has already garnered international attention, including an award in 2012 from the Energy Efficiency Global Forum.<sup>16</sup>

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## NHDR National Case Studies

### *Public Transportation system: Hangzhou*

#### CITY AT A GLANCE

Status: Capital of Zhejiang Province

Founded: 222 BCE

Population (2012): 6.54 million  
(Metropolitan): 8.802 million

Area: 3,068 km<sup>2</sup> (1185 mi<sup>2</sup>)  
(Metropolitan): 16,596 km<sup>2</sup> (6408 mi<sup>2</sup>)

HDI (Province, 2010): 0.744



#### SECTOR OVERVIEW

Public bicycle stations, also known as Bicycle Sharing or Free Bicycle, are an important aspect of sustainable municipal public services. Individuals, companies or organizations set up rental points throughout the city and provide bikes for a small fee or for free. After the journey, the bicycles are returned to one of the many rental point throughout the city. Public bicycles are combined with public transportation hubs, such as bus stops and subway stations, to improve user convenience.

#### THE STORY

In April 2008, Hangzhou Public Transport Group and the Hangzhou Public Traffic Advertising Company jointly invested five million RMB in a public bicycle company under the guidance of the municipal government. By the end of 2011, there were over 2,700

public bicycle depots in the city, with more than 65,000 bicycles for lease. These numbers are expected to increase steadily until 2015, when the number of public bicycles will reach about 100,000, and a rental point will be found every 100 meters in the downtown area.<sup>1</sup>

Public bicycle networks have become integral to modern urban public transportation. Instant rental systems reduce traffic flow and exhaust pollution, while providing citizens with accessible, affordable and healthy transportation. Hangzhou has linked bicycling with traditional transportation methods via bus-to-bicycle and parking-to-bicycle transfer systems.<sup>2</sup> In September 2011, the British Broadcasting Corporation (BBC) travel channel listed Hangzhou among the World's Eight Cities with the Best Public Bicycle Services, noting that it is home to the world's largest bike sharing program.<sup>3</sup>

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# Cultural Heritage: Suzhou

## CITY AT A GLANCE

Status: City in Jiangsu Province

Founded: BCE 514

Population (2012): 3.2899 million

(Metropolitan) 6.4781 million

Area: 2,743 km<sup>2</sup> (1,059 mi<sup>2</sup>)

(Metropolitan) 8,488 km<sup>2</sup> (3277 mi<sup>2</sup>)

HDI (Province, 2010): 0.748



## SECTOR OVERVIEW

Culture encompasses the traditions, knowledge and skills developed in a particular region. It includes oral traditions, performing arts, rituals, cosmology and crafts. <sup>1</sup> In adapting to a particular environment and history, people develop and pass down a heritage and sense of identity that encourage social cohesion. <sup>2</sup>

Protection and promotion of cultural heritage, besides being part of respecting people's cultural rights, can bring economic benefits through tourism. <sup>3</sup> This typically requires government recognition and support, systems to guide protection, experts trained in cultural preservation and public engagement. Public participation strategies can build on local knowledge and customs. <sup>4</sup>

## THE STORY

Suzhou is famous throughout China for its history

and culture. A popular saying goes: "Paradise on heaven, Suzhou and Hangzhou on earth." Suzhou has 2,938 cultural heritage items, with six included in UNESCO's "Representative List of the Intangible Cultural Heritage of Humanity."<sup>5</sup>

These include Wuge, an oral literature tradition in the Wuyu dialect; Kunqu, one of the oldest traditional operas; Pingtan, performances that carry on the literary, artistic, linguistic, ethical and sociological traditions of Jiangnan culture; and Suzhou embroidery, characterized by colourful threadwork.

Suzhou is also renowned for its classical gardens, 60 of which have been preserved. Nine have been classified as World Heritage Sites, and the Humble Administrator's Garden has the highest rating of 5-A in the national tourist attraction ranking. <sup>6</sup> Given its long and respected past, Suzhou has been declared one of 24 Historical and Cultural Cities by the Chinese State Council, ensuring that its unique features will not be lost. <sup>7</sup>

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## Public Service: Ningbo

### CITY AT A GLANCE

Status: City in Zhejiang Province

Founded: 738(Mingzhou)

Population (2012): 2.261 million  
(Metropolitan) 5.777million

Area: 2,461 km<sup>2</sup> (950 mi<sup>2</sup>)  
(Metropolitan) 9,816 km<sup>2</sup> (3790 mi<sup>2</sup>)

HDI (Province, 2010):0.744



### SECTOR OVERVIEW

Public services refer to services such as public health, scientific research, public welfare, cultural undertakings and social relief. The theory and practice of city governance, as practiced in developed nations, provide a wealth of experience for China's current urbanisation transformation. This model of urban governance encourages public participation instead of emphasizing a top-down approach.

### THE STORY

Between 2006 and 2010, the Government of Ningbo formed a comprehensive and multi-level community services system emphasizing coordination of public services for the convenience of the residents. Ningbo city has established many commissions for public service projects in policy consulting, social security, social assistance, health and family planning, labour and employment, aging services, and land management. Dual-level public information services helps match the needs of residents and the major

recipients of market services, receiving wide acclaim from residents.<sup>1</sup>

Public participation is fundamental to urban governance.<sup>2</sup> By the end of 2011, the number of full-time community workers in the city exceeded 3,600, and the number is still increasing. There are more than 8,067 community-level social organizations and 5,850 teams of volunteers with 240,600 registered community volunteers.

In December 2006, Ningbo launched a trial operation called the 'interconnection community', a self-service information platform guided by the government. It connects community residents with public commerce and service systems, and establishes a virtual community where residents can discuss and solve mutual problems. The prototype has since been extended to more than 3,000 communities throughout Beijing, Ningbo, Dalian, Jiangsu, Hainan and other provinces.

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## Green City: Genhe

### CITY AT A GLANCE

Status: City in Inner Mongolia Province

Founded: 1994

Population (2011): 157,308

Area: 20,012 km<sup>2</sup> (7727mi<sup>2</sup>)

HDI (Province, 2010): 0.722

### SECTOR OVERVIEW

See the same sector overview with Teheran.

### THE STORY

Genhe has long tried to balance environmental and economic imperatives by protecting the urban drinking supply and ensuring the water quality in nearby rivers meets local standards. The city encourages scientific and technological innovation to drive development. Businesses must balance resource consumption with replenishment to avoid complete



depletion of stocks. The Genhe Cold-water Fish Reserve,<sup>1</sup> for example, contributes to resource conservation and thus propagates sustainable ecological, economic and social benefits.

The city's Natural Forest Protection Project has preserved an estimated 3.8 million cubic meters of woodlands, with forest increasing from 75 percent to more than 87 percent. Genhe is renowned for hosting 299 known species of ornamental plants,<sup>2</sup> making green space conservation in the area vital to these species' protection.

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## Environmental Protection: Huaxi Village

### CITY AT A GLANCE

Status: Village in Jiangyin City, Jiangsu Province

Founded: 1961 (Small Huaxi), 2010 (Big Huaxi)

Population (Village): More than 2000  
(Small Huaxi), More than 30000 (Big Huaxi)

Area (Village): 0.96 km<sup>2</sup> (0.37mi<sup>2</sup>)  
(City): 30 km<sup>2</sup> (11.58mi<sup>2</sup>)

HDI (Province, 2010): 0.748



### SECTOR OVERVIEW

See the same sector overview with Istanbul.

### THE STORY

In 2010, 13 small villages in the Jiangyin municipality were combined to create the larger Huaxi village agglomeration. It is the first village in the country to become certified under the international ISO14001 environmental management system. A 400 million RMB investment in environmental protection has improved the local environment by changing business behaviours, cleaning the river and beautifying public spaces.<sup>1</sup>

Industries, for example, have adopted dust removal equipment and begun treating wastewater. To better manage scattered enterprises, Huaxi has gathered 150 into a single zone. All effluvia is treated in a central wastewater plant, which reduces operational costs. Yearly energy and reduced consumption savings exceed 100 million RMB.

In May 2008, Huaxi upgraded the industrial zone's wastewater treatment plant to the type-A primary standard, reducing emissions as well as chemical oxygen demand by 70 tons. After being treated, water meets reuse standards and, though not potable, can be used for industry.<sup>2</sup>

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# Green Building: Shenzhen

## CITY AT A GLANCE

Status: City in Guangdong Province

Founded: 1979

Population (2012): 10.55 million

Area: 1953 km<sup>2</sup> (754 mi<sup>2</sup>)

HDI (Province, 2010): 0.730

## SECTOR OVERVIEW

Green building refers to designing and constructing buildings with minimal environmental impact. The United States Environmental Protection Agency defines four categories in which buildings affect the environment: the building site, resource consumption, environmental impacts such as pollution, and potentially longer term effects such as harm to human health and environmental degradation.<sup>1</sup>

A host of assessment tools have been designed to oversee sustainable building practices. China utilizes the national Green Building Assessment Standard, established in 2006. It consists of indicators to measure protecting land and the outdoor environment; saving energy, water and materials, and ensuring efficiencies; safeguarding the quality of indoor environments.<sup>2</sup>

Under this standard, Chinese green building projects follow design principles responsive to and respectful of the changing environment by efficiently using resources, safeguarding local culture and communities, and promoting human-scale architectural space.<sup>3</sup>

## THE STORY

To speed widespread adoption of green building



techniques, the municipal government of Shenzhen has issued several edicts: “Regulations of building energy conservation in Shenzhen special economic zone”, “Regulations of the reduction and use of construction waste in Shenzhen” and “Implementation plan of improving energy conservation in existing buildings in Shenzhen”.

By the end of 2011, Shenzhen’s energy conservation measures covered 60.88 million square metres of buildings; 11.12 million square metres of building space used solar power. Citywide, total energy saved had reached 2.753 million tons of coal equivalent, equalling 8.66 billion kilowatt hours and 7.148 million tons of carbon dioxide emissions. Green buildings account for 30 percent of total annual energy conservation, expected to reach 40 percent by 2015 and 80 percent by 2020.<sup>4</sup>

Shenzhen recently won five national awards as a pilot demonstration city, and the main building of the Shenzhen Institute of Building Research is the most advanced green building in the country, reducing yearly conventional power consumption by 66 percent compared to more typical buildings. When solar power generation is considered, the building can reduce electricity costs by 1.17 million RMB per year.<sup>5</sup>

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## Urban Design: Yunfu

### CITY AT A GLANCE

Status: City in Guangdong Province

Founded: 742

Population (2012): 2.87 million

Area: 7,779 km<sup>2</sup> (3003mi<sup>2</sup>)

HDI (Province, 2010): 0.730

### SECTOR OVERVIEW

A “slow transport system” focuses on bicycles and pedestrian friendliness. By linking bicycle services with public transportation hubs, people are encouraged to limit their reliance on motorized vehicles. The city is designed on a human-scale, ensuring that the choice to bike or walk is both safe and enjoyable. This represents an alternate paradigm for urban transportation while displaying the city’s environmental quality and aesthetic appeal. The emphasis on physical exercise helps relieve stress and promote a healthy lifestyle without forcing the choice upon residents. The slow traffic system also fosters a deeper sense of community and helps support shopping, tourism and the development of cultural and creative industries.

### THE STORY

Yunfu, an underdeveloped mountain city, promotes alternative transportation through the Walk & Bike System. With walking and bicycle tracks surrounding the city, it helps residents travel in a healthy and safe manner, and preserve the environment.<sup>1</sup>

The city has recently renovated and upgraded the Nanshan Forest Garden by improving pedestrian walkways in adjacent areas and constructing high-quality bike tracks. The project connects the park



with schools, markets and communities. Further initiatives will extend links to local attractions such as Dajinshan Mountain and the Wen Pagoda.<sup>2</sup>

Yunfu is dubbed the ‘city of stone.’ Its stone industry is well known around the world.<sup>3</sup> But further development is restricted by limited space, and severe dust and noise pollution. In recent years, the city has shut down inefficient companies using high levels of energy, and phased out over 600 million tons of inefficient cement production capacity.<sup>4</sup> New enterprises must be approved to commence operations.

These measures have reduced sulphate wastewater to zero. Waste residue has been reclaimed as raw material for cement production, chicken manure is used to produce organic fertilizer, and stone scraps end up in artistic mosaic collages for export.

Yunfu has made great efforts to develop cultural and tourist attractions, including its Zen traditions, stone art and the South River culture, with an emphasis on using local resources and stimulating local industry. The Stone Expo Center, covering an area of 80,000 square meters, is near completion. It will host a permanent Stone Art Exhibition and market, providing a use for discarded scraps from nearby stone processing.

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# Energy: Xinyu

## CITY AT A GLANCE

Status: City in Jiangxi Province

Founded: 267

Population (2012): 0.75 million  
(Metropolitan) 1.15 million

Area: 3,178 km<sup>2</sup> (1227mi<sup>2</sup>)

HDI(Province, 2010): 0.662

Per capita green area(2013): 17.39m<sup>2</sup>



## SECTOR OVERVIEW

Cities are notoriously resource hungry, responsible for 75 percent of global consumption despite covering only 2 percent of the world's surface. <sup>1</sup> China's energy crisis and environmental damage require new low-energy and low-carbon development models.

Clean alternative energy sources are in great demand to help reduce pollution, and mitigate emissions and climate impacts. <sup>2</sup> Co-benefits include business growth through new energy industries. <sup>3</sup>

## THE STORY

Xinyu City, also known as the Steel City and the Solar City, is the 'little giant' in Jiangxi Province's ongoing economic development and the city to be dubbed the "National New Energy Science and Technology Demonstration City" by the Ministry of Science and

Technology. It hosts leading enterprises in iron, steel, building materials, silicon and other energy-intensive industries. The city's sponsorship of low-carbon projects has created a new demand for alternative energy. Foreign and domestic enterprises have relocated there, namely, the photovoltaic industry, complemented by the battery, wind power and emission-reduction equipment industries.

The new industrial focus on green technology and sustainable design has had wide impacts on the city's livability, as urban green coverage has reached nearly 52 percent, and the per capita green space is 16.01 square metres. <sup>4</sup> The centralized disposal rate of urban sewage is 80 percent, and 90 percent of urban domestic garbage is treated. The city is evolving from a typical industrial city to becoming an ecologically friendly clean-tech producer.

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## Future Design: Tianjin Eco-City

### CITY AT A GLANCE

Status: National Central City(1949)

Founded: 1404

Population (2012): 14,131,500

Area:11920km<sup>2</sup> (4602mi<sup>2</sup>)

HDI (Province,2010): 0.795

Per capita green area(2012):10.3 m<sup>2</sup>  
(110.87 square foot)



### SECTOR OVERVIEW

See the same sector overview with Masdar City.

### THE STORY

The Sino-Singapore Tianjin Eco-city is a joint Chinese-Singaporean project to establish a harmonious, environmentally friendly city in China. Singapore's Ministry of Development and China's Ministry of Housing and Urban-Rural Development participate in a Joint Working Committee that studies and solves development and construction issues.

The Tianjin Municipal Government has set up an Eco-city Management Committee to oversee coordination between the new Eco-city zone and the rest of the city, taking advantage of the Binhai New Area's business growth and experimental economic reforms while drawing on Singapore's public admin-

istration and operational management experience. <sup>1</sup>

Tianjin Eco-city utilizes the first smart power grid in China, and requires 100 percent waste treatment and at least 20 percent renewable energy usage from its service providers. <sup>2</sup> There are strict guidelines for sustainable design, with an emphasis on human-scale systems such as bike rental hubs and a pedestrian-friendly layout. Green business development has encouraged nearly 900 enterprises and around 66 billion RMB in investments. The city's Joint Coordination Council cultivates strong links with academia, inviting researchers to participate in designing a stakeholder platform for planning and operations. Prominent domestic and foreign experts conduct research on urban planning and applications of new technology, with more than 20 research units and professional design institutes invited as consultants, including Tsinghua University, Tianjin University and Cardiff University.

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## Innovation: Shanghai

### CITY AT A GLANCE

Status: Most Populous City in China

Founded: 1292

Population (2012): 23.8 million

Area: 6,341 km<sup>2</sup> (2,448 mi<sup>2</sup>)

HDI (Province, 2010): 0.814



### SECTOR OVERVIEW

Globalization, the influx of population, economic development, social injustice, environmental pollution and climate change will have a direct impact on the city. But the city is also the most vibrant hub able to respond effectively to these challenges. In the 21st century, the most important aspect of urban governance is how to effectively foster innovation and creativity to promote urban economic development and improve the city's social inclusion. Cities should become places which encourage imagination, production, communication and new ideas marketing.

### THE STORY

The City of Shanghai recognises that innovation is an essential element of economic competitiveness. Accordingly, it has taken a unique approach to fostering a creative city. Interest in supporting innovation through creative industries rose sharply in the 1990s, leading to the establishment of the Shanghai Creative Industry Center in 2004. The Center's ambitious

goal is to build up Shanghai as the most influential creative centre of Asia.

The Center focuses its supporting efforts on five areas: research & development, architectural design, cultural media, creative consulting and planning, and fashion design. Shanghai currently has 80 creative industrial clusters, covering a total spatial area of over 2.5 million square meters with over 6,000 enterprises. Recognising the importance of international perspectives and ideas, these clusters employ more than 120,000 people from over 30 foreign countries.

The results have been dramatic. In 2010, the output value of Shanghai's creative industries amounted to almost US\$ 90 billion (553 billion RMB), which comprised 9.6 per cent of the overall GDP of the city. As a result in 2010, UNESCO named Shanghai as a "City of Design." Shanghai continues to foster creative growth in the media, arts, industrial design, fashion, architectural design, network and software consulting services, advertising, exhibitions and recreation.



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