Supporting Report 4

Inclusive Urbanization and Rural-Urban Integration

INTRODUCTION

China has undergone a remarkable transformation, with the movement of over 260 million migrants from rural to urban areas. Driven largely by this rural-to-urban migration, China's urban population is projected to reach 1 billion by 2030. These migrants have seized the opportunities offered by urbanization, leaving their agricultural jobs and taking up more productive and higher-paying jobs in cities. Through this process, China has managed to sustain high wage growth, achieve even higher productivity growth, and reduce poverty on an unprecedented scale.

However, two closely related sets of inequalities pose challenges to making urbanization inclusive: a "new dualism" among the urban population and the "old dualism" of urban and rural disparities. First, newcomers to the cities—the migrants with non-local *hukou*—are often excluded from access to urban services due to their *hukou* status and/or face greater financial and administrative challenges in accessing quality services.[1] Second, large gaps exist in the quantity and quality of public services (education and training, health, pension, social assistance, and housing) across provinces and between rural and urban areas. The challenges are intertwined because if people move to the cities to receive better public services instead of moving for productive jobs, congestion and unemployment result. Examples of this type of urbanization abound throughout the world. Conversely, if people do not move even though there are jobs for them (e.g., because essential local services are too costly for them), efficiency losses result (mirrored in slower growth), and the human capital of citizens will be underutilized and underbuilt.

Another challenge is in the labor market, as fuller labor market integration and stronger institutions are essential to overcome both the new and old dualisms. An inclusive and efficient labor market would allow migrants to find the best matches for their talents and would provide the supporting training and learning infrastructure to help them continue this productive matching during their working lives an evolving economy. Supportive labor market institutions would mediate the interests of diverse stakeholders in this market and balance policy objectives with respect to national social objectives and economic efficiency.

The Chinese leadership is well aware of these challenges and has presented social policies to address them in the Twelfth Five Year Plan and China 2030 Report. The main social development challenges identified by the Twelfth Five Year Plan include rising inequality of income and wealth, disparities in opportunities and access to affordable and quality services, disconnected rural and urban systems, and poor quality and undersupply of basic public services for poor and vulnerable groups. In light of these challenges, the vision of the Plan is to build, improve, and promote equalization of access to basic public services (i.e. education, employment, health care, pension, social assistance, and housing) for all citizens, to build a harmonious society and maintain social justice and fairness. Similarly, the China 2030 Report envisages promoting economic freedom through equal opportunities for all citizens to access quality public services (i.e. not limited by place of birth, gender, or other factors) and basic security from deprivation to prevent any irreversible loss of human potential.

This report builds upon the policy options laid out in these documents and attempts to translate these into actions, using the prism of addressing inequalities of both the new and old dualisms. It analyzes and provides policy alternatives related to three inter-related questions that are key for the Chinese leadership to advance the inclusive urbanization agenda in the next decade:

[1] The *hukou* is a population registration system that defines peoples' residency status. It classifies the population into rural (agricultural) and urban (non-agricultural) according to their place of birth, and it defines peoples' access to public services based on this classification. Apart from its basic registration function, it provides the framework for managing population flows and defines entitlements for a range of social services, including employment, education, training, health, housing, and social protection programs.

- How can access to basic social services in urban areas be equalized among migrants and local *hukou* holders?
- How should this equalization proceed across the vast and diverse spectrum of rural settlements, townships, counties, and small, medium, and large cities in China?
- What policies will support building a labor market that is productive and inclusive for all?

The structure of the report is as follows. The remainder of this chapter provides a brief overview of the current social context, including demographic shifts and the profile of migrant workers, as well as opportunities and challenges for urbanization. It then describes the overall vision for inclusive urbanization and rural-urban integration, providing a picture of where China could be if the necessary reforms can be implemented successfully. Chapter 2 focuses on the challenges and options in ensuring equitable access to social services in urban areas, starting with the shift from the *hukou* system to a modern residence system. It then looks at the current "urban standard" of social services (i.e. education, health care and insurance, pensions, social assistance and welfare housing), reviewing how services are financed and delivered as well as analyzing the cost of extending services to migrant populations. Chapter 3 takes a broader view of social policy reforms in China, discussing the need for rural-urban integration and equitable service delivery across the entire country. It covers the areas of education, health, pensions, and social assistance programs as well as addresses the cross-cutting issue of accountability in social services delivery. Finally, Chapter 4 focuses on reforms for ensuring an inclusive and productive labor market, specifically in the areas of skills accumulation (i.e. TVET and higher education) and key labor market institutions (i.e. wage setting, labor taxation, labor law, and labor dispute mediation).

This report is part of an eight-volume set. The companion pillars—especially those covering land and finance—are key to understanding inclusive urbanization. The overview report presents an integrated picture of policies for efficient, inclusive, and sustainable urbanization in China.

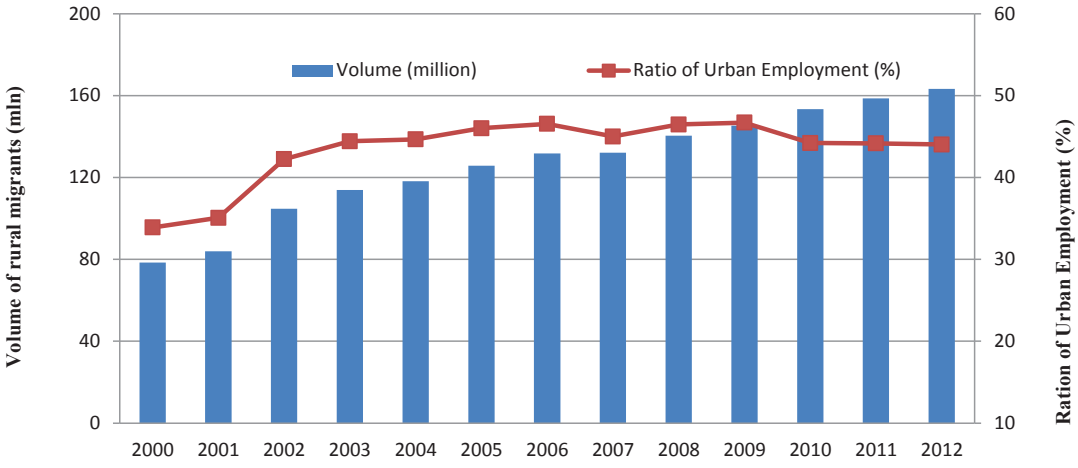
THE SOCIAL CONTEXT

Over the past three decades, China experienced the world's largest internal migration in history, which has been instrumental to the country's growth and poverty reduction. Employment of rural migrant workers, nearly all working in urban areas, more than doubled from 79 million in 2000 to 163 million in 2012. In 2012, China also had 99 million local rural (nonagricultural) workers; together, this amounts to 261 million migrant workers (National Bureau of Statistics, 2012a). In 2010, over 220 million persons lived in a place different from their original place of household registration. In 2013, rural migrant workers accounted for 44 percent of total urban employment (Figure 4.1). This labor migration has contributed to the structural transformation of the economy and integration of the labor market, and it has played an important role in reducing poverty and narrowing the income gap between rural and urban areas.

China's internal migration has unique features due to the existence of *hukou,* the household registration system. In most countries, the processes of industrialization and urbanization are accompanied by rural workers migrating and settling down to become urban dwellers, once they find jobs in cities. In Korea, for example, rural-to-urban migrants become as socially mobile as urban natives within the first generation.[2] In contrast, China's rural migrant workers

[2] Lee and Phillips (1997) show that in Korea, migrants to metropolitan areas had earnings 32 percent higher than rural non-migrants. Although migrants to Seoul had a 5–11 percent earnings disadvantage on arrival compared to Seoul natives, after 15 years, migrant earnings converged completely. While in 1970 more than 60 percent of urban household heads were rural migrants, by 1994, those migrants had become full-scale urbanites with equal wages.

FIGURE 4.1 Rural-to-Urban Migration Trends in China, 2000–2012



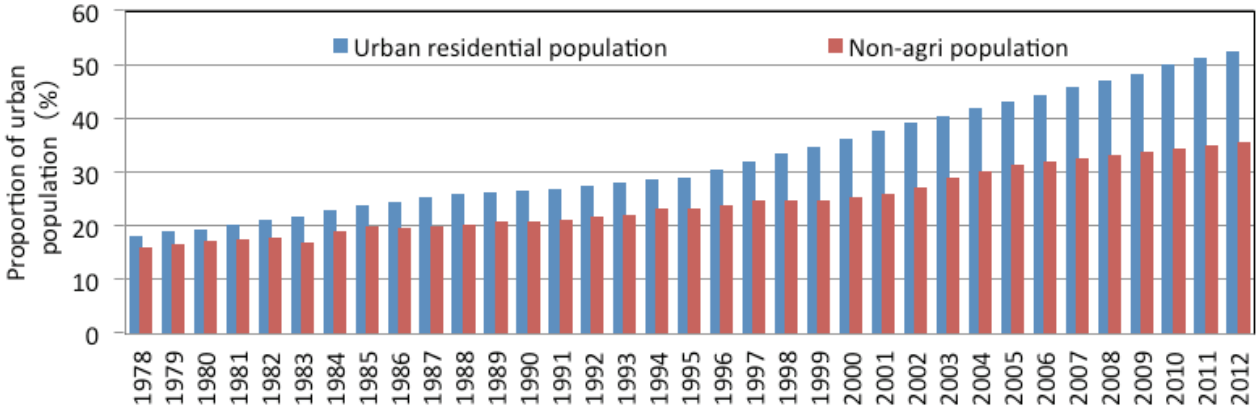
Source: NBS, various years.

have behaved more like "guest workers"—accepting lower wages, migrating without their families, living in dormitories, and having limited access to urban pubic services (Figure 4.2).

As China continues to urbanize rapidly, significant economic restructuring is taking place. China is reorienting its growth model from a capital-intensive and export-oriented one toward one driven more by deepening human capital and total factor productivity (TFP), increasing domestic consumption, and moving up the value chain. On the demand side, many new jobs are now generated inland in response to industrial policy, which is a positive development in reducing the cost of migration for new migrant workers. Economic restructuring and industrial upgrading have intensified the destruction of low-skilled jobs and the creation of semi-skilled and skilled ones, which necessitates the upgrading of human capital of the current workforce.

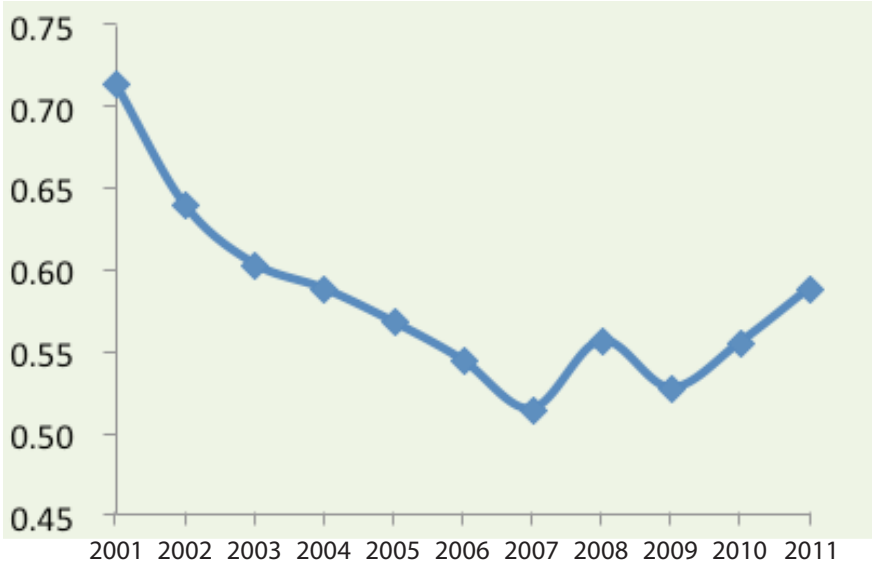
China's urbanization coincides with major demographic shifts that have significant implications for migrant workers and well as the broader economy. In particular, the excess rural surplus labor is nearly exhausted—China is reaching its Lewis turning point. China is also experiencing rapid aging of its population, which contributes to labor shortages. Such unprecedented aging will place greater strain on family support networks and challenge social programs,

FIGURE 4.2 Trends in Urban Resident Population and Population with Non-Agricultural *Hukoi,* 1978–2012



Source: NBS, various years.

FIGURE 4.3 Relative Wages of Rural Migrants and Urban Formal Employees, 2001 to 2011



Source: National Bureau of Statistics. Formal real wages are average urban wages reported in China Statistical Yearbook (2012), rural migrant wages are from NBS rural household surveys and rural migration monitoring surveys.

pensions, and health care. It also has implications for the labor supply, as the pool of available labor has begun to shrink.

In response to these economic and demographic trends, wages of migrant workers have started to increase rapidly, and the end of "cheap Chinese labor" has already been documented.[3] The recent increase in the relative wages of migrant workers marks a reversal from the pattern of 2001-2007, when migrant wages substantially lagged those of urban formal employees. From 2007 to 2012, rural migrant wages increased by an average of 17.1 percent annually in real terms (Figure 4.3).[4] Moreover, the wage differential between migrant and long-term urban resident workers that is unexplained by differences in human capital has diminished considerably, which is consistent with improved labor market integration. Results from the China Urban Labor Survey (2001, 2010) (background paper for the Inclusive Urbanization report) show that the negative impact on wages of being a rural migrant declined to just 13 percent in 2010 and disappeared after accounting for differences in their job characteristics.[5] This means that by 2010, rural migrants were not systematically paid less within the same sector and ownership type. Instead, lower wages for rural migrants were due to migrants working in lower-paying sectors and ownership types.

The demographic profile of the rural migrant labor force is changing, with migrant workers becoming older and being better educated than the general rural labor force. The average age

[3] Li, et al. (JEL 2012).

[4] The rate of increase of rural migrant real wages was lower than that of urban formal employees from 2001 to 2007. Since then, it has been higher in every year except 2009, when 20 million migrants lost their jobs after the onset of the global financial crisis.

[5] These results are based on the Oaxaca-decomposition equation, using data from the 2001 and 2010 China Urban Labor Survey (see background paper for the Inclusive Urbanization report). The wage penalty for rural migrants increased from 24.1 percent in 2001 to 42.2 percent in 2005, but it declined to 13.1 percent in 2010. These findings contrast with studies of earlier periods that found strong evidence of differential treatment of migrants within occupations and sectors (Zhang and Meng, 2007).

TABLE 4.1 Educational Attainment of Rural Workers in 2012

	Local Farmers	Rural Migrant Workers	Local Rural Migrant Workers	Rural Out-Migrant Workers	Young Migrant Workers
Illiterate	8.3	1.5	1.0	2.0	0.3
Primary school	33.8	14.3	10.5	18.4	5.5
Junior middle school	47.0	60.5	62.0	58.9	57.8
Senior middle school	8.0	13.3	12.8	13.8	14.7
Technical secondary school	1.5	4.7	5.9	3.3	9.1
College and above	1.4	5.7	7.8	3.6	12.6

Note: Young migrant workers are those aged 30 years old and below.
Source: National Monitoring Survey Report for Rural Migrant Workers (NBS, 2012a).

TABLE 4.2 Distribution of Rural to Urban Migrant Workers by City Level, 2009–2012

City	2009	2012
Municipalities under the Central Government	9.1	10.0
Capital cities	19.8	20.1
Prefecture cities	34.4	34.9
County level cities	18.5	23.6
Towns	18.2	11.4

Source: National Monitoring Survey Report for Rural Migrant Workers (NBS, 2009, 2012a).

of rural migrant workers rose from 34.0 years old in 2008 to 37.3 years old in 2012. In terms of educational attainment (Table 4.1), in 2012, 5.7 percent of rural workers had three-year college degrees or above, 4.7 percent had completed vocational high school, 13.3 percent had completed regular high school, and 60.5 percent had completed middle school. Compared to rural workers as a whole, both migrants and young rural workers are relatively more educated.

Migrants are increasingly bringing their children or their entire families with them when they migrate. The NBS monitoring survey of rural migrants reports that 20.7 percent of rural migrants left home with their entire families in 2012. However, this figure does not capture the many cases in which multiple family members migrated while at least one family member stayed behind to farm the land or maintain the family's claim to collective land or other benefits. The China Urban Labor Survey (CULS) found that among the children of migrants enrolled in school, the share that went to school in the city increased from 41 percent in 2001 to over 70 percent in 2010. [6]

While the majority of rural migrants are still concentrated in medium and large cities, interprovincial migration has increased significantly. As shown (Table 4.2, in 2012, 30.1 percent of rural migrants worked in provincial capitals or municipal provinces, and 34.9 percent worked in prefectural cities. Interprovincial migration increased from less than 47 percent in 2009 to more than 53 percent in 2012. This increase could reflect rapid development of second- and third-tier cities as well as greater diversity among migrants to include not only young single people but also married and older individuals who may have greater family ties or responsibilities that make them reluctant to migrate too far away.

[6] According to the "Dynamic Monitoring Survey of Migrant Population in Urban China" conducted by the National Population and Family Planning Commission in 2011 (128,000 migrant households, 31 provinces), 78 percent of rural migrants were married, and 74 percent had at least one child. Of those with children, 72 percent had at least one child living in the city (Demurger et al., 2013).

CHALLENGES AND OPPORTUNITIES FOR URBANIZATION

Policies and institutional arrangements such as the *hukou* system and the highly decentralized fiscal system still constrain mobility and create distortions. For urbanization to succeed, people need to move freely, but the *hukou* system still defines their residency status and rights to access public services according to this classification. China's decentralized fiscal system—in particular, the mismatch at the local level between resource availability and social spending responsibilities—also creates distortions, as it does not allow for money to follow people. A sustainable financing framework for local governments to provide mandated services, as in the case of providing education for migrants, is absent. Furthermore, fragmented social security arrangements that lack portability of benefits discourage both mobility and formalization in the labor market.

Urbanization itself brings the challenge of building cohesive communities in cities with more migrants. Higher demand has intensified the competition for urban services, and infrastructure pressures from expanding urban populations are more difficult to manage due to the cost of land. In addition, the types of people coexisting in cities have become much more diverse—for example, expanding urban settings have a diversity of learners, including with respect to dialects among migrants as well as simple diversity in level-readiness for any grade due to differing educational quality in pre-city schooling. Service delivery providers need to tailor their services to accommodate these diversities, while keeping the quality of provision at a level acceptable to long-term residents. Notably, various types of social conflicts have exploded in recent years, for example with labor disputes nearly doubling between 2005 and 2012, largely involving migrant workers.

China's urbanization can create new opportunities for efficiency in social service delivery. With urbanization comes denser cities and more people to service in concentrated masses, which allows for efficient pooling and risk sharing for social services in urban areas. Cities also have a greater supply and better pool of health and education providers, and the possibilities for knowledge networks within cities and learning externalities are much greater than in rural settings. Furthermore, the points of educational supply and labor market demand (firms) are closer, with more possibility of exploiting real-time feedback from the demand side. The potential for outreach is also easier with shorter distances and connection times between facilities and their users. In addition, the natural risk pools of jurisdictions (which are more efficient for risk sharing across health and old age insurance) are larger in urban areas, with fewer coordination challenges in moving to higher levels of pooling (for old age security and pensions).

Urbanization can also help spur labor market efficiency. In the labor market, a significant advantage of urban settlements is that the high agglomeration of activity provides workers and businesses with a wide range of options if they possess or require skills.[7] Urban settings imply more formal sector employment than in rural areas, and the need for labor market institutions (wage setting and collective bargaining) is greater. A formalized labor market also allows for building social insurance institutions, including their efficient administration.

THE VISION FOR INCLUSIVE URBANIZATION AND RURAL-URBAN INTEGRATION

China's vision for inclusive urbanization builds on two main principles. Those principles are:

- *Free movement of people to seek and maximize economic opportunities*, allowing people and society to achieve maximum benefit from the human potential of China's population, and

[7] Ellison, Glaeser, and Kerr (2009) found that industries employing the same types of workers tend to co-agglomerate. This behavior is advantageous to workers and firms: people can move among employers without retooling, and businesses have access to a deep pool of labor with the skills they need.

- *Equitable access to basic social services and social protection across space*, allowing all citizens full integration into urban life.

To achieve China's vision for inclusive urbanization and rural-urban integration, social policy reforms will need follow some cross-cutting guiding principles:

- *Ensuring compatibility with incentives for citizens and providers.* Residence rules should not encourage mobility that does not lead to higher productivity of working household members. Policies need to be consistent with the strong incentives to work and to build human capital across the life cycle for individuals, while discouraging welfare dependency. Service providers need to face the right incentives, with built-in checks and balances that conform to professional ethics. The current incentive structure in health and to some extent education encourages public providers to act as profit-maximizing private sector entities—for example, one-third of hospital admissions in China are considered unnecessary, while school selection fees drive a further funding wedge between "key" schools and regular schools. A workable incentive framework is needed for local authorities to provide equitable access to basic social services and social protection.
- *Redefining the roles of the state, private sector, communities and households to support a successful transition.* The urbanization process is creating opportunities for the private sector to provide higher-end services financed through user fees and, in doing so, share the fiscal burden faced by local governments. Private provision and public-private partnerships could play a bigger role in education and health. The role of government would need to be recalibrated accordingly, with a transition from administrative measures to market measures in some domains and a more direct state role in others. Stronger state capacity to set policies, license, and regulate will be needed, along with greater attention to the financing and provision nexus and potential unbundling of who finances and who provides. Governments at all levels will face challenges as they seek prudent balances between state and market-based solutions.
- *Improving affordability and efficiency.* Reforms should be consistent with sustainable fiscal constraints and promote more efficient use of public resources, taking into consideration affordability. Social sector budgets will face increasing pressures as economic growth gradually slows, the population ages, and program coverage continues to rise. Addressing these challenges will require greater efficiency in service delivery and value for money in public spending, within a sustainable fiscal framework. This in turn requires new information and tools to assess efficiency and incentivize it through budgetary and other channels. Effective policies will increasingly need instruments for both the supply and demand sides of service delivery. Moreover, reforms will also need to promote greater accountability of administrative systems, service providers, and citizens to help ensure efficient use of public resources.
- *Developing an integrated approach to deepening social policy reforms.* Although a basic social service system has already been established in China, it is fragmented across space and rural and urban areas, due in part to the highly decentralized financing arrangements. This fragmentation has not only caused barriers in access to urban public services and transfers of social entitlements, but it has also resulted in low pooling and inefficient management of financial resources, compromising the sustainability of social services. As China continues to urbanize rapidly and move toward high-income status, further reforms need to focus on integration and harmonization of social policies and programs.

It should be recognized that high-level mandates alone will be insufficient to achieve the desired outcomes. The Twelfth Five Year Plan does explicitly address social service provision for migrant workers and rural-urban integration as well as sets quantitative targets for implementation. Nonetheless, policy-driven duality—whereby formal policies still treat long-term residents and migrants differently—remains, along with some areas of divergence between

official policy and its implementation on the ground (e.g., the experience of urban schools that are mandated to accept migrant children). This divergence is related in part to the behavior, attitudes, and incentives of local actors (e.g., the urban old-age security system is open to migrants and mandated under labor legislation, but migrants, employers, and providers often behave like it is not).

Policy and practice must focus increasingly on three different levels. First, high-level policies can promote more equal treatment of migrants and local *hukou* populations. Second, specific supporting reforms can facilitate the realization of high-level policies (e.g., reforms of intergovernment finances). Third, "nuts and bolts" reforms of administrative systems and delivery platforms can enable effective implementation of policy reforms.

REFORMS NEEDED TO ACHIEVE CHINA'S VISION

As discussed in the remainder of the report, key reforms related to the household registration system, public finance, service delivery, and labor market institutions will be needed to achieve China's vision for inclusive urbanization and rural-urban integration. Realizing China's vision will require efforts to ensure equitable access to social services both within urban areas and across rural and urban areas nationwide as well as to foster an inclusive and productive labor market. Key reforms are summarized briefly below.

Ensuring equitable access to social services in urban areas

The shift from the origin-based *hukou* system to a modern residence system for defining eligibility for basic services will be a critical element of the reforms to promote inclusive urbanization. This effort will involve several steps:

- *First, the central government would need to define the principles and national framework of the residence-based system to provide guidelines for local governments*. These should include the system by which local governments should grant residency to people living in a specific locality and the sequence of entitlements that accrue upon attaining a residence permit.
- *Second, under the national framework, local governments can define the qualifying periods to move from one step of the entitlement sequence to the next*. A time-bound pathway should be created within the local permit system for gradual acquisition of the same social entitlements as local residents, and cities should seek to lower the current prioritization of those with higher socio-economic status. The scope and content of basic public services should eventually be standardized based on national guidelines.
- *Third, the conditions and requirements for obtaining a local residence permit should converge over time*, supported by broader reforms such as fiscal and taxation system reform, equalization of public services, and rural-urban integration.
- *Fourth, the residence system should be facilitated by an information technology (IT) platform based on a set of national standards for exchange of population data across jurisdictions*, building on the unique national ID and the social security cards.

Achieving China's vision will also involve providing current residents with access to the "urban standard" of social services, which will require additional fiscal resources and a rebalancing of financing responsibilities between central and sub-national governments. In the short term, higher levels of government could consider subsidizing cities for the increased costs of services to migrants. In the medium term, fiscal system reforms on both the revenue and expenditure sides will be necessary to finance national minimum standards for social public services, irrespective of location. Such standards must be calibrated carefully, as they would need to fit the fiscal resources that China has available and would need to be phased in along with a

TABLE 4.3 Cost of Extending Urban Social Services to Cover Rural Migrants (in percent of 2012 GDP)

	2015	2020
Education	0.98	0.95-1.97
Health services	0.27-0.36	0.33-0.49
Old-age security	0.03 (1.0-1.95)	0.05-0.06 (1.09-2.19)
Social Assistance	0.04	0.05
Housing	0.02-0.11	0.02-0.1
Total	1.52-2.52	2.67-4.77

Source: Authors' calculations, see background paper "Costing out China's residence-permit reform".

gradual change in the intergovernmental fiscal system that should provide the needed resources to localities with more expenditure needs than revenue capacity. Local authorities can top up this package for their residents, and the private sector can also help create fiscal space through high-end medical services, private third-pillar pensions, and private schools.

The costs of extending access to the "urban standard" for rural migrants are significant but manageable. The current package of social services in China's cities includes: nine years of free compulsory education, access to basic public health care services, social security (medical and old-age pensions) for formal sector workers and for residents in rural and urban areas, a social assistance program for rural and urban areas, and a welfare housing system in urban areas (*12th Five Year Plan Commitments for Public Social Services*). The annual cost of extending this package to cover current rural migrants within the next one to two years is 1.5–2.5 percent of 2012 GDP, depending on the assumptions and method of calculation. By 2020, the cost will increase to 2.67–4.77 percent of 2012 GDP, mainly because it is assumed that most of the left-behind children of rural migrants will move to the cities with their parents (Table 4.3).

Social policy reforms and rural-urban integration

To be truly consistent with the goals of efficient urban development and rural-urban integration, efforts must extend beyond equalizing access within urban areas, with a longer-term goal of equalizing access to a basic package of social services across provinces and urban and rural areas. A minimum package of social services and social insurance that is guaranteed by the Central government would be a basis for this equalization. A set of incentives for local authorities to continue topping-up this package would allow them to raise the standard for all residents of their jurisdiction. The fiscal implications of financing this basic package for all may be significant and should be carefully calibrated so China can afford it.

Sectoral policy reforms in health, education, and social protection, as well as cross-cutting reforms in accountability for service delivery, could help contain costs and increase the efficiency of service provision. These reforms should cover the following:

- *Education:* Efforts are needed to narrow the disparities in quality of basic education and expand access to senior secondary and early childhood education. Financing reform would facilitate minimum standard-setting for every level of education and ensure central transfers for equal access to and quality of education for poor rural localities and disadvantaged children. Demand-side mechanisms that stimulate competition and allow higher levels of private provision will also improve education access and quality. Teachers' incentives need to be

realigned to improve quality of instruction and strengthen school management. Peer tutoring programs, computer-assisted learning tutoring programs, afterschool support, tuitions, and resource persons targeted at migrant students and their families will further support the integration of migrant children.

- *Health care:* A stronger urban health delivery system is needed to cope with the expected increase in demand. This could be achieved by improving primary health services and coordination among health providers; integrating and ensuring portability of health insurance to allow citizens to choose the best treatment; strengthening health promotion and illness prevention in urban settings; and implementing effective cost containment and quality improvement measures. Provider payment reform should replace the dominant fee-for-service payment system with a diagnosis-related group-based system, which has a proven track record internationally for containing the costs of inpatient care.
- *Pensions:* Pension reforms are required to facilitate labor mobility, narrow gaps in pension benefits, and cope with population aging. In the short run, national guidelines could ease the transfer of pension rights and benefits between schemes and locations. In the long run, the urban worker pension scheme could be reformed through introduction of a notional defined-contribution design while developing a financing strategy to resolve the legacy cost outside the reformed pension system. These reforms would lower the existing high contribution rates, provide stronger incentives for employers and employees to contribute, and realize the objective of a targeted replacement rate.

  Migrant workers with wage jobs and labor contracts can be encouraged to join the reformed urban workers' pension scheme to reduce the government subsidies needed for the rural residents' pension scheme. Self-employed migrants and those with informal jobs could also join the urban residents' pension scheme but would need to meet local requirements for transfer, since local governments finance the top-up of pension benefits at the local level. Pooling could begin first at the provincial level then be expanded to the national level, supported by an integrated national data management system. Finally, gradual reforms in retirement age and indexation would help ensure the adequacy of pension benefits and the sustainability of the pension system.
- *Social assistance:* Reforming *dibao* and other social assistance programs requires consolidation, standardization across space, and harmonization with antipoverty interventions in poor counties and other social programs. Most high- and middle-income countries apply a unified formula for determining eligibility for national welfare programs while maintaining some flexibility, including regional cost-of-living adjustments. China could gradually move toward a more systematic approach in determining eligibility thresholds from county (city) to prefecture, from prefecture to province, and finally to a nationwide setting.
- *Accountability for service delivery:* More sophisticated service delivery and ambitious equalization goals call for greater accountability for outcomes, cost effectiveness, and transparency. Three broad channels can be used to promote accountability: government, citizen-based, and choice or market-based. Government systems can promote better performance from service providers by linking budgetary transfers to the performance of subnational governments. Human resource management and compensation systems and facility-based management initiatives could also become more performance-based channels. Regulation, accreditation, and licensing systems for providers are increasingly important tools and are expected to be core elements of the modern and diversified system of social service provision in China. Citizen-based channels could be strengthened by providing more public information on service delivery costs and performance and harnessing information efforts to generate citizen oversight and feedback on service delivery performance. A further channel for citizen involvement is more direct incorporation into management and oversight institutions. Choice and market-based channels will require greater reliance on demand-side financing of services where appropriate and greater public purchasing of social services.

Strengthening institutions for an inclusive and productive labor market

An inclusive and productive labor market for all will allow people to seek and maximize economic opportunities and will help unleash the potential of labor mobility. Geographic, occupational, and sectoral mobility could be supported by measures such as:

- *Building a modern system for continuous upgrading of the human capital of workers, both on-the-job and in learning institutions.* Overall, investment in skills should focus increasingly on lifelong learning and continuous upgrading of worker skills over their entire careers. Policies should promote a more modular and competency-based technical and vocational education and training (TVET) system, broaden ongoing experiments with demand-side financing of training, encourage private sector training providers to enter the training market and provide a more level playing field for them, and build institutions for accreditation of skills to increase the portability and relevance to employers of skill certification. Tertiary education reforms should focus on increasing the labor market relevance of higher education. Such reforms would include greater autonomy and accountability for universities and would explore the potential for private provision and financing of higher education. An overarching reform needed across TVET and higher education is to increase articulation between the technical and academic streams so students can shift between them with due credit for competencies acquired in either system.
- *Strengthening labor market institutions that can facilitate efficient labor market transactions, balance wage and productivity growth, and mediate labor disputes.* As a starting point, the basic function of the minimum wage will need to be reoriented from a minimum income guarantee to an instrument of collective bargaining and administrative labor market policy intervention. Reforms of labor taxation could help reduce the tax burden on workers and employers, and there is potential for reducing the pension, unemployment, and housing contributions. These measures would also require accompanying reforms of the overall tax mix across factors of production and financing.

Inclusive urbanization can bring a range of positive economic and social benefits for China. Urbanization that is inclusive can help China rebalance its economy, maximize human capital to sustain a competitive economy, narrow welfare gaps, and promote social cohesion. In this context, inclusive urbanization is not only an issue of equity and social cohesion but also a crucial underpinning of the country's evolving economic model, which will rely on maximizing human resource potential to move China from middle- to high-income status.

2: ENSURING EQUITABLE ACCESS TO SOCIAL SERVICES IN URBAN AREAS

In order to achieve China's vision for inclusive urbanization, the current "urban standard" of social services can be extended to migrant populations. This chapter discusses one of the most critical elements of the necessary reforms: the shift to a residence-based permit system which will de-link access to social services from *hukou*. It draws lessons from local experience as well as international practices and lays out various considerations and policy options for the adoption of the residence permit system. The chapter then examines the barriers that migrant populations face in accessing the current "urban standard," focusing in particular on financing arrangements and the system of delivery for compulsory education, health care and insurance, pensions, and social assistance and welfare housing. Finally, building on these findings, the chapter suggests a framework for cost sharing and incentives for municipal governments to integrate migrants into urban areas.

CONTEXT AND CHALLENGES

For migrants and their families, access to publicly financed services in urban areas has been regulated by *hukou,* limiting their mobility and reducing their welfare. The original rationale was that migration for work was temporary and that families of migrants would stay behind and access services in the rural areas. While this was true in the early stages of China's economic transition, the situation has changed dramatically over the last couple decades. Rural-to-urban migration has become more permanent in nature, with the majority of migrants having no aspirations to return to rural areas (Cai and Wang, 2010). In addition, there is now a second generation of migrants, born and raised in cities, who have no attachment to the rural areas from where their parents migrated.

In response to the evolving economic and social situation, *hukou* reform has been undertaken gradually since the early 1980s. In particular, the mobility restriction function of *hukou* has largely been eliminated in practice by reforms since the late 1980s. Starting in 1997 and culminating in a 2001 National Policy, measures were gradually introduced to encourage selected rural migrants to apply for urban *hukou* in small cities and towns (the "small city free" policy—see Wang, 2002). In 2006, the State Council promulgated a milestone document (State Council, 2006) that provided a comprehensive policy framework for the fair treatment of rural migrant workers in cities with respect to their entitlement to social services including employment, training, education, health, social insurance, housing, and family planning services. All fees levied on rural migrants such as temporary residence fees and management fees, family planning fees, urban expansion fees, and management and service fees were removed.

Most recently, the State Council in 2011 formulated a national policy on *hukou* reform and issued reform guidelines linked to the city's administrative level.[8] These guidelines set differential approaches to granting local *hukou* in cities, depending on a city's administrative level. In towns and county-level cities, migrants could apply for permanent local *hukou* for themselves and family members (spouse, unmarried children, and parents) if they have legally stable employment and a residential apartment (including leased). If facing major strain on overall

[8] As this report is being prepared, the Ministry of Public Security is formulating a roadmap for *hukou* reform, aiming for implementation by 2020. The December 2013 "Urbanization Work Conference" of the central government also called for an "orderly conversion" of rural migrants and proposed a numerical target of 100 million long-term rural migrants to be converted to urban *hukou* holders. These measures are to be supported by investments to renovate shantytowns and urban villages in central and western regions. See the media interview with Vice Minister Mr. Min Huang, "Establishing A New Type of *Hukou* System by 2020," on December 17, 2013, www.newhuanet.com.

carrying capacity, cities could make specific conditions for the scope and years of legally stable employment and place of dwelling. In prefecture-level cities, migrants could apply for permanent local *hukou* for themselves and family members if they had legally stable employment for over three years, a legally stable place of residency, and contributed to social insurance for a certain number of years. These requirements could be lowered in Central and Western provinces if local conditions allow, while they could be increased in cities facing major strain on overall carrying capacity. In municipalities directly under central management, vice-provincial level cities, and other large cities, strict quota control policies will continue.

The State Council also requested that institutions take steps to improve registration of temporary populations in the cities and called for gradual rollout of the residence permit system. The unified national residence permit system would be residence-based rather than origin-based and would de-link access to social services from *hukou*.[9] If access to social services in the place of residence is de-linked from *hukou*, then for rural migrants, the remaining function of their rural *hukou* is their rural land rights. This is an important and potentially lucrative right—rural land values in developed areas are high, and rural *hukou* holders could receive a windfall from land conversion.

These reforms are an important step toward rural-urban integration and equalization of access to social services across the country, which will improve the welfare of the population and benefit the economy as a whole. A residence-based approach for access to social services will encourage mobility and incentivize workers to move to places where they can earn the highest returns to their labor,[10] which will improve allocative efficiency in the labor market and help enhance productivity. At the national level, removing all mobility restrictions will play a major role in narrowing rural-urban and regional income gaps.[11] Furthermore, making social entitlements available to all workers and their families in their areas of their residence will help deepen the human capital base, promote a healthier workforce, and alleviate social tensions.

However, it is important to recognize that although a residence-based system is a more efficient and fairer system for regulating access at the local level, the full benefits are realized at the national level, which may reduce local government incentives for such investments. The full benefits of increased population mobility, optimal allocation of labor resources, and improvements in the stock of human capital are realized at the national level, while the costs of providing these social services are largely borne by local governments in receiving areas. Moreover, the uncertainty of the returns to investing in mobile workers further reduces the incentives for such investments. Local governments therefore have little incentive to provide free or subsidized services for migrant families under the current intergovernmental fiscal system.

The introduction of a modern residence system needs to be national and unified, accompanied by a change in intra-governmental fiscal responsibilities that would promote fiscal sharing arrangements for social service provision for all residents. It needs to be led firmly by the national authorities and accompanied by change in the intra-govermental fiscal arrangements that would assure funds for minimum standards of social service benefits. It should also hold local authorities accountable for providing services to all residents. The operating principle of such fiscal reform should be "money follows people" and could be implemented through

[9] A typical notion of "residence" defines the jurisdiction under which laws and regulations a person has rights and responsibilities with respect to taxation and qualification for benefits and social services. A first residence is acquired when people are born and are registered with the population registration system. A residence system is defined by (i) a framework and standards for eligibility for a residence permit and (ii) the extent of access privileges offered once a residence permit is obtained, as well as the sequencing of such privileges.

[10] Zhang and Zhao (2011) show that *hukou* restricts people from moving to the places where they would be most productive.

[11] Completing *hukou* reform can have a dramatic equalization effect between rural and urban incomes. See Zhai, Herte and Wang (2003) and Whalley and Zhang (2004) which used CGE models to explore the impacts of removing all migration restrictions, as well as Zhu and Luo (2010) for a study of Hubei province on the positive distributional effects of labor mobility.

a national net-settlement system or other reforms of intra-governmental fiscal responsibilities. This would encourage all cities to use residence-based rules for access to public resources through an incentive-based approach rather than through command and control.

The concerns of urban residents regarding eligibility for social services in the cities should also be taken into consideration. Urban residents are concerned about potential deterioration in service quality in cities if their localities must absorb the costs of service provision for migrant populations.[12] Managing such perceptions may be a significant element of the reform agenda and will require actions to improve services for all.

A MODERN RESIDENCE SYSTEM—AN INSTITUTION TO REGULATE ACCESS AT THE LOCAL LEVEL

The shift to a modern residence system will clearly be a challenging process which could benefit from lessons of experience. To help inform the reform process, it is useful to examine experiences with similar reforms to date, both within and outside China. This section highlights some relevant examples that provide insights into the challenges in granting residency and point to possible solutions. Building on these lessons, it discusses some of the major elements to be considered for China's residence permit system, including sequencing and phasing of reforms, political economy considerations, and other factors that may affect the reform process.

Local experiments and international practices

With encouragement from the central government, many provinces in China have piloted *hukou* reforms and more recently the parallel residence permits. One such reform has been the unification of *hukou* registration (agricultural, non-agricultural, and "blue-stamp"), undertaken by 15 provinces by 2009. However, in the absence of supporting entitlement reforms, this reform remained largely symbolic. Some provincial pilots have involved liberalization of *hukou* within their administrative jurisdiction, with or without exchange of rural and urban entitlements. Chongqing, for example, required the so-called "exchanging three rural clothes for five urban clothes" policy—the "rural clothes" being homestead land, farm land, and contracted forest land, and the "urban clothes" being pension, medical insurance, housing, employment, and education. A similar localized *hukou* conversion pilot in Chengdu did not require the exchange of rural and urban entitlements. In a number of large cities and provinces such as Shanghai, Shenzhen, Zhejiang, Guangdong, Jiangsu, Chongqing, and Chengdu, parallel residence permits have been adopted, linking provision of social services to these permits rather than to *hukou* status.

The conditions of the residence permit system approach differ across cities, as described in Box 4.1. Some cities offer easier access to residence permits but more limited access privileges, while others offer a better package of entitlements but have stricter criteria for obtaining a residence permit (e.g., Shanghai). Other cities mix the two approaches for those with temporary residence permits and those with permanent and fuller entitlements (e.g., Zhejiang).

The experience of other countries and the EU during its enlargement provides useful insights on rules for establishing residency and the associated benefits. In the EU, a "right to reside" is linked to one's employment status for the prime-aged, economically active population from EU member states other than the one where one is born.[13] Workers and self-employed persons have the right to reside without any conditions but must have the proper documentation to

[12] Numerous sociological studies find that urban residents are concerned about migrant workers compromising the quality of services (Watson, 2009).

[13] According to the European Parliament and Council Directive (2004/38/EC), every EU citizen has the right to move and reside freely within the territory of another member state for up to three months without any conditions or formalities, other than the requirement to hold a valid identity card or passport. The objective of

BOX 4.1 China's Experience with Residence Permits

Guangdong is the first province that replaced the traditional *hukou* quota system with a point system for *hukou* conversion and gradually lowered the conversion criteria for migrants in 2010. The points are calculated based on education, vocational certificates and profession, years of social insurance contribution, charitable activities such as blood donation and volunteer work, and government awards. Between 2010 and 2011, about 696,000 of the floating population were converted through the point system.

In **Shenzhen,** a permanent residence card is granted to non-local *hukou* residents over 16 years of age who are employed, have investments, own properties, are overseas returnees, or possess "creative talents." A "temporary residential card" is granted to those who do not have jobs, investments, or private property in Shenzhen. Permanent residence cards allow migrant workers to enjoy the same housing, medical, educational, and pension benefits as those with local *hukou*. Shenzhen issued 5 million such cards by the end of 2008.

In **Chongqing,** a residence permit seeker must have a job and must have worked for five years in the central city of Chongqing or for three years in a township within the municipal boundary. They can become registered residents only in the places where they have been working.[1] The package includes free access to compulsory schooling, the same subsidies for health and retirement insurance plans that urban residents receive, unemployment insurance in the formal sector, and free or subsidized vocational training. Using a lottery, authorities in Chongqing give residence permit holders access to subsidized public housing rentals, with the subsidy covering about half of the market rental price. In the three rounds of lotteries to award subsidized public housing rentals, more than 100,000 people were granted subsidized rental units. These subsidized public rentals are also open to long-term residents who do not own residential property, allowing for the creation of mixed neighborhoods. At this time, only intra-provincial migrants are eligible for subsidized rental units.

Shanghai introduced a point system in 2013 to allow people with legitimate and stable employment in the city can apply for a residence permit. Points are calculated based on the resident's age, years of experience, and social insurance contributions in Shanghai, as well as educational and technical qualifications. Residents who make a significant investment in Shanghai or otherwise contribute to boosting local employment earn 100 points, while those providing false information lose 150 points. Those who violate the family planning policy or have a record of criminal offenses are disqualified. A total of 120 points is required for a residence permit holder to be entitled to such social benefits as social insurance and the right for their children to take the national college entrance exam in Shanghai. The health insurance subsidy and the subsidy for social housing are not automatically provided to resident permit holders.

More recently, **Tianjing** promulgated its point system in 2013 to take effect in 2014, and **Beijing** announced it will formulate its residence permit system in 2014.

Source: World Bank staff compilations from various sources.

prove their status, such as a certificate of employment or proof of self-employment.[14] In the case of students or 'economically inactive' persons (e.g., unemployed, retired), the "right to reside" involves proving that they have comprehensive sickness insurance as well as 'sufficient resources'[15] to not become a burden on the host EU country's social assistance system during their residence. The "right to permanent residence" requires five years of continuous legal

residence or status (e.g., employed, self-employed, tourist, student, retiree) has no bearing on this right during this time period.

[14] Jobseekers benefit from the right to reside without any conditions and formalities for a period of six months and even longer, if they continue to seek employment in the host EU country and have a genuine chance of getting work.

[15] The general rule is that EU citizens have sufficient resources if the level of their resources is higher than the threshold under which a minimum subsistence benefit is granted in the host EU country.

residence in the host EU country, and once acquired, is not subject to the conditions mentioned above. One can lose the right to permanent residence only through an absence of more than two consecutive years, although there are stipulated reasons for which such an absence is acceptable.

EU migrants to member states enjoy privileges such as access to social assistance, education, and health care which make the residence rules meaningful. The general working principle is that EU citizens and their family members residing in the territory of another member state enjoy treatment equal to that of nationals of that host country. Box 4.2 provides details on the eligibility of EU migrants for various social benefits in member states.

In the United States, the "bona fide residency" requirement and "durational residency requirement" regulate local access.[16] A bona fide residency requirement simply requires that the person establish residence before demanding services that are restricted to residents.[17] A durational residency requirement obligates a person to show that, in addition to being a bona fide resident of the state, they have resided there for a certain stipulated period of time. For example, to be able to send their children to public primary and secondary school for free, families must establish bona fide residence (actual physical presence plus intent to remain there) in the school district. However, for eligibility to pay lower in-state (resident) tuition at public higher education institutions and to access state education grants, most U.S. states enforce a durational residency requirement of at least one year (excluding any time as resident to enroll for the sole purpose of attending an educational institution).

Japan uses two distinct registry systems to manage citizen information: (i) the Basic Resident Registry *Jūminhyō)* and (ii) the Family Registry (*Koseki*). The *Jūminhyō* lists basic sociodemographic information (name, address, date of birth, gender, nationality, status of residence, etc.), along with information related to social benefits and insurance. *Jūminhyō* is required to access various social services, including registering children at a local school district or starting/renewing national health insurance membership. It basically serves as proof of residence, such as for opening a bank account or applying for government permits. Since 2002, *Jūminhyō* information is available electronically through the *Jukinet* electronic registration system, used by more than 1,700 local governments in Japan. The system has greatly helped in simplifying moving-in/out procedures, obtaining a residence registry card, and eliminating the need to attach a copy of the resident's record in administrative procedures. From December 2008, it has also eliminated the need for pensioners to confirm benefits eligibility annually, since the Basic Resident Registration Network System reports directly to the Japan Pension Service on behalf of the pensioner. In contrast, the *Koseki* is the formal record of a family's (rather than an individual's) history and is mainly used as a proof of citizenship. It is not normally used to verify information or required to obtain government services.

Lessons and concerns

China's pilots point to a number of issues in granting residence, while these pilots and international experience also suggest some solutions. The main lessons and issues include:

Large cities bias: Rules for accessing residence permits are most restrictive in large cities, where rural migrants are concentrated. In large cities (Beijing and Shanghai are prime examples), strict conditions are imposed on the entry of migrants. At the same time, in small and medium cities, social services and social protection are less generous, contributing to the limited success of the policy in attracting migrants there.

[16] Overall, residence is determined differently for different purposes, and the criteria often vary by state.
[17] Also if a person has conducted a substantial amount of business in a state, some states will recognize that person as an actual resident and grant them certain advantages of residency. http://legal-dictionary.thefreedictionary.com/residency.

BOX 4.2 EU Migrants' Eligibility for Social Benefits in Member States

Goals set out in the EU treaties are achieved by several types of legal acts, including regulations, directives, recommendations, and opinions. A "regulation" (e.g. social security regulation) is a binding legislative act and must be applied in its entirety across the EU. A "directive" (e.g. the right to education) is a legislative act that sets out a goal that all EU countries must achieve. However, it is up to the individual countries to decide how to do so.

Right to Education (under EU directive): Children of EU migrants are entitled to attend school in any member country under the same conditions as nationals of that country. They have the right to be placed in a class with their own age group, at the equivalent level to their class in the country of origin (regardless of language proficiency) and to receive free language tuition in both the language of the new country as well as the country of origin.

Right to Health Care (under EU regulations): Insured persons moving temporarily to member states are entitled to necessary medical treatment upon presentation of a European Health Insurance Card (EHIC), issued by the competent authority of one's home country. Treatment is provided by public health care providers and is subject to the same user fees charged to local permanent residents of the host country. For those residing for longer periods of time, EC Regulations on social security coordination provide that all insured persons are entitled to health care (including long-term care benefits) provided for under the legislation of the Member State in which they reside. These benefits are to be provided by the institution of the place of residence in accordance with their statutory conditions, procedures, and rates, as though the beneficiaries were insured under the host country legislation.

Right to Social Security/Insurance (under EU law): Social security benefits have to be granted to people from other EU Member States once their place of 'habitual residence' is confirmed in the host country. Such benefits (sickness, maternity and equivalent paternity benefits, old-age pensions, pre-retirement and disability benefits, survivors' benefits and death grants, unemployment benefits, family benefits, benefits in respect to accidents at work and occupational diseases) vary considerably from one member state to another. The EU provisions do not harmonize them but instead provide for their coordination, aided by establishment of common rules and principles that have to be observed when applying national laws. Every member state is free to decide who is to be insured under its legislation, which benefits are granted, under what conditions (e.g., based on residence, employment or occupational activity, completion of certain periods of insurance), how these benefits are calculated, and what contributions should be paid. The principal rule is that employees (and the self-employed) are covered by the social security system of the country in which they are employed (work), irrespective of where they live or where the employer is based. For the unemployed (students, retirees, etc.), their right to social security is determined in accordance with the legislation of their country of residence.

Right to Non-Contributory Social Assistance and Housing Assistance: The EU rules on social security coordination do not apply to: (i) social and medical assistance benefits normally granted on the basis of one's means, (ii) taxation, and (iii) certain special cash benefits which are non-contributory and aimed to ensure minimum resources for those without other means of support. These are provided by and at the expense of the institution of country of residence and in most cases are paid to people whose pension or income is below a certain level. Regarding social housing, the EU directive on equal treatment (2000/43/EC), which applies to a wide range of spheres including housing, prohibits discrimination, but it is left to each member country to implement the directives in its legal framework.

Source: http://ec.europa.eu

Selection of migrants with desired characteristics: There are systematic differences in the treatment of migrants based on their socioeconomic status, which runs counter to the Government's goal of reducing inequalities. This is especially true in larger cities where the reforms have generally been focused on selecting migrants with the desired characteristics and attracting high-skilled and wealthy individuals (Zhang and Tao, 2012; Zhang, 2012). In many cities, this has meant that mainly better-off migrants are able to obtain local *hukou*, thus widening the gap between local and non-local *hukou* holders. Poorer migrants are excluded in a variety of ways, in some cases by explicit entry barriers regarding skills, investments, or income. Other cities achieve rationing through strict interpretation of income or work and place of residence requirements—for example, excluding those renting apartments and those without formal employment. Other cities impose stricter time requirements (e.g., five years of prior residence for low-income people versus two years or none for others).

Cities as "welfare magnets": Local governments are concerned about "benefits tourism." Local governments in richer areas or areas with higher quality of services fear that residents from other jurisdictions may move in to "shop for benefits." Long-time residents show or prove their connectedness to the local government by paying taxes and/or paying into the social insurance system, which also allows services to remain fiscally sustainable.

Internationally, the evidence of welfare benefit-induced geographic mobility is mixed. In the EU, for example, there is little evidence of excessive receipt of welfare support by immigrants within the EU relative to natives. The general findings are that immigrants are either as likely or less likely to be receiving support, and there is no strong link between welfare generosity and immigration (Joyce and Maitre, 2012; Dustmann, Frattini, and Halls, 2009). However, strong evidence from countries such as Brazil indicates that rural dwellers tend to move to the cities for better social services.[18]

Notably, strong evidence from the United States shows that rural-urban migration has net positive effects on cities, despite the initial concerns about fiscal costs and possible negative effects. In the United States in 1967, one of every five urban residents over age 14 had migrated from a rural area. Although such migration imposed short-term fiscal costs, in the long run, migrants paid more into the system than they had taken out of it (Petersen and Sharpe, 1969). Their economic gains, though low during the migrants' first five years in cities, increased rapidly thereafter (Wertheimer, 1970).

Social tensions and competition for urban services: Local urban residents in China have concerns about the potential impacts on service quality if their localities have to absorb the costs of service provision for migrant populations. One survey of local residents in Guangzhou shows that more than half of urban residents agree that rural migrants deserve the rights to enjoy health insurance, have compulsory education, join the Labor Union, and vote in their destination. However, around the same number are against migrants applying for unemployment compensation, *dibao*, and low-rent housing (Liu, 2008). Another study conducted in 2010 using the 2005 National Comprehensive Social Survey data found that local residents from places with better public service provision and higher public service quality tended to be more reluctant to accept migrants (Wang, 2010). The study also found that urban residents with relatively lower socioeconomic backgrounds were more reluctant to accept migrants, as were residents of cities with higher employment pressures.

These concerns are not unique to China, and animosity toward migrants is documented across many societies.[19] The United States and the EU, both large countries/unions with diverse

[18] Lall, Timmins, and Yu (2009) evaluated the relative importance of wage differences and public services in migrants' decisions to move in Brazil. Their findings showed a distinction in preferences according to income level: for relatively well-off people, basic public services were not important in the decision to move, but for the poor, differences in access to basic public services did matter.

[19] See World Bank (2013), based on World Values Survey (2005–2008).

residents and high migration, had to manage these processes. These often arise from the perception that migrants compete for scarce jobs and are a drain on resources in the form of publicly funded services. Conflicts between migrants and residents are likely to be more intense when the receiving area is ethnically homogenous and migrants and native populations are easily identifiable, when migrants dominate certain economic activities, and when migrants fare better than natives. Some findings also show that antipathy toward foreigners is correlated with the proportion of migrants in the population.

Managing these perceptions will be a significant element of reform for China. The national government has a distinct role in this process as a mediator of the interests of stakeholders. Some strategies for national and local governments include: improving services for long-term urban residents and migrants alike, allowing private provision of high-end services within the appropriate framework, and encouraging remedial programs for migrants so they can join the mainstream.

Elements of the residence permit system for China

The shift from the *hukou* system to a modern residence system for defining eligibility for basic services will involve several steps. These steps include:

- *First,* the central government will need to define the principles and national framework of the residence-based system to provide guidelines for local governments, including the system by which local governments should grant residency to people living in a specific locality and the sequence of entitlements that accrue upon attaining a residence permit. In the short to medium term, it may not be practical to expect common levels of eligibility criteria, but the central government should set minimum guidelines for local governments to follow and create a time-bound pathway for extending access privileges.
- *Second,* under the national framework, local governments can define the qualifying periods to move from one step of the entitlement sequence to the next. Already, many localities have implemented localized residence permit systems with different approaches and requirements, from more liberal ones in small cities to strict point-based ones in Shanghai, Guangdong, Tianjin, and Zhejiang. In the initial phases, it is unlikely that all social entitlements of current local residents could accrue immediately upon obtaining a residence permit, but for fundamental rights, requirements should be very simple and low.
- *Third,* the conditions and requirements for obtaining a local residence permit—which could vary between cities in the initial stage—should converge over time, supported by broader reforms such as fiscal and taxation system reform, equalization of public services, and rural-urban integration.
- *Fourth*, the residence system should be facilitated by an information technology (IT) platform based on a set of national standards for exchanging population data across jurisdictions, building on the unique national ID and social security cards.

While full convergence of residence permit policies may take a decade or more, establishing an elaborated national framework for residence permits is an urgent priority. Negotiations with subnational authorities will be required to balance the desire for common national standards with local discretion. It would be greatly facilitated by fiscal reforms to support cities in assuming enhanced service provision responsibilities for migrants.

In developing this national framework, one important issue to consider is the extent to which it should have common standards for all types of urban settings. To date, the national authorities have promoted a variable strategy for obtaining *hukou* depending on city size/status. It could be argued that making acquisition of local *hukou* in smaller cities easier can help promote agglomeration effects in regions where market forces may not be as strong drivers as in more prosperous areas. However, based on global practice, closer convergence of qualifying

conditions for obtaining local residence permits across all types of cities would be preferred for achieving truly unified citizenship, although this is unlikely to be politically feasible in the short to medium term and is best considered a longer-run policy goal.

Another consideration is the core criterion against which residence for the purposes of obtaining a residence permit is established. The key question is whether residency for a prescribed period should itself be sufficient to acquire the rights of a local resident or if some additional criterion should be applied, typically a period of employment. International experience is not definitive on this question, with variation across and even within countries and jurisdictions. For China, a residence permit system based purely on period of residence is unlikely to be workable in the short to medium term in larger and affluent cities for a number of reasons, such as:

- *political economy*, as local *hukou* residents and local authorities would be reluctant to accept such a mandate, particularly without an overhaul of the inter-governmental fiscal system to better match local revenues and fiscal transfers with the total population residing in a city.
- *gaps in the current registration system for movement to/from different areas*. While in principle migrants must register their new residence within three months, in practice it is difficult to keep track of such movements fully between areas and even within districts.
- *incentive structure*, as a purely residence-based system may weaken incentives for migrants to participate in formal sector employment and accompanying social security, labor protection, and other schemes.

For cities where demand for migrant workers exceeds supply, political economy factors will differ, and the desire to expand the local workforce may outweigh the second and third considerations.

If a permit system based purely on residence is not feasible for the foreseeable future in larger cities, there is still an argument to make some entitlements subject to a period of residence only (perhaps 6–12 months). The obvious entitlement to be based on residence alone would be basic education for children of migrants. This already has a clear basis in national policy, minimizes inter-generational transmission of inequality, is subject to substantial lifetime externalities beyond the city, and would minimize the problem of "left-behind" children. Basic health services is another example.

Beyond a very limited set of basic entitlements which should vest quickly and be based on residence only, other entitlements could be subject to a work requirement of some form. This is a non-issue for formal sector social insurance schemes, where entitlements are already linked to contributions through the employer. The more complex entitlements are resident pension and health insurance schemes, *dibao*, and social housing. For migrant workers in formal employment, it is only a question of deciding the appropriate prior period of residency and employment and the extent to which it differs across entitlements. Migrant workers in informal employment pose a more difficult case, as verification of employment is challenging.

Another consideration is the extent to which the national framework should prescribe the sequence for all cities to follow in granting entitlements to migrants and the criteria for prioritization. In contrast to specific conditions for acquiring entitlements (i.e. number of years of residence and/or employment for acquiring a specific entitlement in a given city), there is a case for mandating a common national sequence for entitlement acquisition. This should be based on some guiding socioeconomic principles that could include:

- *Entitlements that generate externalities beyond the individual city should be given priority*. The most obvious example is basic education, given the national economic benefits of a well-educated population. Another example is the basic public health package, as vector and disease control in one area has impacts beyond its jurisdiction with mobile populations. A third example might be employment services, given the economic benefits of better matching of workers and jobs.

- *Entitlements that increase the possibility for families to live together should also be prioritized*. Basic education is again an example. Evidence on crime rates and other socioeconomic issues among left-behind children is persuasive, as are the costs of divorce and family problems with split families. Facilitating family co-residence may also help address emerging challenges such as childcare costs and the growing need for home-based care of elderly people.
- *Entitlements that are largely self-financing such as urban worker pensions, health insurance, and unemployment insurance should be immediately accessible to migrants*. Efforts should also be made to promote their uptake among employers and migrant workers through policies and information systems to promote portability and the acceleration of higher-level pooling of contributions to lessen the spatial fragmentation of social insurance.
- *Entitlements that are primarily of a welfare nature should be considered later in the sequence, with the exception of short-term support such as disaster relief or temporary social assistance and probably specific groups such as people with disabilities*. The obvious examples of welfare entitlements are *dibao* and social housing. While these should be part of the complete package associated with obtaining a local residence permit, for political economy, welfare dependency, and other reasons, they may "vest" only after a more extended period of residence and employment.

The rationale for including such prioritization in the national framework is to realize gains for the country to which individual jurisdictions may not attach the appropriate socioeconomic benefits. Strong guidance to localities within the national framework would help promote fairness and common treatment across space. It would also prepare the ground for longer-run convergence across different types of cities in the detailed local criteria for resident permit acquisition. If the national authorities provide a fiscal transfer for a transitional period to assist cities in taking on enhanced responsibilities for basic services to migrants, adoption of the sequencing for acquisition of entitlements could be a condition for cities to receive their central transfer.

Development of an IT platform will be important for providing quantitative information to facilitate fiscal allocations to underpin the modern residency system as well as supply data for monitoring and evaluation. Setting up the IT platform should start with establishing national standards for information systems and data exchange of information on mobile populations. A fully centralized national database seems overly ambitious at present, but a common platform would be essential. Such a system would be the information backbone of shared guidelines for social services, including a population registration system for the purposes of fiscal transfers. The system would rely upon unique residence-individual identification matching, verification, and validation. Programmatic eligibility can be uniquely consolidated so that individuals move and still receive benefits from another location, as well as to ensure that individuals are residents in only one place at a time (Box 4.3).

Apart from *hukou* policy itself, a less predictable factor that will shape *hukou* policy over the longer run is labor supply and demand. The discussion above assumes excess demand of migrants for local residence permits, at least in larger and more affluent cities. A shrinking working-age population, and more specifically the shrinking pool of surplus rural labor, suggest that cities will increasingly compete to attract workers. If so, the conditions for obtaining a local residence permit will become a potential source of competition between cities seeking to attract workers. This is already happening with respect to highly skilled or wealthy migrants, and recent experience in some Pearl River Delta cities suggests that similar labor market dynamics will increase competition for mid- and even lower-skilled workers over time.

In any reform of *hukou* policy, the set of complementary policies that will affect the demand of migrants for residence permits must also be considered. Perhaps the strongest is rural land policy and the implications of assuming the urban residency permit for land claims in areas of origin. Studies suggest that fear of losing rural land claims is a significant deterrent to migrants

BOX 4.3 China's Resident Population Information System—Setting up a Comprehensive Population Management Information Database

Currently, the collection and management of data on resident population in China relies on several sources of information. These sources include the population census (including the small scale census), Population Sample Survey System, as well as the information collected by various administrative departments, including most notably the Department of Public Security or the police. However, given the large gaps, vast improvements in the accuracy and sharing of information will be needed before these can be used for the purposes of a resident population database.

In the past, the police department was in charge of all household registration, which included information on births, deaths, temporary registration, and household migration according to the Household Registration Rules of the People's Republic of China released in 1958. After the 1980s, with more and more people not living in the place where their households were registered, the accuracy of this system came under question. The 2003 Administration Approval Law made it no longer mandatory for citizens to show their birth control certificate to apply for a temporary residence permit, and cities lifted the registration fee levied on migrants. Registration of the migrant population dropped precipitately, so local governments attempted to reform their population registration system through issuance of resident permits. Although registration is not universal for migrants, it remains a source of data on the resident population in China. Other departments such as health, education, labor, tax, and finance have also set up their own population information systems.

Recent national and provincial-level pilots can inform the next steps in setting up the resident population database. In 2002, the government released the "National Informatization Leading Group's Guidance on How to Build E-government in China forwarded by General Office of CPC Central Committee and General Office of the State Council" and the "Special Plan for Informatization of the National Economy and Social Development," recognizing the basic population information database as one of the four major national databases. In 2004, the State Informatization Office, Ministry of Public Security, Ministry of Labor and Social Security, State Taxation Bureau, and National Standardization Management Committee jointly launched the pilot integration of basic population information from these departments for select cites and provinces (Hunan, Shanghai, and Yangzhou). In June 2007, the Ministry of Public Security developed an "Online System for Checking Citizen ID," offering ID services for banking institutions. In February 2009, the Ministry of Human Resources, Labor and Social Security followed up by preparing to build a nationwide social security information enquiry system (using personal ID numbers as social security numbers) to help beneficiaries check their pension and benefits record at any time.

Source: DRC.

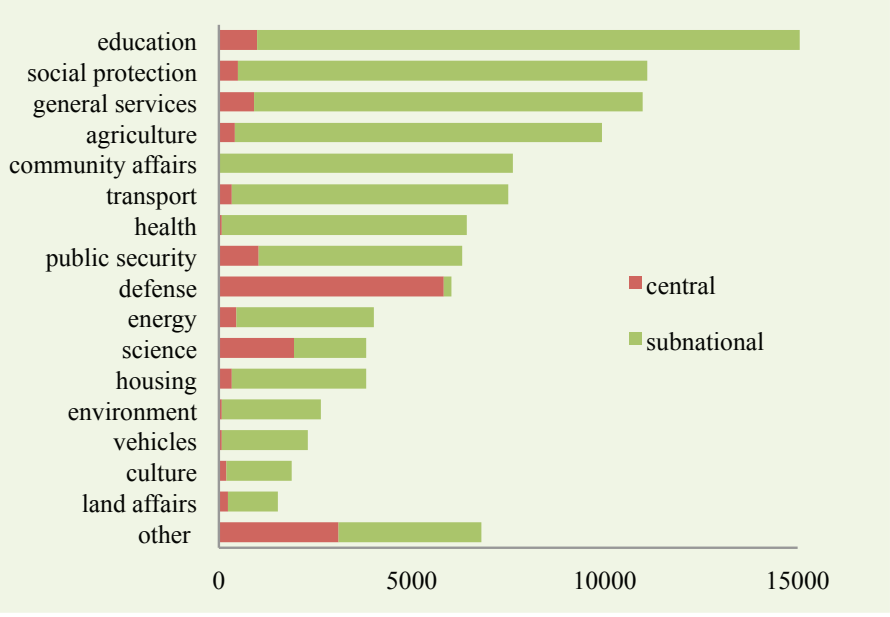
converting their *hukou*.[20] There is also a range of other relevant policies, including portability provisions (or lack thereof) in pension and health insurance schemes. The interaction of these and other policies with the proposed residence permit reform will need close attention.

THE CURRENT "URBAN STANDARD" OF SOCIAL SERVICES—ITS FINANCING, DELIVERY, AND THE COST OF EXTENSION TO MIGRANT POPULATIONS

As China moves toward a modern residence permit system, it will be important to determine what the modality of service provision will be and to ensure that the extension of services to

[20] This is discussed in the land pillar report, including recent indications from the 3rd Plenum meeting of willingness to undertake rural land reform.

FIGURE 4.4 Central and subnational expenditure by function (2011)



migrants can be funded adequately. While providing the current "urban standard" of social services is a critical aspect of making urbanization inclusive, the costs of extending such services can place considerable strain on already stretched local government budgets. This section takes stock of progress in providing the "urban standard" of social services and describes the financing and delivery arrangements. It then proposes options for extending services to migrants and their families and provides indicative estimates of how much it would cost to equalize access to public resources within cities for residents with and without local *hukou*.

The current "urban standard" of social services, which goes beyond the current basic package of social services, varies by location. The current package of social services in urban China includes nine years of free compulsory education, access to basic public health care services, social security (medical and old-age pensions) for formal sector workers and for residents, a social assistance program, and a welfare housing security system. The 12th Five Year Plan commits to a wide range of social services that go beyond the current basic package,[21] but this current "urban standard" varies across China's provinces, regions, and cities. It is financed from different sources, both public (central and subnational) and private.

Financing of public social services is highly decentralized, with subnational governments accounting for 85 percent of total government spending. By comparison, the average is 26 percent for transitional economies and 32 percent for OECD countries. As shown in Figure 4.4, China's subnational governments dominate every major functional category of public sector expenditure except defense, accounting for at least 95 percent of spending on most of the major functions of government (education, social protection, and health).

[21] While seemingly generous, it falls quite short not just of the OECD benchmark but also when compared to the BRICS countries, with only India having lower social sector spending than China. The latest available estimates from OECD (2011) indicate that public social sector spending (as a proportion of GDP) in 2007 was 16.3, 12, 8.1, 6.5, and 4.6 in Brazil, Russia, South Africa, China, and India, respectively. According to World Bank (2011), Brazil and Russia allocate more than 60 and 50 percent of their total government spending to the social sectors, respectively.

BOX 4.4 Central Government Resources in Compulsory Education

Education transfers. In compulsory education, the central government introduced a program to provide free textbooks, which grew to become known as the "Two Exemptions [of the textbook fee and miscellaneous fees] and One Subsidy [boarding subsidy]" or TEOS. The government extended the TEOS to all rural students in compulsory education, beginning with the western provinces in 2006 then all provinces starting in 2007. To ensure adequate funding for schools, the government introduced a new transfer, the "rural education operating cost guarantee mechanism" (often called "the New Mechanism" 新机制). As a long-term framework for upgrading the quality of school buildings, the School Safety Program (校安工程) was introduced, under which the central government provides subsidies for a portion of agreed maintenance and construction costs of schools. Starting in 2006, the government also rolled out a program to help resolve the "education debts" of subnational governments that had borrowed for school construction, including those for many village schools.

General transfers. In terms of general transfers, the central government increased support for rural Universal Compulsory Education to support salary payments. One of the most important is the "wage adjustment transfer" (WAT) (调整工资转移支付). First introduced in 1999 and intended only to offset the cost of the wage increase mandated by the central government, the WAT has grown rapidly over the past decade as public sector wages have risen steeply. It now accounts for the vast majority of wage payments at the subnational level. In Hubei province, for example, as teachers comprise 60 percent of public employees at the county level, this transfer is a principal source of central government financial support for rural universal compulsory education.**

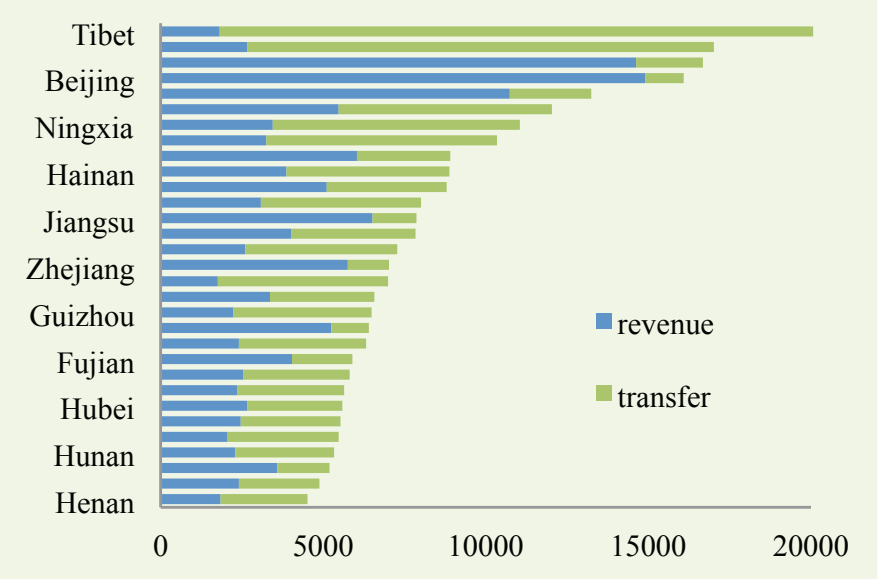
Sources:
*Chen Zhili speech at a meeting on reform of the funding mechanism for rural compulsory education, "Step-by-Step Elimination of Fees and Increasing Funding" (abstract), 27 December 2005, http://edu.people.com.cn/GB/3976821.html, accessed 24 February 2011.
** Interview at Comprehensive Department, MOF. March 2013 and State Council Notification on Deepening Reform of New Mechanisms for Ensuring Funding of Compulsory Education. State Council [2005] No. 43, December 24.

The fiscal relationship between the central government and provincial governments is defined by a system of tax sharing and transfers (see the Fiscal Pillar report for further details). On the revenue side, each province has an arrangement for sharing certain taxes with its prefectures, which in turn have arrangements for sharing taxes with their counties. Responsibilities for providing social services are assigned to local governments at the sub-prefecture levels—counties and townships for rural schools and clinics, and districts and street offices for urban. The fiscal relationship between the individual provinces and their subordinate units of administration (prefectures, counties, and districts) is complex.

Until 2000, the system had no transfer mechanisms to ensure local governments had sufficient resources to meet expenditure responsibilities, which amplified regional disparities. Subnational governments mobilized extra-budgetary resources to support the continuation of service provision. Schools, hospitals, clinics, and other public service providers collected fees, donations, and generated other revenues, including running enterprises. Even in 2000, extra-budgetary resources financed as much as half of total expenditures in schools. Since fees and other extra-budgetary resources are tightly linked to per capita incomes, the high dependence on extra-budgetary financing has tended to widen regional disparities.

Reforms of the 2000s sharply increased the amount of central government resources to the social sectors. For example, budget expenditures for universal compulsory education increased seven-fold in real terms from 2000 to 2010. An essential package of health care, delivered through primary health centers (PHCs) with funding provided by the central government, was

FIGURE 4.5 Per Capita Subnational Revenues and Transfers, by Province/Region, RMB, 2011



introduced in 2009. A nationwide voluntary rural pension scheme was rolled out, and the broad design was replicated in mid-2011 for urban residents, both subsidized by the central government. To support these policies, the central government has greatly expanded general intergovernmental transfers and introduced many programmatic transfers, starting its efforts with the rural sector where financing problems had been the most acute.

The large system of central-to-provincial transfers that has developed strongly targets resources for social services toward rural areas and the western and central provinces. For example, for the "Two Exceptions and One Subsidy" program and the "New Mechanism" (described in Box 4.4 above), the central government provides 80 percent of the costs for western provinces and 60 percent for central provinces but only a minor percentage for the eastern provinces except Beijing, Tianjin, and Shanghai. There is also differentiated treatment of urban and rural compulsory education, with central transfers targeted almost entirely at rural schools (Figure 4.5). The universal exemption from miscellaneous fees was applied to rural schools starting in 2006 for the western provinces and in 2007 for all other provinces. In urban schools, the exemptions were mandated to begin only in the autumn of 2008.[22] It should be noted that for urban schools, the cost of subsidies to offset revenue losses from fee exemptions are borne entirely by subnational governments, mostly at the lower levels (State Council, 2008).

The implications for financing social services in urban, migrant-receiving areas are that, left to manage within their own budget envelope, municipal governments find it difficult to pay for a "floating population." These services are costly to provide, and central government policies regarding social service provision for migrants are often considered to be unfunded mandates. In Hubei province, for example, education absorbed 24 percent of county-level budgets on average in 2007. In Wuhan and Huangshi municipalities, education accounted for 25 and 26 percent of district expenditures, respectively, reaching as much as 37 percent in some districts.

[22] In some coastal cities, exemptions began in 2006 with local funding from the municipal governments (Hu Yaozhong, 2009).

The subsections below take a closer look at the different types of social services in the current "urban standard" and the costs of extending them to the migrant population. The subsections elaborate on the system of delivery, cost of extension to the migrant population, and financing framework of services such as compulsory education, basic public health care, social security (medical and old-age pensions), social assistance, and welfare housing. Detailed cost calculations are presented in a background paper for this report titled "Costing out the residence-based permit in China".[23]

Access to Compulsory Education

Current status and challenges

The current official policy on the right of migrant children to universal compulsory education is residence-based, which represents a dramatic policy change that has taken place over the past two decades. In 2001, for the first time, the State Council Decision on the Reform and Development of Basic Education raised the idea of the "two mainly's": migrant children should be accommodated mainly locally and mainly in public schools. Several important policy documents followed in 2003–2005, starting with the No. 1 document of 2003 jointly issued by the Party Central Committee and the State Council which emphasized the need to support the migration of farmers into cities and ensure that their rights are respected and that discrimination ceases, which includes the right of their children to universal compulsory education. More recently, a 2008 State Council policy resolution extended free compulsory education to all schools and called on urban local governments to treat migrant children on the same basis as local children in allocating school expenditures, both for those enrolled in public schools as well as those enrolled in *minban*[24] schools.

The receiving urban local governments are required to establish a mechanism for guaranteeing funding for the schooling of migrant children and to provide financial assistance to schools that have enrolled more migrant children. In 2003, the Joint Notification issued by MOF, MOLSS, MOE, MPS, and the Family Planning Commission called for the establishment of a funding mechanism for public services for migrant workers by incorporating their expenditure needs—including for educating their children—into the scope of recurrent budgetary expenditures (MOF et al., 2003). A 2003 State Council circular also directed that fee levels for migrant children should be reviewed and reduced to be more in line with those for local students. For children of low-income migrant workers with unstable jobs and residences, financial assistance should be provided to defray fees, provide free textbooks, and so on.

Many migrant-receiving cities appear to have made great strides in enrolling migrant children in their public schools over the past decade. A Ministry of Education survey found that in 2009, nearly 80 percent of the 9.97 million migrant children enrolled in urban schools were in public schools, and in 19 provinces, this share reached more than 90 percent (Yuan, 2013). Similarly, a 2009 survey of migrant populations in Beijing, Shanghai, Shenzhen, Taiyuan, and Chengdu by the Family Planning Commission found that 98 percent of migrant children aged 7–14 were enrolled in school. Among them, 69 percent were enrolled in public schools, 25 percent in private schools, and only 6 percent in "schools for children of migrant workers."[25] In 2010, Shanghai became the first municipality to declare the achievement of providing universal compulsory education places for the city's migrant children (Yuan, 2013). Longitudinal data assembled by the Research Institute for Community Education shows that in Beijing, the

[23] The background report is available from the authors upon request.
[24] *Minban* are private schools which charge fees and typically operate at much lower standards than public schools.
[25] The third category comprises schools that cater to migrant workers' families and charge low fees. They are often substandard and have not been approved by the local education bureaus.

TABLE 4.4 Enrollment of Migrant Children in Universal Compulsory Education, Beijing Municipality

	All students	Migrant children	Migrant children enrolled in public schools	Share of migrant children in compulsory enrollment (%)	Share of migrant children enrolled in public schools (%)	Share of migrant children in public school enrollment (%)
2001	1,338,904	150,000	99,571	11.2	66.4	7.8
2002	1,286,082	180,000	134,980	14.0	75.0	11.0
2003	1,239,976	240,000	170,839	19.4	71.2	14.8
2004	1,220,442	320,700	212,263	26.3	66.2	19.5
2006	1,121,033	370,000	255,846	33.0	69.1	25.9
2008	1,082,036	400,000	276,047	37.0	69.0	29.5
2010	1,058,998	438,000	306,668	41.4	70.0	33.7

Source: Yuan and Zhang (2013), Table 2–3, p.32.

TABLE 4.5 Status of Migrant Children Enrollment in Universal Compulsory Education in Selected Cities, various years

City/year of reporting	Total population (million)	Migrants (million)	Enrollment of migrant children (thousand)	
			Potential*	Actual**
Shanghai (2012)	24.3	10.5	1,155.0	500.0
Beijing (2009)	19.6	7.1	775.0	393.1
Guangzhou (2011)	12.7	4.8	523.6	362.4
Ningbo (2012)	7.6	2.3	251.7	289.0
Chengdu (2010)	14.1	2.6	288.3	173.8
China	1,370.5	221.4	24,356.9	12,000.0

Source: 2010 census, Shanghai figures are from Beijing Foundation (2013).
* Based on the average 11.1 percent share of the population enrolled in universal compulsory education in 2011. This is likely an underestimate since rural migrants have a higher birth rate and hence a younger age structure than the overall population.
** Estimated from reported shares of migrant children, various news reports.

number of school-age migrant children nearly tripled during 2001–2010. The rapid increases in migrant children in Beijing and their public school enrollment are shown in Table 4.4.

However, China still has many "left behind" who are not enrolled because they remained in the villages or have dropped out of school. In some cities, the proportion of migrant children enrolled in public schools has stayed roughly the same, for example at about 40 percent in Guangzhou (Wang, 2013). Some indicative data are presented in Table 4.5 to show the large gap between the potential number of migrant children and the reported enrollment numbers.

Several barriers continue to keep migrant children out of the mainstream urban education system. These barriers include:

- *Capacity constraints in urban schools are a common reason given for not accommodating all migrant children in urban public schools.* Migrant children are placed at the bottom of the waiting list for school places and are admitted only after urban (*hukou*-based) demands have been met. In cities where migrant children populations are large, local officials cite

TABLE 4.6 Conditions for Enrollment in Public Schools for Migrant Children, 2011

City	Share in public schools (%)	Eligibility requirements	Ease of enrollment	Hidden rules for enrollment
Shanghai	70	The 5 documents, including proof of immunization	Relatively difficult	Rely on *guanxi*
Guangzhou	40	Residence for 6+ months, stable job and income, graduated from local kindergarten	Very difficult	Large sponsorship fee
Kunming	55	3 documents, including Family Planning Certificate	Difficult	Rely on *guanxi* or large sponsorship fee
Beijing	70	The 5 documents, including letter certifying that the child cannot be cared for in *hukou* jurisdiction	Relatively difficult	Good schools require large sponsorship fee

Source: adapted from Yang (2011).

the high cost of building new schools as a reason for not being able to absorb all migrant children.

- *Legal and regulatory barriers remain high* (Montegomery, 2012). In general, the procedure for migrant workers to enroll their children in a local school is complicated. They are required to submit many documents to the local education department—the typical number appears to be five, as reflected in the common reference to "the five documents" (五证), although Foshan requires 16, while Ningbo requires 10 (Xinhuanet, 2009). Table 4.6 summarizes some of the conditions for enrollment for migrant children in public schools, including some "hidden rules" such as having the necessary relationships or connections (*guanxi*). The common perception among migrants is that getting their children into urban public schools remains difficult.
- *High costs continue to pose a barrier for many families*. Despite the repeated calls to treat migrant children on an equal footing and abolish all "rental" and school selection fees, many public schools continue to levy them, often with local urban government approval. One recent survey of migrant education in Guangzhou found that annual costs were more than RMB 2000 for over 60 percent of children in public schools, more than RMB 3000 for 31 percent, and less than RMB 1000 for only 15 percent (Wang, 2013).[26] Migrant children who are not in public schools must usually pay tuition and other fees for the private schools they attend. Shanghai is the exception, with tuition exempted even in private schools (although only those approved by the government). Elsewhere, private schools receive little or no government funding support, and the costs are borne largely by the students. In Guangzhou, where half of the enrolled migrant children are in private schools, a survey found that over 70 percent of them pay more than RMB 4000 per year (Wang, 2013).
- *The policy requiring students to take university entrance exams in the province of their* hukou *also discourages migrant children from enrolling in urban schools, especially junior middle school.* Since the curricula differ across provinces, students who had not studied in the local schools are often disadvantaged. As a result, migrant children may be kept in the cities through primary school but sent "home" for junior middle school.

In 2008, the central government introduced a program of fiscal incentives to reward provinces that have performed well in providing free basic education to migrant children, although

[26] Nanfang Dushi Bao, May 17, 2010, http://gz.aoshu.com/201005/4bf09fe7b82ee.shtml. In Zhuhai (Guangdong), for example, it was reported that public schools charged migrant children a school selection fee of RMB 5000 to RMB 10,000 as of 2011. In Hubei, the Provincial Education Department sets the school selection fees, currently at RMB 7200 in primary schools (field visit, March 19, 2013). In Chengdu, school selection fees are RMB 2000–5000 (field visit, May 31, 2013). Once in the public schools, there are numerous costs associated with extracurricular activities and tutoring lessons that add to the financial burden.

TABLE 4.7 Assistance in Financing Migrant Children's Education

City	Source of assistance	Amount of assistance (RMB)	Date	Share of cost / per child
Jiangsu	central government	671,000	2008/11	RMB 813 per child
Nanjing	central government, province and municipality	37,000	2012	RMB 523 per child
Guangdong	central government	500,000	2012	RMB 140 per child
Ningbo	central government		2012	2-3%
Chengdu	central government	4,500	2012	5%
Beijing	municipality	5,000/yr	2002/03	
	municipality	100,000/yr	2004/10	
	municipality	100,000	2009	3.3%
Shanghai	municipality	2,000 per child enrolled	2012	10%

Sources: Field visit May 2013, BJ Foundation; Yuan 2013, and Wang 2013.

the subsidies seem relatively small compared to the costs. The performance measures include total number of migrant children enrolled in school, proportion of migrant children who are enrolled in public schools, proportion of enrolled migrant children who are from outside provinces, and amount of fiscal input and subsidies provided. However, there is little information on how central subsidies for migrant children's education are distributed. Data from selected available reports are presented in Table 4.7, which shows that financial assistance is available to the districts and counties that are the main recipients of migrant children, but it covers only a minor portion of total costs.

While reforms and increased central government injections have greatly improved the financing of universal compulsory education, these changes have not created a sustainable financing framework for implementing universal access policies due to lack of sufficient local government funds. The financing framework provides little central government assistance to municipalities to fund the integration of migrant children. In most municipalities, nearly all of the responsibility falls on districts and counties, which often have inadequate resources and lack the motivation to comply with central policy. Moreover, the financing burden on grassroots subnational governments is heaviest in the rich, coastal provinces. Under the current financing framework, these subnational governments receive scant assistance from central government funds for universal compulsory education since they are predominantly urban and eastern. For them, the current policies for education of migrant children are costly but largely unfunded mandates.

In principle, the system could be adjusted to make the funding that is currently aimed at rural schools follow the children who migrate to cities to help finance their transfer to urban schools. The New Mechanism (for non-salary operating costs) is well-designed for this purpose, since the funds are allocated on a capitation basis by school enrolment. However, most of the central transfers go to salary payments and thus cannot be reallocated.[27] In addition, the system of central government transfers is complex and nontransparent, making it difficult to identify all the transfers provided for compulsory education. As a result, local officials either overestimate or underestimate the extent of assistance received. The system is also administratively cumbersome and imposes high costs for monitoring and supervision.

[27] Among the main transfers, the WAT and rural fee and tax reform transfer are devoted wholly to salaries. The compulsory education transfer (CET) goes not only to funding the New Mechanism but also to performance pay for teachers (Li et al., 2010). Under the assumption that performance pay takes up just one-third of the CET, support for salary payments took up nearly two-thirds of central transfers for universal compulsory education in 2011.

Considerations for next steps in urban inclusive education

Under the current delivery modality and cost structure of the urban school system, the cost of expanding access to the current migrant population is around 1 percent of 2012 GDP. Under the assumption that all left-behind children will accompany their parents to the cities, the costs double to about 2 percent of 2012 GDP.

At present, public schools are qualitatively far superior to private schools in China, aside from the small number of elite private schools which most of the population cannot afford. This is reflected in virtually all conventional measures of inputs such as school facilities and buildings, student-teacher ratios, and teacher qualifications. Numerous studies also confirm the superiority of public schools in educational outcomes. For example, Chen and Feng (2013) found that migrant students enrolled in private schools performed significantly worse than their public school counterparts in Chinese and mathematics.

In this context, improving access to public schools would certainly raise the quality of education for migrant children, but it is not the only way. Efforts to reform education services for migrant children need to include a mix of more concerted efforts to make public schools more accessible to migrant children as well as improve migrant schools to match public school standards. The relative importance of the two will differ depending on current policies, status of integration, existing capacity of public schools, and so on. Political economy considerations are also important, and efforts will be needed to assuage urban residents and the community at large who have concerns and to address the unwillingness of public school officials to admit migrant children.

Some lessons for a more cost-effective solution to providing migrant children with access to education may be drawn from the "Shanghai model," in which the government has taken an active role in providing financial and technical support. In 2008, when Mayor Yu Zhengsheng declared that Shanghai would strive to provide free universal compulsory education for all migrant children during the 11th Five Year Plan, the municipal government initiated a large program to build hundreds of new public schools. It also undertook a program to selectively "purchase places" in private schools to accommodate migrant children.[28] While Shanghai is not alone in relying on private schools to absorb migrant children, what distinguishes it as a model is that the government has taken an active role in helping to upgrade the quality of private schools with financial and technical support.[29] These efforts made it possible for Shanghai to be first in declaring success in providing universal compulsory education places for all of the city's migrant children in 2010, as mentioned earlier (Beijing Foundation, 2013).

In light of the difficulties in cost containment in the public school sector, the Shanghai model for private schools may be worth considering in the search for more affordable, cost-effective solutions. At present, the private schools in Shanghai remain a second-best solution, since they are qualitatively inferior to public schools and are supported at a fraction of the cost of public schools. With continued improvements in quality and conditions, they could perhaps be converted gradually to public schools. Alternatively, they could develop as a separate stream and impose competitive pressure to bring improvements in public schools.

[28] The government conducted a full audit of the more than 270 existing migrant schools and chose more than 100 of them for the municipal-supported private school program. Another 60 were selected for upgrading under a three-year plan, during which they received funding, personnel, and other support from the government. By 2010, 162 private schools had been approved for enrolling migrant children under government supervision, and these schools receive financial support based on enrollment.

[29] Once selected into the program for private schools, each school receives a capital grant of around RMB 500,000 from the municipality and is eligible to apply to the district government for supplemental funds. Thereafter, the schools receive grants for operating costs of up to RMB 5000 for every migrant student enrolled. With this support, the schools are able to stop collecting tuition and many other fees, pay teachers a decent salary and provide them with social security, and improve facilities.

Access to Health Care and Insurance

Current status and challenges

During the last decade, China has launched two waves of reform to improve access to health care, which have important implications for any efforts to expand coverage to migrant populations. The first wave, initiated in the early and mid-2000s, expanded health insurance coverage through the creation of subsidized rural and urban insurance schemes. Building on these earlier reforms, in 2009, the government unveiled a more ambitious and comprehensive program of health system reform. Any effort to expand coverage to migrant populations must be viewed in the context of the organizational, financial, and delivery arrangements put in place or planned under these reforms, particularly for basic care access and insurance coverage.

Urban residents are covered for health care through two financing arrangements. The first involves direct or budgetary subsidies allocated to facilities to cover operating costs (e.g., staff salaries), equipment purchases, and infrastructure investments, including the provision of an essential package of public health and basic medical services as described below. The second consists of two urban insurance schemes: (i) a mandatory urban employee scheme (UEBMI) which covers formal sector workers and is financed mainly through employer and employee contributions but with a small government subsidy and (ii) a voluntary urban resident scheme (URBMI) which covers the poor and those workers not covered by UEBMI and is heavily subsidized by government at different levels.[30] Most migrants with rural *hukou* are covered by the voluntary and subsidized national rural scheme (NCRMS).[31]

The essential package of public health and basic medical services is delivered through community health centers (CHCs) to urban populations—including migrants—in their catchment areas. Inclusion of migrants in the essential package of public health and basic medical services was accepted in central government policy from the start. The government specifies a national minimum standard for financing the public health and basic medical package. The package typically includes nine categories of services: health information system, health education, immunization, prevention and control of infectious diseases, child health promotion, maternal and geriatric health care, chronic diseases management, and the management of severe cases of mental health problems. The package has expanded over time to include interventions such as hepatitis B immunization, screening for cervical and breast cancer for women 15–59 years of age, and cataract surgery for poor patients.

The essential package is funded by a capitation grant based on the permanent population (including migrants) in the catchment area. On average, the capitation subsidy should be shared equally between central and local governments. In practice, however, the contributions of central, provincial and local government vary considerably (Yip et al., 2012 and team field visits in May 2013).

While some CHCs have been converted to "fully funded service units" and receive budgetary support for personnel and capital expenditures, most are still dependent on fees charged to patients, which may hinder access for migrants. The absence of a sustainable financing framework has hindered progress in policy implementation. Local governments often receive little assistance in financing primary care, including the essential public health and basic medical package. The burden falls most heavily on the municipal, district, and county levels and even the street offices (or towns and townships). Nearly all CHCs attempt to make up the financial shortfall by charging fees for many basic medical services rather than reducing benefits.

[30] Unlike URBMI, UEBMI also contains a medical savings account (MSA) which beneficiaries use to pay for copayments and uncovered services.

[31] State Statistics Bureau (2010–2012) reports that population coverage of UEBMI increased from 34 percent in 2003 to 70 percent in 2011, and population coverage of URBMI reached 82 percent by the end of 2011. Ministry of Health (2007–2012) reports population coverage of NCRMS expanded from 10 percent in 2003 to 97.5 percent in 2011.

Although the percentage of total revenues from fees has fallen with the increase in government subsidies, in 2010, 63 percent of CHC revenues were derived from "business income" (CCHDS, 2011). The fees may pose a barrier to access, especially for low-income migrants.

With respect to insurance coverage, despite the government's policy of open enrollment, available data indicate that coverage of urban insurance schemes is low for migrants. Although migrant workers can in principle enroll in URBMI, in many cities, URBMI does not cover informal workers or migrants, targeting local residents including the poor, elderly, disabled, and children. Some URBMI schemes cover migrant children but not the migrants themselves (Harris and Wang, 2012). Migrants with permanent employee contracts are eligible for coverage under the UEBMI and pay a reduced premium of 2 percent of salary. However, the benefit package is shallow, and reimbursement rates are low (World Bank, 2011). In 2008, about 31.3 million migrants (or approximately 21 percent) were covered by UEBMI (World Bank, 2009). In addition, some cities—i.e. Shanghai, Chengdu, Shenzhen, Zhuhai, and Beijing—have created special schemes for migrants, but coverage is also shallow and often requires high copayments.

According to government data, the majority of migrants are enrolled in the NCRMS but are less likely to enjoy NCRMS benefits compared to their counterparts who actually reside in rural areas. The NCRMS, which charges lower premiums than URBMI and has deeper benefits, is county-based, and reimbursement arrangements occur there and are not portable for most rural migrants. Enrollees would first have to pay for care (in urban facilities) then seek reimbursement from NCRMS upon visiting their county of residence, usually during long holidays (Meng et al., 2012). Few can afford to wait many months for reimbursement. Therefore, while many migrants are covered by the NCRMS, they cannot realistically and conveniently take advantage of benefits from the scheme when they access health services in urban areas.

Proposed options and corresponding rationale for migrant conversion to urban health insurance schemes

Equalizing access to health services for migrants in the cities implies incorporating them into one of the urban health insurance schemes. Although the 2010 insurance law calls for merging the three social insurance schemes into a single scheme, it is generally agreed that implementation will be a long-term endeavor, given the differences in institutional arrangements, benefit design, management systems, and risk pooling (World Bank, 2011). Table 4.8 summarizes the major characteristics of the three schemes in terms of eligibility, sources of financing, fund management, and service package.

The three health insurance schemes vary considerably in terms of fund collection and management, benefit package, health care utilization, and medical expenditures. As shown in Table 4.9, UEBMI is the most generous, with premiums seven times higher than NCRMS and URBMI. Although co-insurance rates of the three schemes are similar, co-insurance levels and in turn out-of-pocket (OOP) spending as a percentage of total expenditures are much higher for NCRMS and URBMI. UEBMI has higher inpatient utilization, while outpatient utilization is similar across the schemes. Medical expenditure per outpatient visit of URBMI and UEBMI are two and three times higher, respectively, than that of NCRMS, while medical expenditures per inpatient visit are four times and five times higher, respectively.[32]

This analysis considers two conversion options for incorporating migrants into the urban insurance schemes: (i) from NCRMS to URBMI and (ii) from NCRMS to URBMI and UEMBI.

- *Option 1: Converting rural migrants from NCRMS to URBMI.* A number of cities have already converted rural migrants from NCMS to URBMI, which can provide valuable

[32] Financial inequalities are partially reflected in per capita health spending data. In 2010, total health expenditure per capita was 666 RMB for rural residents compared to 2,315 RMB for urban residents (China National Health Development Research Center, 2012).

TABLE 4.8 Summary of Characteristics of the Three Health Insurance Schemes

Schemes	Eligibilities	Source of Fund	Location of Fund pooling	Service Package
NCRMS	Registered rural population	Government subsidies and individual contributions	County	Inpatient and outpatient care
UEBMI	Urban employees	Employers and employees	Municipal (prefecture) city	Inpatient and outpatient care
	Self-employed workers	Individual premiums	The same as above	Inpatient and outpatient care
URBMI	Urban non-working residents	Government subsidies and individual contributions	The same as above	Mainly Inpatient care

TABLE 4.9 Comparison of the Three Health Insurance Schemes

Arrangements	NCRMS	URBMI	UEBMI
Premium and fund pooling (2011)*			
Per capita premium (RMB)	246	269	1960
% from individuals	20	30	96.5**
% from government subsidies	80	70	3.5
Fund pooling	County	Municipal	Municipal
Benefit package (2012)***			
Number of types of drugs in the list	1138	2150	2150
Deductibles (RMB)	600	1300	1300
Co-insurance (inpatient care) (%) (policy)	30	30	20
Co-insurance (outpatient care) (%) (policy)	50	50	30
Ceiling (RMB)	75,000	100,000	100,000
Health care utilization (2011)******			
Outpatient utilization (%, last two weeks)	15.2	14.8	13.9
Outpatient visits (number, per capita, last two weeks)	1.7	1.6	1.6
Hospitalization rate (%)	8.5	9.4	12.8
Unit medical expenditures (2008)*******			
Medical expenditure per outpatient visit (RMB)	72	150	200
% of OOP (generalized data)	65	60	30
Medical expenditure per inpatient (RMB)	1440	4000	6000
% of OOP	67	50	36.8

* Statistical yearbook and statement reports from MoH and Ministry of Human Resources and Social Security.
** In the total fund from individuals, 76 percent from employers, 20.5 percent from employees.
*** Estimated based on plans of the insurance schemes of selected counties and municipal cities.
**** Based on data from a nationwide household survey conducted by MoH in 2011.
***** Based on data from the national health services survey in 2008. The figures are median.

lessons for rolling out this option nationwide. NCRMS and URBMI are similar in terms of funding sources, premium level, and benefit package, making it financially feasible for rural migrants to be included in URBMI. If the administrative authority of NCRMS and URBMI is integrated as planned by the government, institutional or administrative barriers to conversion will be removed. This option is affordable for both individuals and government. However, under the present fiscal rules, local governments may not have sufficient fiscal capacity to underwrite the costs of migrant enrollment. On average, local government is the source of 40 percent of government insurance subsidies, and this proportion is significantly greater in higher-income cities.

- *Option 2: Converting rural migrants from NCMS to both URBMI and UEBMI.* An estimated 30 percent of rural migrants work in the formal sector, and it would be reasonable for those people to join UEBMI rather than URBMI. This option will reduce government subsidies for this group because migrants and their employers will bear most of the cost for joining UEBMI. Besides, in the long run, China will establish a single health insurance system

TABLE 4.10 Comparison of Estimated Incremental Financial Requirements for Programs/Facilities and Insurance Expansion (Options 1 and 2), in nominal billion RMB and as a percentage of GDP

Type and Source of Financing	2015			2020		
	Programs and Facilities*	Insurance Extension		Programs and Facilities*	Insurance Extension	
		Option 1 URBMI	Option 2 UEBMI+ URBMI		Option 1 URBMI	Option 2 UEBMI+ URBMI
7% annual growth in Medical Spending						
Incremental (net) financial requirements						
in billion RMB	59.8	38.1	99.9	70.8[b]	128.7	203.4
as % of 2012 GDP	0.12%	0.07%	0.19%	0.14%	0.25%	0.39%
Government subsidies	29.9	19.7	0.3	42.5[c]	75.2	22.5
as % of 2012 GDP	0.06%	0.04%	0.00%	0.08%	0.15%	0.04%
Individual contributions	29.9	18.4	99.5	28.3[b]	53.5	180.9
9% annual growth in Medical Spending						
Incremental (net) financial requirements						
in billion RMB	67	44.2	113.1	87.3	161.9	273.5
as % of 2012 GDP	0.13%	0.09%	0.22%	0.17%	0.31%	0.53%
Government subsidies	33.5	23.3	1.7	52.4	95.5	31.6
as % of 2012 GDP	0.07%	0.05%	0.00%	0.10%	0.18%	0.06%
Individual contributions	33.5	20.9	111.4	34.9	66.4	241.9

*Refer to financial requirements of facilities and programs to cover operating costs (e.g., salaries), construction, equipment purchases, and public health programs, including the essential package. Direct budgetary subsidies for essential public health and basic medical package and facility operations and investment. Estimates assume the proportion of individual contributions represents half of total financial requirements in 2015 and about 40 percent in 2020.

according to its plan to achieve universal health coverage. This option will give the government a head start in closing the gaps among the three health insurance schemes. However, this option will involve administrative difficulties in identifying and enrolling migrants and collecting premiums from both employers and migrants, particularly for those working in small enterprises. Another concern relates to employer disincentives to enroll migrants since coverage would add to their business costs. In the past, mandatory enrollment has been poorly enforced (Harris and Wang, 2012).

Cost estimates for these options include the financial requirements to: (i) operate and maintain the urban network of mainly primary care facilities which are the main providers of the essential package of public health and basic medical care and (ii) expand migrant enrollment in urban health insurance schemes. In 2011, about 42 percent of government subsidies were allocated to budgets (e.g., direct subsidies) that supported program implementation and facility operations and investments, including provision of the essential package. Nevertheless, health insurance schemes are absorbing an increasing share of government subsidies. In 2011, 45 percent of total government health subsidies were allocated to health insurance schemes and medical assistance funds. Table 4.10 presents the incremental financial estimates for increasing access to basic health care through programs and facility operations, including the essential public health and basic medical package, and for expanding insurance coverage for Options 1 and 2.[33] These are calculated applying 7 percent and 9 percent annual growth rates in medical spending for estimating financial requirements for 2015 and 2020.

[33] "Programs and facilities" refer to funding requirements to cover operating costs (e.g., salaries), specific public health programs (including the essential package), and construction and equipment. The main sources of financing for these items are direct budgetary allocations and fees. For expanding "program and facility operations," estimates of incremental financial requirements are based on the difference between per capita government budgetary outlays (e.g., direct subsidies) in urban and rural areas. This difference, or per capita spending gap, was applied to the to-be-converted population (e.g., middle estimate) to determine net spending requirements to provide the essential package as well as cover operating and investment costs of facilities that would serve migrant populations.

In terms of health insurance options, the levels of financing are higher under Option 2 due to superior level of benefits, utilization rates, and medical expenditures of UEBMI compared to URBMI. Assuming a 7 percent increase in medical expenditures, the incremental financial requirements of Option 2 are higher than Option 1 by 162 percent for 2015 and 58 percent for 2020. Assuming 9 percent growth in medical expenditures, the difference is 157 percent for 2015 and 69 percent for 2020. Importantly, financing from individuals under Option 2 will dwarf estimated individual responsibilities under Option 1. This is mainly due to employee contributions of UEBMI and, to a lesser extent, the higher level of utilization of UEBMI beneficiaries. In contrast, Option 2 projections for government subsidies are significantly lower than for Option 1 since employer and employee contributions will cover most UEBMI financing.

Assuming 7 percent growth in medical spending, improving health care access and expanding insurance coverage for migrants will require additional government financing (budgetary and insurance subsidies combined) of 30.2–49.6 billion RMB in 2015 and 65.0–117.7 billion RMB in 2020, depending on the insurance option selected. Assuming 9 percent growth in medical spending, the government will require 35.2–56.8 billion RMB in 2015 and 84.0–147.9 billion RMB in 2020. If costs are not controlled (e.g., 9 percent spending growth), government outlays will increase by about one-third by 2020 compared to the lower cost (7 percent) scenario. As described in Chapter 3, implementing robust cost containment measures will require deepening health reforms.

The central government can help facilitate and stimulate improved access and insurance coverage for migrants by setting targets for rural-to-urban conversion, with the aim of achieving full coverage of both the essential package and enrollment in an urban insurance scheme. For the essential package, CHCs can enroll migrants and their families in their catchment areas and use tracer indicators to measure the effectiveness of access to the essential package (e.g., vaccination, prenatal and well-baby coverage, registration of chronically ill in disease management programs, reduction in waiting times). For health insurance, the government can set annual enrollment targets under the selected option while also setting benchmarks for increasing depth of coverage (additional benefits such as ambulatory care and chronic disease coverage) and reducing reimbursement rates.

Old age security

Current Status and Challenges

China has made considerable progress in reforming and expanding the coverage of its pension system in recent years. China started to reform its pension system in the mid-1980s and undertook a major structural reform of its urban pension insurance scheme in the late 1990s. By the mid-2000s, the traditional work unit-based social insurance program was transformed into a multi-pillar system. In late 2009, starting with rural areas, China rolled out a nationwide voluntary pension scheme which combines a matching contribution subsidy to an individual account with a basic flat pension benefit after retirement for workers who have contributed for 15 years. By the end of 2012, the voluntary pension schemes were established in all counties and cities for rural and urban residents.

China's current pension system is now comprised of four types of schemes. These schemes are: (i) the urban worker pension scheme, (ii) the rural and urban resident pension schemes, (iii) schemes for PSU employees and civil servants,[34] and (iv) voluntary enterprise and individual pension savings arrangements. The main characteristics of these schemes are presented in Table 4.11.

[34] The schemes for PSU employees and civil servants are defined-benefit in design, with a generous replacement rate financed from government revenues. A reform program with a framework similar to the urban employee pension scheme was introduced for PSU employees in 2009 but is yet to be fully implemented, pending a separate reform to reclassify PSUs.

TABLE 4.11 Summary Characteristics of the Major Pension Schemes in China

	Urban Worker Pension Scheme (UWPS)	Rural Resident Pension Scheme (RRPS)	Urban Resident Pension Scheme (URPS)
Eligibility/Coverage	Urban enterprise employees, including migrant workers and self-employed	Rural residents 16 and older, except students	Urban residents 16 and older, except students
	urban enterprise employees (equivalent to formal sector workers, but excluding public sector workers). Participation is voluntary for urban workers in the informal sector, the self-employed and rural migrant workers.		
Financing	Individual contribution plus employer contribution	Individual contribution plus government subsidies and/or subsidy from rural collectives	Individual contribution plus government subsidy
	mandatory	voluntary	voluntary
Contribution	Individuals contribute 8% to individual account and employers contribute 20% of payroll to social pooling account	Five levels, RMB 100–500 annually	10 levels, RMB 100–1,000 annually
Government subsidy	Governments provide subsidies to fill in the gaps of pension benefit expenditures	RMB 30 matching to individual account annually; RMB 55 a month basic pension benefits	Same as NRPS
Benefits	Accumulation in individual account divided by 139 plus a basic pension from social pooling account	Accumulation in individual account divided by 139 plus RMB 55 a month basic pension	Same as NRPS
Individual account	additional benefits from individual account	annuity from the individual account	annuity from the individual account
Social pooling	basic defined-benefit pension	basic flat benefit	basic flat benefit
Vesting		15 years	15 years
Fund management	Partially pooled at the provincial level through an adjustment fund	Specific account at county level	Specific account at city level

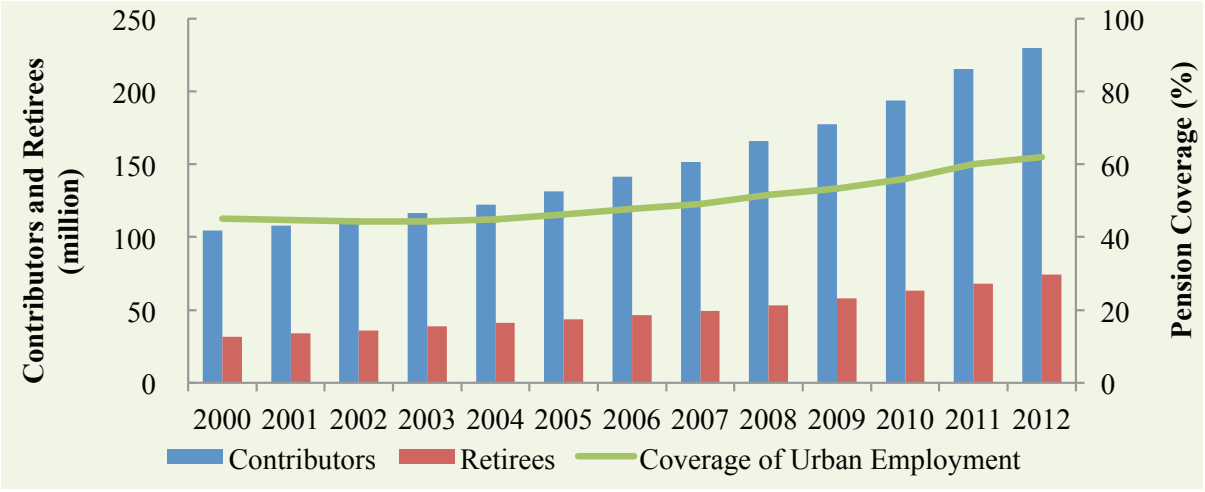
Pension coverage in urban areas increased significantly over the past five years. In urban areas, the number of contributors to urban employee pension schemes increased from 104.5 million in 2000 to 229.8 million in 2012 (Figure 4.6). During the same period, total urban employment coverage increased from 45.1 percent to 61.9 percent. The number of urban retirees who received pensions also increased from 31.7 million in 2000 to 74.5 million in 2012. Among all urban workers who contributed, 16 million were from government and public organizations, accounting for 38.9 percent of total civil servants and PSU employees.

However, pension coverage among migrant workers, the self-employed, and workers in the informal sector has lagged. Based on administrative data from the Ministry of Human Resources and Social Security, the number of rural migrants participating in the urban employee pension scheme increased from 14.2 million in 2006 to 45.6 million in 2012. This represents an increase in the coverage rate from 10.8 percent to 27.8 percent, but it remains less than half of the coverage rate of urban workers. Data from the 2005 and 2010 CULSS survey confirms that while migrant worker participation in the pension system roughly doubled between 2005 and 2010, it remained at only around one-quarter of migrants, much lower than the 80 percent participation among local workers.

Several factors explain the low participation rate of rural migrant workers in the urban employee pension scheme.

- *High contribution rates discourage both employers and workers*. China has some of the highest social insurance contribution rates and labor taxation in the world. Although

FIGURE 4.6 Pension Coverage for Urban Workers in China, 2000–2012



Source: NBS, China Labor Statistical Yearbook (2012); Ministry of Human Resources and Social Security (MOHRSS), 2012 Statistic Bulletin of Human Resources and Social Security.

participation in the urban employee pension scheme is mandatory under the 2011 Social Insurance Law, employers have limited incentives to make the required matching contributions for their employees (Gallagher et al., 2013; Giles et al., 2013). Instead, they try to collude with local governments to evade the required contributions by hiring rural migrant workers through labor service companies or by offering employees differential wage levels to discourage their participation. At the same time, most rural migrant workers are quite young and have unstable employment, so making contributions for old-age income support is not a high priority for them. Therefore, they tend to choose the higher wage levels offered by employers for not participating in urban social insurance programs rather than the lower wage levels offered for participating.

- *Historically, full social insurance rights were not portable.* Rural migrant workers could only withdraw accumulated funds from their individual accounts if they left the city where they made contributions. In 2009, the State Council initiated measures supporting the transfer of pension rights and benefits across provinces for the urban worker pension scheme in order to improve portability, but its implementation has been limited so far.

Options for extending pension coverage to migrant workers and their cost and financing

In extending urban pension schemes to cover rural migrant workers, it is important to consider how the costs will be financed as well as how the legacy costs of the urban pension system will be addressed. When the urban worker pension scheme was introduced, the implicit pension debt—a legacy cost for the "old man" and the "middle man"—was not disposed of appropriately, necessitating large Central transfers to fill in gaps for provinces where the pension system runs deficits. From 2004 to 2011, government subsidies for the urban worker pension scheme increased from 57 billion RMB to 207 billion RMB, accounting for 2.0 percent of total general revenue and 0.5 percent of GDP in 2011. In 2011, for example, 14 provinces could not cover their pension obligations and ran deficits (Zheng, 2013).

Options for extending pension coverage to migrant workers could include participation in the urban employee pension scheme, the urban resident pension scheme, or some combination of both. Rural migrant workers are typically engaged in wage-based work with labor contracts or are self-employed. For wage-based rural migrant workers with labor contracts, it is reasonable

to encourage them to participate in the existing urban employee pension scheme. Rural migrant workers who are not wage-based could perhaps join the urban resident pension scheme.

Two types of costs are associated with rural migrant workers who join urban pension schemes. These are:

- *Government subsidies for basic pension and matching contributions under the urban resident pension scheme.* Although the design of the urban resident pension scheme is similar to the rural resident pension scheme, local governments are encouraged to top up the pension subsidies based on local fiscal capacity. Rich cities tend to offer higher subsidies for basic pension and matching contributions. For each city, accepting non-wage rural migrant workers into the urban resident pension scheme requires additional subsidies from the city government.
- *Pension liabilities from social pooling accounts under the urban worker pension scheme.* The current design of the urban worker pension scheme has a larger social pooling account compared to the individual account, in order to redistribute income between workers and between generations. Because the average wage of rural migrant workers is lower than the social average wage chosen as a base for social insurance contributions, rural migrant workers would receive the benefits of income redistribution from the social pooling account. Given the pooling at city or county level and the pension account deficits in most cities, local governments would be responsible for those liabilities if the existing urban worker pension scheme does not change.

The pension costs of integrating rural migrant workers into urban pension schemes were estimated for three scenarios. In the first scenario, all rural migrant workers participate in the urban resident pension scheme. In the second scenario, wage-based rural migrant workers with labor contracts participate in the urban worker pension scheme, and non-wage rural migrant workers participate in the urban resident pension scheme. In the third scenario, all rural migrant workers participate in the urban worker pension scheme. The fiscal cost of integration under these scenarios is around 0.03 percent of 2012 GDP in 2015 and 0.05–0.06 percent of 2012 GDP in 2020. If both the government subsidies and future pension liabilities are annualized and discounted to their present values, the cost increases to 1–1.95 percent of 2012 GDP in 2015 and 1.1–2.20 percent of 2012 GDP in 2020, depending on the scenario.

Access to Social Assistance and Welfare Housing

Although "urbanization of poverty" has been a policy concern for many countries, the massive internal migration in China has not caused a rise in urban poverty. Studies show that in many countries in Latin America and South Africa,[35] urbanization was accompanied by the increased prevalence of urban slums, crime, and violence.[36] Using the CULS data in 2005, Park and Wang (2010) found that the difference in the poverty rates of migrants and local residents is relatively small in China. The subsection below discusses the issues of eligibility and access to two welfare-enhancing programs—urban social assistance and welfare housing for the migrant population.

Social Assistance

Dibao and other social assistance programs have been targeted at households with local *hukou,* making rural migrants in cities ineligible for these programs. Inclusive urbanization should consider extending coverage of *dibao* and other social assistance programs to rural migrants after they meet eligibility and qualifying conditions.

[35] Ravallion (2002); Ravallion et al. (2007).
[36] Rice (2008); Brener et al. (2012).

From the perspective of local city governments, the inclusion of rural migrant families into urban *dibao* and other social assistance programs poses an additional fiscal burden. The fiscal burden of city governments would increase due to the large gaps in program thresholds and benefits between urban and rural areas. With higher benefits in cities, the inflow of poor rural migrant families would place greater pressure on urban finance and could threaten the urban social assistance system.

Although central transfers for *dibao* have increased significantly, the amount varies significantly by province, with areas that are receiving places for rural migrant workers getting no central budgetary allocations. Although the urban and rural *dibao* programs were financed largely by local governments in the initial stages, the central government has increased its public inputs and fiscal transfers significantly since then. For urban *dibao*, the share of central transfers increased from 29 percent in 1999 to 65 percent in 2012. Notably, the coastal provinces—the receiving places for rural migrants—receive no central budgetary allocations, while both the central and western provinces—the sending places of rural migrant workers—receive these allocations. For example, in Zhencheng city in the Pearl River Delta area of Guangdong province, 95 percent of funds for urban *dibao* and 85 percent of funds for rural *dibao* came from local government in 2012. In contrast, in Heilongjiang province, 70 percent of funds for urban *dibao* came from the central government, 16 percent from provincial government, and 15 percent from local city government in 2012. Within a province, the richer prefecture cities normally receive no or small budgetary allocations from central and provincial governments, while the central and/provincial governments play a much more important financing role for cities in lagging areas.

The management of the inclusion of rural migrant families into urban *dibao* and other social assistance programs also poses a challenge for local governments. Rural migrants are mobile, and it is also difficult to verify their income and assets. If *dibao* eligibility is linked to a residency-based approach, clear rules are needed on some minimum duration of residency (for example, 3-5 years) with or without additional criteria such as employment status or housing status to avoid families moving simply to take advantage of social benefits.

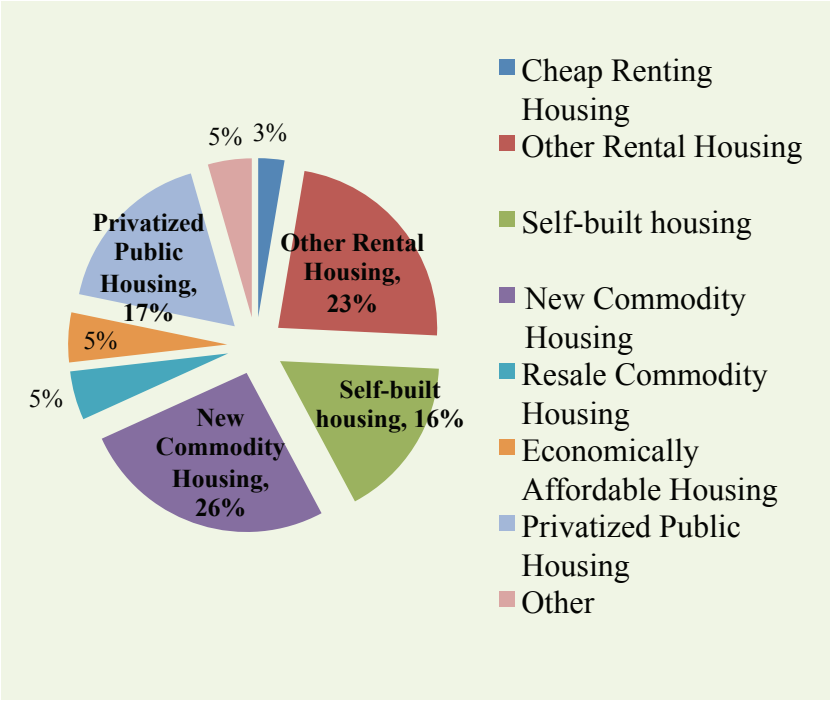
Addressing these concerns, cost estimates of the extra financial resources needed if cities extend urban *dibao* to cover rural migrant workers are based on current fiscal outlays and a coverage rate of 4.6 percent among the urban population with non-agricultural *hukou*. If the concerns of local city governments are addressed, and assuming the coverage rate for migrants is the same as for urban local residents, the annual total cost of extending *dibao* to the eligible migrant population is estimated at 0.04 percent of 2012 GDP.

Housing

Due mainly to historical legacy, nearly 84 percent of local *hukou*-holding households in the cities live in homes they own, a very high rate of homeownership by international standards. This high level of home ownership is the result of government policies in the 1990s to liberalize the housing market by allowing occupants of work-unit housing to purchase homes at heavily discounted prices (Ma et al., 2011). Under the central planning system, housing was publicly owned and allocated through work units, resulting in low levels of investment in the housing sector, chronic shortages, substandard quality housing stock, and poor living conditions for most urban residents, in part because the rent collected was not sufficient to cover maintenance costs (Wang and Murie, 1996). It was not until 1998 that the direct production and allocation of housing by employers truly ended, and even then, some employers continued to provide housing allowances so employees could purchase housing on the market. Gradually, housing was transformed from a component of the basic social welfare package to which all urban employees were entitled to a privately owned commodity largely supplied by the private sector (Ma et al., 2011).

With the market dominating housing production, housing prices have increased dramatically in recent years. The bulk of the housing supply is created through commercial housing

FIGURE 4.7 Modes of Access to Dwellings in Urban Areas (by household)



development and is supplied through the private sector (Figure 4.7). Returns on investment in the housing sector have been dramatic in the last 20 years, with prices across urban areas doubling between 1999 and 2010 and increasing by over five-fold in cities like Shanghai and Beijing. These prices are fueled by rising land prices, which are the primary source of fiscal revenue for local governments. This has made the Chinese housing market severely unaffordable (Ma et al., 2011).

Affordability rather than residency status now poses the biggest barrier to accessing quality housing. Those who did not benefit from privatization—such as the urban poor, migrants without *hukou*, young entrants into the labor market, and rural migrants, in particular—suffer most from lack of affordable housing (Li, 2012; Chen, 2013). Studies show that in several large cities such as Guangzhou and Shanghai, long-term urban residents and urban migrants have similar access to housing (Li, 2012; Huang and Jiang, 2009; Logan et al., 2010; Chen, 2013), suggesting that *hukou* type matters less than income.

Privatized public housing accounted for the largest form of government assistance in access to housing, but since this form of housing is a matter of historical legacy, its impact will continue to decline over time. Many of these privatized units are of low quality and will need replacing, but many of the owners are unable to afford housing at current rates. In 2010, less than 10 percent of households had access to the subsidized homeownership program—5 percent lived in homes purchased through the Economic and Affordable Housing Program, and 3 percent rented through the Cheap Rental Housing Program meant to serve the poorest households.

The current investment in social housing is not reaching the intended beneficiaries. Government programs that aim to support homeownership have primarily benefited middle- and upper-income households. The recently introduced Public Rental Housing Program is a government rental program explicitly open to migrants without a local *hukou*, but it has primarily

been used to attract talented professionals and is not serving low-income wage earners or the poor.[37]

The formal and informal rental markets provide an important source of housing, and their importance is likely to grow over time. Since housing is so unaffordable in many of China's large cities, the bulk of low-income housing is provisioned outside formally established government programs through collective housing (e.g., dormitories provided by employers), private rental units in "urban villages," or on the urban fringe. In Shanghai, for instance, only 5.5 percent of migrant households can afford to purchase commercial housing, and around 80 percent are renters.[38] Although prices in the formal rental market have been increasing steadily, rental rates are still growing at a significantly slower rate than housing prices.

While the informal rental market is vibrant, innovative, and diverse, informal rental markets are inherently risky as tenants lack security and have few protections. Around half of China's estimated 150 million migrants live in some 50,000 urban and suburban villages across the country. Pockets of urban villages such as the Gaojiabang area in Shanghai provide low-cost rent (and low quality) in a spontaneously densified area (Wu et al., 2012). This informal residential market has led to fast growth of so-called 'small-property-rights' housing, although there is no legal protection with such housing and the government has issued many prohibitive policy documents. Another example of informal rent is the secondhand rental of "municipal public rental units," part of the old housing stock that could not be privatized because the government considered the quality to be too poor. Despite their poor condition, all these represent desirable options as they are affordable and located within the urban core. However, these units are also the primary targets for demolition under the inner city renewal programs.

A policy that focuses primarily on homeownership is neither fiscally possible nor economically desirable. As renters are more mobile, they contribute to the efficiency of the labor market. Research has shown that economies with small rental sectors tend to face higher migration costs and labor rigidity. Given China's fast rate of urbanization and economic development, it requires a more flexible and adaptable labor force. Renting provides tenants with the flexibility to adjust to employment and income changes and requires little or no savings.

A top-down approach to social housing policy exacerbates distortions in the housing market and results in a mismatch of supply and demand. A key challenge for local governments in China is that targets and objectives for social housing are determined by the central government. These policies outline the range and level of coverage and even stipulate planning, design, size, quality, and safety requirements, thereby creating a system of unfunded mandates for local governments. Moreover, the social housing provided in an attempt to respond to targets set by the central government is not necessarily what is needed or demanded by households. In many large cities, this results in comparatively high vacancy rates in suburban locations and lack of sufficient housing in more central areas.

The central government should provide incentives for local governments and developers, but planning for housing should be done by local governments through careful analysis of local conditions. In order to better align housing supply and demand, market studies should be carried out to find alternatives to building by formula. A "Housing Observatory" is needed to collect systematic information on housing markets and demographic and socioeconomic data to capture trends in housing affordability and finance. This will enable local governments to define the nature and scope of policy interventions required to align housing demand and supply effectively. Without such ongoing monitoring, policy interventions may be misguided.

China should support the development of a privately led rental market that serves different market segments (including low-income households), which will enable the government to focus

[37] For Beijing: http://news.xinhuanet.com/2011-03/16/c_121196129.htm; for Shanghai, http://news.ehomeday.com/2012-11/201211183205.htm

[38] http://www.labour-daily.cn/web/NewLabourElectronic/newpdf/PdfNews.aspx?Calendar=2011-9-24

direct assistance on those who need it most. The emergence of a well-developed and competitive rental market will promote affordability for all income segments, whether local *hukou* or non-local *hukou* holders. This could be accomplished through the formalization of housing developments in urban villages, which could trigger higher investments and introduce better standards in housing for migrants. Urban villages offer affordable housing to migrants when urban governments fail to provide such housing, and they offer collectives new and significant income sources which often offset the negative impacts of the previous land requisition. Urban villages thus provide support to the two most vulnerable groups in China's urbanization: the floating migrant population and dispossessed farmers.

To address the housing needs of the lowest-income households, China should consider introducing demand-side subsidies based on a means-tested targeting approach. While national policies for housing often mention "low-income" housing, the reality is that only a small percentage of the allocation for new social housing is for Cheap Rental Housing. This program is intended to serve those households who do not qualify for a mortgage. A means-tested targeting system is needed to determine the level of support that will allow a household to rent through a private market, most likely piggybacking on the existing targeting process for *dibao*. Such rental vouchers could also help stimulate development of the rental market. The annual cost of this option is between 0.02–0.11 percent of 2012 GDP, depending on the assumptions regarding eligibility and coverage.

International experience has shown that it is almost impossible to maintain decent housing over the long term without such demand-side subsidies for a specific segment of the population. While these involve a significant fiscal cost, they are much more efficient than supply-side incentives. Most countries with advanced housing and housing finance systems rely heavily on demand-side subsidies such as housing allowances, vouchers, or cash assistance to maintain affordability. It is extremely rare for a middle- or upper-income country to not provide housing payment assistance. For example, the United States Department of Housing and Urban Development provides housing assistance to renters through a program commonly known as Section 8, which provides housing vouchers or direct payments to private landlords. Under the Section 8 program, tenants pay about 30 percent of their gross income for rent, with the remainder of the market rate rent subsidized by the program.

Framework for cost sharing and incentives for municipal government to integrate migrants into urban areas

The annual cost of extending access to compulsory education, basic public health care services, social security (medical and old-age pensions), social assistance, and welfare housing to current migrants is estimated to be around 1.5–2.5 percent of 2012 GDP, depending on the assumptions and method of calculation. The major driver of differences in estimates is the accounting of the cash flow *vis* accrued liability costs of extending urban pension schemes to rural migrant workers. The annual cost will increase to 2.67–4.77 percent of 2012 GDP by 2020, mainly because it is assumed that most of the left-behind children of rural migrants will move to the cities with their parents.

While a transitional subsidy would help cities expand social service coverage for migrants, fiscal system reforms will be needed in the medium term to finance the national minimum basic package of social services. In the short term, a transitional subsidy to cities to entice them to deliver social services would accelerate the integration of migrants. While the overall cost is high but manageable, some cities with high concentrations of migrants will have high expenditure needs. In the medium term, fiscal system reforms of both revenues and expenditures will be needed to finance the national minimum basic package of social services, which should be phased in and carefully calibrated to fit fiscal capacity (see more on the national minimum basic package in Chapter 3).

To increase the willingness of local governments to provide social services to migrants, fiscal resources should follow people. The fiscal system should be closely linked to the new modern residence system—once people have moved to a new location, registration would increase the population count used for fiscal allocations. In addition to a gain in the tax base, they would receive larger transfers from the center for delivery of the basic package. Such a link would help make receiving cities less resistant to delivering services for new arrivals.

For contributions-based insurance, a bottom-up approach of higher-level pooling is required. This could be done outright or partially as many provinces do already, with some share of contribution revenue pooled to the provincial level. Once the possibility of bottom-up equalization is created, the mechanism becomes top-down in terms of the redistribution formula for contribution revenues from the highest pooled level (see Chapter 4 and the companion "Financing Urbanization" Supporting Report 6).

In addition to providing migrants with social services, China's cities can learn from cities in other countries that have experienced rapid migration about how to integrate migrants. In the United States—the largest and most open country to immigrants—cities have promoted social inclusion through programs to create education, service, and entrepreneurship opportunities. For example, New Haven, Connecticut offers college scholarships to successful high school graduates. Similarly, Chicago has dedicated offices to connect immigrants to services offered by the city, schools, community organizations, and private institutions.

From international and local experience with migrants, five principles emerge for inclusive urbanization at the municipal level:

- *Make local government accountable for inclusion.* Municipal policies and programs should benefit migrant workers according to their economic contribution, and municipal governments and leaders should be evaluated for their success at including migrants in urban life.
- *Engage all relevant municipal departments and agencies in assimilating migrants.* Cities should not see inclusion as the responsibility of a particular office, bureau, or agency. Rather, inclusion should be mainstreamed into the activities of all agencies that can make a difference for inclusion.
- *Emphasize municipal innovations for social inclusion in second- and third-tier cities.* Lessons from second- and third-tier cities can help top-tier cities. In recent years, second- and third-tier cities have grown faster in GDP and jobs than top-tier cities, and they have made more progress in *hukou* reform.
- *Improve cooperation among local governments, NGOs, and other non-state bodies.* Municipal governments can leverage their resources through trusting, supportive, effective, and mutually beneficial partnerships with NGOs that help migrants.
- *Build cities and neighborhoods as places of community and identity.* Neighborhoods distinguish cities from rural lands and bind residents to cities permanently. Community-based measures have already worked to increase social inclusion in China and elsewhere.

3: SOCIAL POLICY REFORMS AND RURAL-URBAN INTEGRATION

Beyond expanding access to services in urban areas, China faces the broader challenge of delivering services equitably across the entire country. In addition to the reforms discussed in Chapter 2, wider sectoral and cross-cutting accountability reforms will be critical to improving equity and distributional outcomes. They would also promote greater efficiency and cost-effectiveness as well as quality improvements in services. Unlike Chapter 2 which focused more narrowly on the modalities and costs of extending services in urban areas (and for migrants, in particular), this Chapter looks more broadly at issues of urban-rural integration and overall sector reforms. Following a brief overview of the context and need for such reforms, it discusses specific reforms in the areas of education, health, pensions, and social assistance. The Chapter then addresses the cross-cutting issue of strengthening accountability to improve social service delivery.

CONTEXT AND BACKGROUND

The social policy vision for urbanizing China should have the goal of equalizing access to basic public services across provinces and across urban and rural areas. Such an approach is truly consistent with the goals of efficient urban development and rural-urban integration and corresponds to the notion of equality of opportunity. The 2009 World Development Report introduced the notion of spatially blind institutions as the bedrock of an effective integration policy. Spatially blind policies—available to everyone regardless of location, but based on their attributes—should also be universal in coverage, in particular for regulations affecting labor and social services. Spatially blind social services are critical to rural-urban integration in ensuring that people are pulled to cities by agglomeration economies and not pushed out by a lack of schools, health services, and social security in rural areas.

While China has made remarkable progress in basic service provision in recent years, further progress is needed in both the quantity and quality of services. China has achieved widespread access to a range of basic services: basic health insurance, compulsory education, post-basic education, and a rapidly expanding pension system. In both urban and rural areas, people increasingly expect not only quantity but also quality of service provision. While the quantity challenge is not yet met (e.g., for early childhood development and migrant pension coverage), the biggest challenges now relate to ensuring quality and improved outcomes.

The foundation for rural-urban integration is a basic minimum package of social services and social insurance that could be provided to promote equality of opportunity with basic security for all. Building on the Five Year Plan (2011–2015): Commitments for Public Social Services (Box 4.5), this package could include:

- An expanded cycle of quality general education that is accessible for all. Pre-primary education would be available affordably to all, with subsidies to the most needy, and senior secondary schooling would be fee-free.
- Pension and health insurance systems that have full coverage and provide more uniform and deeper financial protection, integrating rural, urban, and migrant residents.
- A safety net that is available for the poorest and most vulnerable and has greater coherence with different parts of the social protection system and across space.

Financing this type of basic minimum package across China will require a large amount of additional resources. In many localities—especially rural areas—the quality of services needs to be raised substantially. Resources will also be needed in urban areas across the country to deliver services to the large number of new qualified users, while maintaining quality for the increasing numbers of users.

BOX 4.5 12th Five Year Plan (2011–2015) Commitments for Public Social Services: Basic Package and Beyond

The 12th Plan identifies the disconnect between basic services systems in rural and urban areas as a major challenge, and it makes rural-urban integration and equalization guiding principles for future actions. This will be achieved by developing standards, implementing an urban-rural integrated basic public service facility, encouraging local areas to conduct pilot reforms, supporting rural basic public services (through greater investment in fixed assets and improvements in the professional capability of the rural grassroots public service workers), and developing basic public service programs for the mobile population (particularly rural migrant workers).

The Plan also outlines sector-specific initiatives to promote rural-urban integration in education, health, social assistance, and security. In education, for example, it talks about establishing mechanisms for co-development and sharing of compulsory education resources among urban and rural schools and one-on-one exchange and assistance systems. In health, it also mentions expanding one-on-one urban-rural hospital assistance efforts. The Plan outlines tasks such as national coordination of pension insurance and integration of the basic health insurance system in urban and rural areas, as well as enhancement of the connection between urban and rural minimum security and unemployment insurance. In addition, the Plan stresses the need for greater sharing and integration of information resources and encourages the use of information technology to facilitate rural-urban integration in all public services.

Source: Authors' interpretation of the 12th Five Year Plan for the National Basic Public Services.

To make efficient use of these resources and to promote equality of opportunity, sectoral reforms and cross-cutting accountability reforms will need to be deep and aim to affect the behavior of users and providers. In the case of users, reforms should target the incentives to copay. In many cases (such as the lack of portability of old-age insurance), current institutional rules of service provision do not provide sufficient incentives to segments of the population to co-finance services or consume the appropriate level of services (as in the case of health care, with insurance payments favoring costly inpatient care). In the case of providers, reforms should provide incentives to not induce demand (as is currently the case in health care) but should promote delivery of outcomes.

It is important to note that providing services on an equitable basis does not require that services be equal for all citizens. Needs, resources, goals, and social values differ widely throughout China. While all residents of a city should be given access to equal services, residents of different cities and urban and rural areas may be given different services.[39] The central government may wish to establish a minimum or basic package of services that would be offered to all citizens, with nationally assured funding as needed for every jurisdiction to meet this standard. Beyond this basic package, provinces, cities, or towns may raise the standard for their jurisdiction but would be responsible for providing additional funding. They could raise the standard because they are more affluent, because their residents demand different or better services and are willing to pay higher taxes, or because they wish to attract new residents.

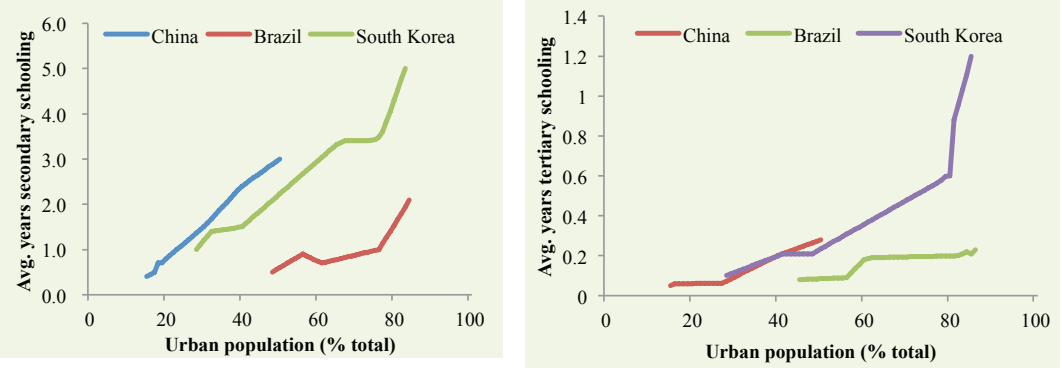
EDUCATION

Background

Although China has greatly improved its human resource endowment, challenges remain in improving educational outcomes across the country. Thanks to a positive policy environment

[39] Similarly, the "Basic Public Service Equalization Plan" refers to the concept that every citizen should have equal opportunity of access to basic public services, not necessarily that all services should be the same.

FIGURE 4.8 Education and Urbanization as Complements: Share of Urban Population with Secondary and Tertiary Education in China, Brazil, and the Republic of Korea



Source: Barro and Lee (2001); World Bank staff calculations.

and a high level of societal demand for education, China has universalized access to nine years of basic education, nearly universalized enrollment in junior secondary education, and increased enrollment in senior secondary education to almost 80 percent. Almost one quarter of high school graduates are now going to university. Nonetheless, China's gross enrollment rates of 65 percent for preprimary education and 24 percent for tertiary education are well below the OECD averages of 90 percent and 68 percent, respectively.[40] Moreover, these national-level education outcomes mask the high level of disparity across social strata, rural and urban areas, coastal and inland provinces, and migrant and local residents. At one end of the spectrum, Shanghai's star performance in the 2009 and 2012 international PISA tests captivated the world, as 15 year olds in Shanghai ranked first in math, reading, and science compared with peers from 65 countries.[41] At the other end of the spectrum are school-aged children in rural areas of Yunnan, Fujian, Hunan, and other poor parts of the country whose neglected diseases such as anemia, intestinal worms, and nearsightedness have profound negative effects on their educational performance.[42]

Middle-income countries that have transitioned to high-income status have invested heavily in education and human capital. When Japan and Korea were at China's current development level, they had universal high school education. In contrast, countries that have not escaped the "middle income trap" such as Argentina, Brazil, Mexico, Egypt, and Iraq have low human capital for their income (World Bank, 2013). China has performed more like Korea than Brazil (Figure 4.8), but further improvements will be difficult unless the population has access to higher-quality, free education.

Urbanization offers unprecedented opportunities to further this agenda but can lead to fierce competition for urban services if not managed properly. As mentioned in the previous chapters, with greater urbanization comes denser cities and more people to service in concentrated masses, giving rise to scale economies in service provision. However, denser cities will also place additional stress on existing education systems, as more migrants and their children become

[40] World Bank Data http://data.worldbank.org/indicator/SE.TER.ENRR/countries/DE—XS-OE-US?display=graph

[41] For 2009 PISA results, see Shanghai government website, http://www.shanghai.gov.cn/shanghai/node27118/node27818/u22ai74238.html; for 2012 results, see OECD http://www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf

[42] Large-scale national survey conducted by the Chinese Ministry of Health from 2001 to 2004 (Coordinating Office of the National Survey on Important Human Parasitic Diseases, 2005). For Yunnan, see Steinmann et al., 2008; for Fujian, see Xu et al., 2000; for Hunan, see Zhou et al., 2007.

eligible for and demand equal access to quality education at all levels.[43] With the demand for services exceeding the supply, rationing will result when services are free, and/or prices will be introduced for what are nominally free services (e.g., placement fees, informal payments to schools). In addition, the greater diversity in the types of people coexisting in cities today means that there is a diversity of learners. All these are potentially at odds with the interests of long-term urban residents and can lead to conflicts if not managed properly.

Some educational challenges are becoming more prominent and demand more immediate policy attention as a result of urbanization. These include defining a level and standards for minimum public education provision for all and developing financing and accountability measures to ensure the provision of such minimum public education to both rural and urban children. It will also require removing structural rigidities and abolishing the *hukou* requirement for entrance into senior secondary education and higher education.

Current Status and Challenges

Since 2000, the public financing of universal compulsory education has undergone major changes. Under policies calling for improved public services, budget expenditures in education have increased rapidly, with an 8.6-fold increase in nominal terms and a 7-fold increase in real terms. The composition of funding for universal compulsory education has also changed significantly: budget appropriations were just over 50 percent in 1997, and by 2010, they were more than 90 percent of total revenues across the subsectors of universal compulsory education (Table 4.12). The acceleration of public spending became especially marked after 2006, when the new Education Law (2006) stipulated that compulsory education would be "implemented free of tuition and fees." The law also laid out a framework for financing to cover "the whole of universal compulsory education," with funding to be shared by governments at all levels while responsibility for coordinating its implementation was assigned to the provinces.

To support these changes, the central government has greatly expanded intergovernmental transfers and introduced many funding programs, but wide disparities remain both across provinces and across counties within provinces. Although central transfers have helped stem the trend of growing regional disparities, these disparities remain significant. In 2011, Beijing spent more than 8 times as much per student in junior middle schools as Henan—nearly RMB 38,000, compared to RMB 4,600 (Figure 4.9). Wide disparities can also be found across counties and districts within provinces. In Guangdong, for example, the 2012 provincial average was RMB 5,600 per student in primary schools, while the average for districts in Shenzhen municipality was RMB 16,000, and the province's poorest counties spent barely RMB 2,000 (Guangdong Statistical Yearbook, 2013).

Equality of quality in basic education across different areas, social categories, and income groups remains the key challenge. The equality of quality agenda is relevant to rural and urban areas in distinct ways.

- Rural areas—and especially remote areas—face significant challenges in the recruitment, compensation, and retention of quality teachers as well as gaps in the quality of educational infrastructure and learning inputs (Wu et al., 2011). Challenges also remain for poor households in shouldering the non-fee costs of education, especially in the face of rising opportunity costs as real wages have risen.
- In urban areas, disparities are evident among local children, migrants, and children from poor households and without social connections. This can be seen in the differential

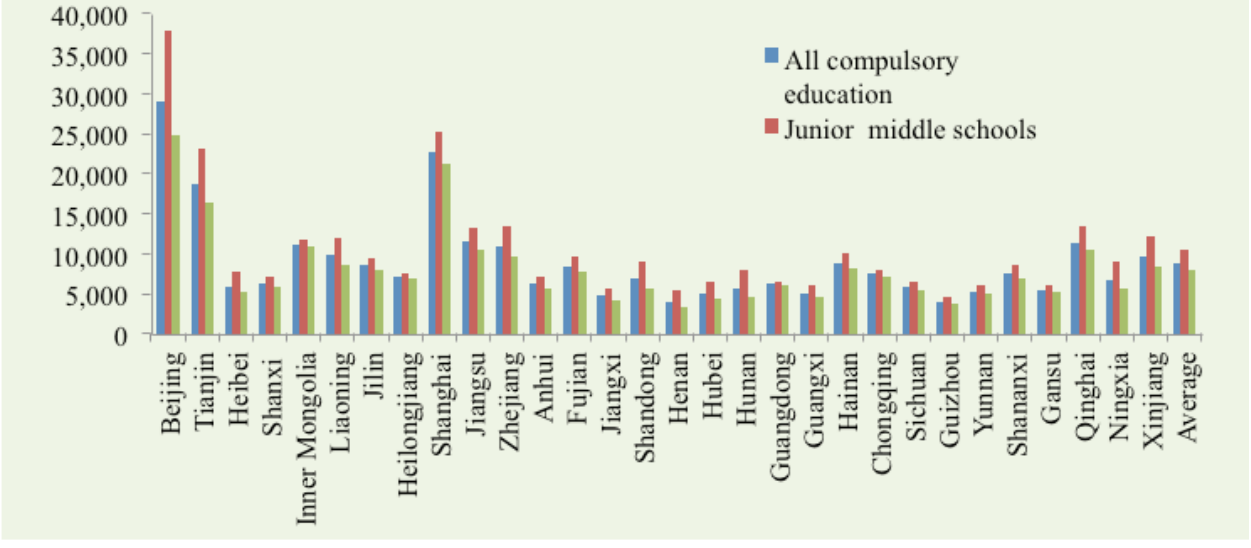
[43] According to the 2010 census, there are more than 20 million school-aged (6–14 years of age) children of non-local *hukou* migrants in urban areas. This does not include a significant reservoir of "left-behind" migrant children who stay behind with relatives in rural areas as their parents migrate for work but who could potentially move if *hukou* restrictions are lifted (OECD, 2010).

TABLE 4.12 Comparing the Composition of Funding in Universal Compulsory Education, 1997 and 2010

Share of total	1997				2010			
	Junior Middle School	Rural Junior Middle School	Primary School	Rural Primary School	Junior Middle School	Rural Junior Middle School	Primary School	Rural Primary School
Budgetary appropriations	54.3	53.1	56.3	55.1	89.8	92.7	92.0	94.4
Earmarked taxes and surcharges	16.6	17.8	16.0	17.3	5.8	4.6	4.7	3.4
incl: urban education surcharge	4.7	1.1	2.7	0.7	4.3	3.1	3.5	2.4
incl: rural education surcharge	11.1	16.3	12.8	16.4	1.3	1.2	0.9	0.8
Other fiscal resources	0.6	0.4	0.4	0.3	0.3	0.3	0.2	0.2
Profits of school-run enterprises and services	3.5	2.9	3.3	2.7	0.1	0.1	0.0	0.0
Social contributions	10.3	12.7	10.0	11.4	0.9	0.7	0.8	0.6
Fees collected by schools	9.9	10.0	9.8	10.2	0	0	0	0
Other educational incomes	4.7	3.1	4.1	3.0	3.4	1.9	2.4	1.5

Source: Ministry of Education, 1997 and 2010.

FIGURE 4.9 Per Student Fiscal Expenditure in Compulsory Education in 2011, by province



Source: China Educational Finance Statistical Yearbook (Ministry of Education, 2012).

enrollment rates in higher-quality "key" schools and regular schools between local, migrant, and poorer children and in indicators such as average class size and transition rates. The increased importance of family connections and "placement fees" to get children into elite urban public schools risks reinforcing existing social disparities. In megacities such as Beijing and Shanghai, key elementary and junior high schools generally use exams to select their students. For example, a key primary school in Shanghai accepted 60 out of 3,000

six-year-old applicants through an intense one-hour exam consisting of 200 questions,[44] despite the national policy set out in the *Compulsory Education Law of the People's Republic of China* that entitles a child to attend a neighborhood school near his or her home.

In urban areas, most of the privately operated migrant schools charge fees and lack proper accreditation from the government, qualified teachers, and/or adequate facilities. As of 2007, almost 80 percent of private migrant schools in Beijing were unlicensed (Tian and Wu, 2010). Even among government-approved migrant schools, education quality is still not on par with that of public schools, as discussed in Chapter 2. As the migrant population continues to increase in urban centers, unequal access to public education between migrant children and urban students will continue to be an acute issue.

In rural areas, a School Merger Policy is being implemented, with boarding schools becoming important providers of education services. Responding to demographic trends and outmigration, the Ministry of Education launched a School Merger Policy in 1999. Under the policy, education officials closed down small, remote schools and focused their attention on improving teaching and facilities for larger, centralized schools. The merger policy has improved the quality of education, at least in terms of the policy goals of hiring more qualified teachers and improving school infrastructure (Zhuo, 2006). One of the most notable problems with the merger policy was the dramatic increase in the distance between students' homes and schools (Ma, 2009). The government responded with a program to build dormitory facilities, and by the mid-2000s, most students who needed a place to board had access to dormitory rooms. Recent evidence shows that ensuring dietary quality of food provision in these establishments remains a challenge (Luo et al., 2009).

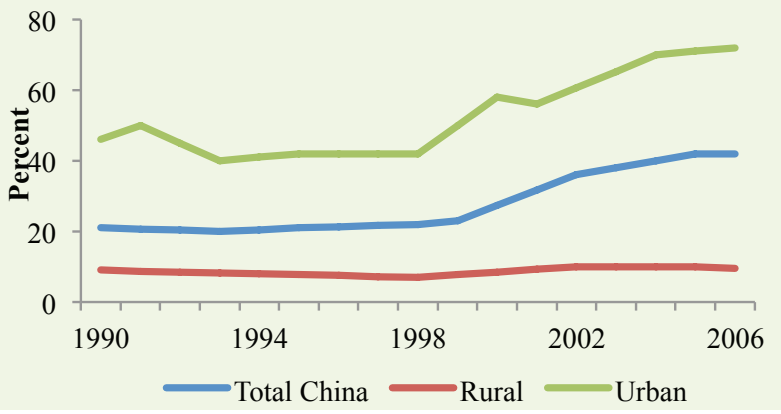
Beyond compulsory education, access to other levels of schooling also remains problematic in rural areas.

- For senior high school, official data on the rate of graduation into the senior secondary academic stream among rural children show that this rate remained almost stagnant between 1990–2006, increasing from 7 percent to only 9 percent. The newest estimates (taking into account rural children who go to school in urban areas) indicate that about 20–30 percent of rural children progress to senior academic, compared to 40–70 percent of urban children (Figure 4.10). Drivers of low rural progression to senior secondary academic schools include: the entrance exam, the high costs of secondary education, the perceived low quality relative to cost, and the opportunity costs. In addition, the government policy direction to achieve a 50–50 ratio between academic and vocational enrollment might be pushing a higher proportion of rural graduates into the vocational track (see Chapter 4 for further discussion.)
- For preschool, only 30 percent of rural children attend preschools, compared to 80 percent of urban children. Among those who attend early childhood development and education (ECDE) in rural areas, half are in one-year-only programs. Furthermore, rural ECDE programs have higher pupil-teacher ratios and a lower percentage of qualified teachers. Disadvantages accumulating at various stages of childhood development for rural children tend to manifest themselves in relatively lower "school readiness" scores, as documented by a recent study comparing the school readiness of rural children with their urban counterparts. Stunting affected over 20 percent of children under age five in poor rural counties, almost six times the national urban rate.

Migrant students also face difficulties in accessing public education high schools. In urban areas, junior high school students must take a city-wide Senior High School Entrance Examination as a prerequisite for entering any senior high school-level public institution (including

[44] China Youth Daily 2012/07/11 http://zqb.cyol.com/html/2012-07/11/nw.D110000zgqnb_20120711_3-09.htm

FIGURE 4.10 Official Promotion Rates from Junior High School to Academic High School, urban and rural, 1990–2006



Source: Rozelle 2011.
Note: Rural promotion rate includes promotions only in rural areas.

regular senior high schools and vocational high schools). However, for migrant students, the local government in Beijing grants the opportunity to take the exam only for vocational high schools, and even then, they must meet numerous criteria.[45] In 2012, the government of Shanghai also introduced a set of requirements that migrant parents would have to fulfill in order for their children to qualify for the exam for regular senior high schools.[46] As a result, migrant students' access to high school education—especially regular high school education—is very limited in urban centers.

Proposed Policy Responses

The most critical area for reform is education financing. Education financing reform should be implemented in a way that (a) facilitates the setting of minimum standards for every level of education and revises the revenue and expenditure assignments to ensure financing to meet these standards for poor rural localities and disadvantaged children, (b) better defines fiscal and spending responsibilities among various levels of government, (c) experiments more with demand-side financing mechanisms to stimulate competition and choice that encourage higher levels of efficiency in public spending, and (d) explores higher levels of private provision and financing, in particular for upper secondary education.

Given the mounting evidence on the glaring disparities in education quality, it is also imperative that the national government starts defining clear quality standards for basic education. At a minimum, these standards should specify pupil-teacher ratios, per student public expenditure, and percentage of qualified teachers in each school. In the future, it may be desirable to introduce more advanced quality indicators such as graduation rates and employment rates or even national and international test scores.

Improving quality will require focusing on teachers—teacher recruitment and career advancement, as well as allocation, compensation, and incentive policies. A combination of

[45] The criteria, released in 2013, are: the migrant parents must have a valid proof of Beijing residency, have held a stable job for at least three years, and have paid for social security in Beijing for at least three years. In addition, their children need to have studied in a Beijing junior high school for three years and have a school residency (*xueji*) (Beijing Municipal Education Commission, 2012).
[46] The migrant parents must meet the basic requirements set by "The Management Regulations of Migrant Workers in Shanghai" and achieve a certain score. Xinhua News, 2012/12/31.

TABLE 4.13 Examples of Extended Free Basic Education in China

Type of Extended Free Basic Education	Extension Duration (Year)	Length of Free Basic Education (Year)	Areas of Implementation
Pre-School	1	10	Xiamen (Fujian), Yan'an Zhidan (Shaanxi)
	3	12	Dongying Hekou (Shandong)
Senior High School	3	12	Zhuhai (Guandong), Wuqing (Tianjing), Ningbo Yinzhou (Zhejiang), Shanshan (Xinjiang), Haixi (Qinghai), Fuzhou Mawei (Fujian), Ankang Zhenping (Shaanxi), Xiangxi (Hunan), Yuxi Hongta (Yunnan), Zoucheng (Shandong), Nilka (Xinjiang), Inner Mongolia, Nansha (Guangzhou), Menghai (Yunnan), Linfen Gu (Shanxi), Linfen Pu (Shanxi), Linfen Ning (Shanxi), Shuozhou Pinglu (Shanxi)
Pre-School + Senior High School	3 + 3	15	Ankang Ningshan (Shaanxi), Wuqi (Shaanxi), Shenmu (Shaanxi), Fugu (Shaanxi), Yanzhou (Shandong), Changzhi (Shanxi), Tibet

Note: The name of the province is indicated inside the parentheses.

measures will be needed, including: rotation mechanisms to promote quality teachers spending time in disadvantaged schools, twinning arrangements between stronger and weaker schools, strengthening of in-service training, incentives for hardship postings, and a more fundamental examination of teacher compensation.

For China to continue deepening its human capital base, it will be necessary to increase senior secondary school completion rates in the coming decades. China has already set a senior secondary enrollment target of 90 percent (with half in the academic stream and half in the vocational stream) by 2020, which is comparable to Korea's senior high enrollment rate in 2000. A case could be made for extending public free education provisions beyond basic education as conditions allow.

China will also need to improve the coverage of ECDE programs (particularly for the rural poor), for example by further increasing its level of public financing and using diverse delivery mechanisms. Preprimary education is the most seriously underfunded sector in China, accounting for 9 percent of the total number of students in the system but receiving only 1.3 percent of the budget. Internationally, preprimary education commonly claims 6–8 percent of the total education budget. Localities in China can use diverse delivery mechanisms, including public-private partnerships, home-based care, or a combination. In particular, public-private partnerships are worth exploring to diversify sources of funding and models of delivery and to create markets with new providers for ECDE.

Some localities (particularly those with better economic conditions) are experimenting with free preschool and/or senior high school education. In more than 25 geographic areas across China, students now receive free preschool education, free senior high school education, or a combination (Table 4.13). Most of these services are only available for children with local *hukou*. Certainly, each locality will need to develop a strategy for financing such an extension. For evidence-based policy making, more rigorous and continuous studies of the demand-side constraints to enrolling in preprimary and senior secondary education for rural children need to be conducted.

It will be important for the government to set clear expectations on the role of public financing in education. If current trends in China continue, demand for education will continue to rise. The Chinese society values education highly, and parents' demand for education for their children seems insatiable. There should not be any barriers for families seeking education beyond what the government provides for free. Demand is already high for private English education, tutoring for college entrance exams, additional extracurricular activities, and tutoring for entrance into overseas universities. Over time, migrant families will have similar demands.

The government will need to place greater emphasis on regulations and quality assurance to ensure consumer protection in these areas and to ensure that all public and private money is spent efficiently.

MAKING HEALTH SERVICES MORE EQUAL AND RESPONSIVE TO NEEDS

Background

Reforms in the past decade have greatly improved coverage and reduced out-of-pocket medical expenditures, but the current escalation in health spending raises questions about the long-term sustainability of China's health financing arrangements. As discussed in Chapter 2, China has launched two waves of reform in the past decade to improve access to health care. At the same time, between 2007–2010, real annual growth in health spending averaged about 15 percent, compared to annual GDP growth of approximately 8 percent. As shown in Figure 4.11, the lion's share of spending occurs in urban settings, and this trend will probably continue for the foreseeable future as China urbanizes.

Urbanization and other demographic trends will continue to place greater pressure on the health system. Rising incomes, an aging population, and an increasing burden of chronic diseases will together likely increase demand for health care in urban areas. The share of people aged 60 years and over will rise rapidly in the coming decades, from around 12 percent in 2010 to almost 25 percent by 2030 and more than 33 percent by 2050. Another demographic challenge is the growing epidemic of non-communicable diseases (NCDs), which account for more than 80 percent of the 10.3 million deaths annually and contribute to 82 percent of the total disease burden (WHO, 2009). A recent report shows that migrants and those with lower education levels tend to have a higher NCD burden, another indicator of urban dualism (World Bank, 2011).[47] Urbanization itself also leads to behavior change and exposure to risks that can increase demand for health care.

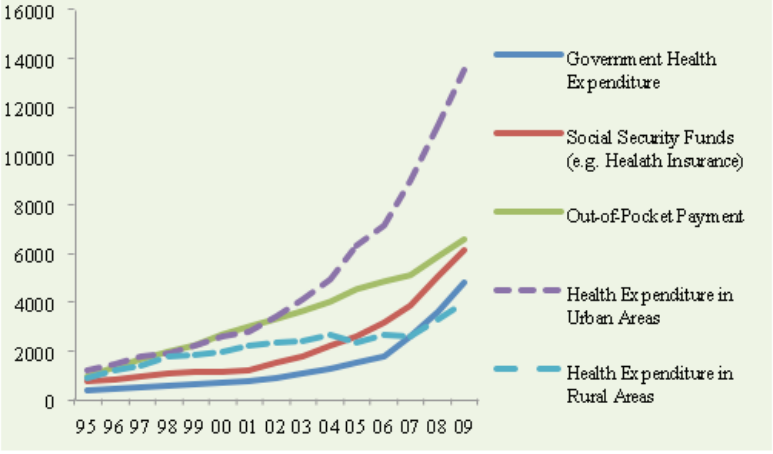
Current Status and Challenges

Despite a massive expansion in grassroots facilities and beds in both urban and rural areas, hospitals continue to gain an increasing share of both outpatient visits and inpatient admissions. There is a strong hospital bias in Chinese health spending relative to OECD countries, with nearly half of total public health spending going to hospitals in 2010. This bias appears to be intensifying, and the system is becoming increasingly "top heavy," which will escalate costs and contribute little to improved health outcomes. Between 2007 and 2011, the number of inpatients increased by 56 percent, compared to 33 percent for outpatients (Ministry of Health, 2004–2011). Moreover, it is estimated that nearly 30 percent of hospital admissions are unnecessary,[48] which can inflate spending since the average cost of an inpatient stay is nearly 37 times more than an outpatient visit.[49] Another factor that increases costs is average length of hospital stay, which is double the OECD average.

The perceived poor quality of primary care providers as well as higher insurance reimbursement levels for inpatient care drives patients to upper-level health care facilities such as hospitals. The primary care system in China is institutionally fragmented, with highly fragmented financing arrangements. The primary care system consists of many oftentimes uncoordinated actors including family planning agencies, maternal child health programs, township health centers (THC) for primary and secondary care, village doctors, and public health agencies.

[47] World Bank (2011).
[48] See MOH. Report on National Health Service Survey In China, 2008.
[49] In 2011, the average cost per inpatient was RMB 6632, while the average cost per outpatient was RMB 180 (Ministry of Health, 2011).

FIGURE 4.11 Health Spending by Source and Location 1995–2009



Funding sources for primary care are also varied and include earmarked vertical program budgets, health insurance, central and local budgets, and user fees, all of which make financing highly fragmented and unequal across space and social groups. Patient surveys found that only one-third of patients considered urban community health centers (CHCs) to provide adequate quality of care (Bhattacharyya et al., 2011). Despite government training programs to upgrade these physicians and general practitioners and despite outreach technical support from hospitals, most residents prefer to travel longer distances and queue for specialty care in hospitals. Yet another barrier to primary care is the low level of reimbursement for outpatient care (Wang et al., 2012). In 2009, it was reported that about 40 percent of CHCs were recognized by urban social insurance schemes for reimbursement (Bhattacharyya et al., 2011). The insured also have an incentive to seek inpatient admissions because insurance reimbursement levels for inpatient care are higher than for outpatient care.[50]

Other factors also contribute to the hospital-centric nature of China's delivery system, such as:

- China has yet to systematically adopt coordinated care approaches to service delivery, which increasingly dominate the service delivery landscape in many OECD countries. Coordinated care consists of a mix of measures that links professionals and organizations at all levels of the health system, emphasizes patient-centered care integration, manages patient referral through the delivery system, and promotes follow-up care as well as the continuity of long-term service provision. The concept is often based on the strong role of primary care facilities as the driver of coordination functions. In China, however, there is very limited cross-referral across the three tiers of health care facilities to ensure that health conditions are managed at the most appropriate and cost-effective level. Patients tend to go directly to hospitals even for outpatient care (around 53 percent of patients have their first contact with the system at a hospital), with little gatekeeping by lower levels.
- The capital investment model for public hospitals is not conducive to rational hospital planning and may lead to excessive hospital capacity. It involves a strong reliance on bank lending and "project cooperation," whereby third-party capital investors effectively take a role in

[50] Reimbursement rates are directly related to hospitals' level of classification, providing an incentive for hospitals to upgrade to achieve a superior classification and thus gain higher reimbursement while building their reputation to attract more patients.

management and even ownership. This has reinforced incentives for profit maximization in public hospitals, led to unclear ownership and control of public facilities at times, and contributed to irregular practices. More broadly, capital planning in China may contribute to an oversupply of beds and facilities. International experience demonstrates that excess beds are associated with overutilization of hospitals (Delmater et al., 2013).

Quality of the delivery system remains nearly forgotten. Many of the essential and systematic elements of quality improvement are still in their infancy in China, including continuous quality improvement programs, performance measurement, monitoring and benchmarking, provider accreditation, medical and nursing school accreditation, professional credentialing (and re-credentialing), and disciplining for malpractice. As in many countries, lack of reliable data on quality of care, systematic measurement, and institutional infrastructure for quality monitoring and evaluation frustrates attempts to assess quality at any facility or level of care.

Providers face strong incentives to induce demand, leading to over-servicing which threatens the sustainability of the insurance and delivery systems. For all levels of care, the dominance of fee-for-service provider payment systems, emphasis on self-financing of facilities (e.g., "sales" or "business" income was over 90 percent of hospital revenue in 2010), and the link between hospital 'business' revenue and physician income have encouraged unnecessary care and inefficiency in service production.[51] Distorted pricing for treatments has given health care providers strong incentives to generate demand for profitable high-technology services and drugs in place of unprofitable basic alternatives. There is considerable evidence of cost-enhancing (and quality-impairing) provider behaviors in response to these incentives: extended lengths of stay and prolonged treatment, unnecessary admissions and complementary services (e.g., intravenous fluids), overuse of high-tech diagnostics, misuse of antibiotics, and over-prescribing. In 2009, 43 percent of health spending in China was for pharmaceuticals, compared with 17 percent in OECD countries (Yi et al., 2013).

In terms of China's health insurance system, the fragmentation of risk pooling poses a threat to long-term sustainability. Since insurance funds are pooled at the level of urban cities and rural counties, nearly 3,500 separate risk pools have been created for the various schemes. Compared to international experiences, these risk pools are relatively small, limiting the ability of insurers to spread risk between the healthy and the ill and to provide adequate financial protection. Research also shows that NCRMS and URBMI face adverse selection (Chen and Yan, 2012; Liu and Tsegai, 2011) which, combined with low levels of risk pooling and government subsidization, may compromise their long-term financial viability.

Lack of portability in the health insurance system is another concern. In general, benefits from URBMI and NCRMS are not portable when workers change jobs or switch residences between rural and urban areas. This may impair labor mobility, access to health services, and continuity of care, especially for chronic conditions. One possible deterrent to portability is the lack of uniformity in benefits and reimbursements across schemes (e.g., higher out-of-pocket spending due to higher premium levels and copayments or lower reimbursement ratios), making enrollment in a new scheme unattractive.

The health insurance system also suffers from low capacity. Agencies responsible for operating insurance schemes generally lack sufficient staff, information technology, and managerial know-how to manage and monitor the schemes, oversee providers, and navigate the increasingly complex array of norms and regulations effectively (Yan et al., 2011). The lack of integrated databases and management information systems impedes the monitoring of provider behaviors and quality, coordination of care across different types of providers, and facilitation

[51] Tam (2008) reports that hospitals or hospital departments often set up off-the-book accounts, known as "little treasuries," in which sales revenues are placed for distribution to physicians. Hospital authorities set revenue targets for clinical departments, while they may also be held accountable for unpaid bills of the patients they treat.

of claims reimbursements across provinces for migrants (Liang and Langenbrunner, 2012). Another capacity issue relates to the role of health insurers in altering provider behaviors through effective purchasing strategies. Despite major increases in health insurance financing, health insurance agencies remain largely passive payers of claims.

Proposed Policy Responses

China faces both new and unfinished reform agendas in addressing the health consequences of urbanization. As discussed in greater detail below, the new reform agenda involves the expansion of insurance to migrants, integration of separate insurance schemes, and promotion of healthy urban living. The unfinished reform agenda entails dealing with cost-inducing perverse financial and provider incentives, an unbalanced and uncoordinated delivery system, and unknown quality of care.

New Agenda

To increase equality and labor mobility, segmentation among the three health insurance schemes must be reduced to create an integrated and seamless system. Notwithstanding expansion of insurance coverage to migrants as described earlier, China should continue to minimize differences in benefits, reimbursement rates, copayments, and deductibles among the three social insurance schemes. They should also be integrated into a common institutional platform while raising the pooling level of the health insurance system to at least the provincial level. Although there is no blueprint for integrating insurance schemes, what may be most appropriate for the Chinese context is the consolidation of multiple funds into a limited number of pools. Variants of this model can be found in Canada, the United Kingdom, Sweden, Korea, Colombia, Chile, and Norway.

In the medium term, China can build upon the experiences of several provinces in China in merging URBMI and NRCMS. Integration can start with merging organizational arrangements, including physical location; managerial, monitoring, and supervisory functions; and information systems. Chongqing, Guangdong, Ningxia, and Tianjin have vertically integrated these schemes, although the breadth and depth of integration varies. The next step would be to merge benefits, reimbursement rates, and provider payment systems. There is also a need to move away from the current model of individualized coverage in insurance schemes to household-based coverage, promote administrative efficiency, and facilitate portability of entitlements. Pending issues include selection of the government agency responsible for the new organization and establishment of the accountability arrangements for performance oversight.

In addition, it should be noted that healthy urban environments require healthy urban design. International evidence shows that urban environments that promote healthy living incorporate design elements such as: pedestrian environments, bicycle networks and infrastructure, parks, play areas and plazas, weekend pedestrian and cycling streets, pedestrian overpasses and traffic islands, and walking trails (see the "Urban Planning" Supporting Report 2 for more details). These strategies are typically supported by promotional or soft activities such as fitness events, childhood overweight and obesity programs, senior group exercise events, promotion of exercise facilities and use of stairs in the workplace, anti-smoking regulations and campaigns, access to mental health services, and street "health" fairs.

Unfinished Agenda

China needs to reorient service delivery based on primary and coordinated care. Planners in China need to consider an alternative care delivery model that would anticipate and shape patterns of care according to the projected health and medical needs of the population, while placing considerable emphasis on strengthening the role and raising the quality of primary care.

It should involve significant strengthening of community-focused care, vertical and horizontal integration of facilities to provide comprehensive services along a continuum or chain of care, and use of primary care as the point of entry into the system. Recent OECD experience suggests using an emerging "coordinated care" delivery model in which considerable emphasis is placed on primary care (as a gatekeeper and "case manager"), defined links among providers, and specialized outpatient and day surgical treatment, which reduces the need for inpatient beds. The international trend is toward the transfer of services currently provided by hospitals to community-based ambulatory centers or telemedicine clinics.

Pilot reforms to strengthen the role of primary care in China are underway. Emerging experiences in Shanghai and Beijing demonstrate that CHCs are able to fulfill primary care provision and case management tasks when equipped with a new set of competencies and provided with professional support. Shanghai and Ningbo have also provided promising examples of a functional family doctor model for the past several years. Beijing, Wuhan, and Shanghai are testing "medical consortium" models which link CHCs, secondary hospitals, and tertiary hospitals in a two-referral system in which CHCs serve as entry points or gatekeepers. Specialists are also decentralized to CHCs.

To improve the quality of health care, China can implement several short- and medium-term measures that are already underway to some extent in a number of cities, counties, and facilities. The first measure involves conducting an inventory of quality improvement initiatives in ambulatory units and hospitals, including any results of these initiatives. The second is to require all hospitals to report a set of quality indicators on high-volume tracer conditions. Third, the eligibility of hospitals to receive insurance financing should be linked to "threshold requirements" such as accreditation or certification that they meet specified standards. A fourth measure entails providing financial incentives to improve quality, known as quality-based purchasing, which has become widely accepted in the OECD. Using this approach, insurance schemes can use their purchasing power to stimulate quality improvement, data reporting on quality, and patient satisfaction.

China can learn from the lessons and emerging innovations of OECD and other middle-income countries that are faced with an oversupply (or underutilization) of beds. OECD countries are adopting alternative planning approaches in the face of aging populations. They are applying coordinated, community-based medical models to address NCDs, rapidly advancing communication and telemedicine technologies, emerging non-invasive or minimally invasive therapies, pharmaceutical advances, miniaturization of sophisticated equipment, and increased use of ambulatory surgery, urgent care centers, and other forms of "day hospitals." In doing so, these countries have redefined the role of hospitals and reduced bed-to-population ratios, lengths of stay, and ultimately the number of hospitals—almost all of which are steps China must also take.

In terms of health insurance reform, controlling utilization and provider cost escalation are essential to the financial sustainability of any insurance scheme. International experience shows that no single approach to cost containment can effectively slow the increase in costs over the long run. Used in combination, the following three approaches could contribute to effective cost containment in China:

- The first approach, already in practice in China, involves the design and implementation of robust provider payment mechanisms. Payment reform is essential if the other components of the reform agenda are to be achieved, if uncontrollable cost escalation is to be avoided, and if public trust in the health system is to be restored. Some pilots with alternative provider payment systems are underway, and although the number of facilities involved in these experiments is small, preliminary assessments indicate progress in cost containment. For example, Hainan province introduced prospective global budgets in six hospitals, resulting in slower rates of cost inflation, lower copayments, and slower increases in expensive services compared to hospitals paid on a fee-for-service basis (Yip and Eggleston, 2004).

Expanding pilots to experiment with alternative payment methods will provide important information on which models work best in the Chinese context.

- The second approach involves managerial cost control measures that aim to control utilization or frequency of claims, lower spending for services provided, and in some cases detect and control fraud. Measures typically used by health insurers and purchasers involve: (i) inpatient management to reduce length of stay and avoid unnecessary admissions (e.g., preadmission review, concurrent review, second opinion before surgery, discharge planning); (ii) programs and incentives to encourage the substitution of outpatient for higher-cost inpatient care and the identification of new and less costly treatments for high-cost conditions; (iii) provider profiling to enable the analysis and characterization of providers according to utilization, costs, quality, and other performance-related features to help identify high-cost providers as well as providers with patterns of high utilization; (iv) standard treatment guidelines and provider education programs (to encourage cost-effective practice patterns); and (v) programs and incentives to promote the use of generic drugs and low-cost technologies.
- The third approach involves expanding the institutional separation of revenues from expenditures, which is an operational feature of the current health reform although uptake has been slow. It is meant in part to delink incomes of facility staff from revenue generation. Chengdu, Hangzhou, and Beijing have applied this reform to urban CHCs. All revenues are placed into a special government account then returned to the facility in the form of a negotiated budget. The measure has reduced over-testing and over-prescribing, breaking the link between "sales" and physician income (Tang et al., 2012). The cities are experimenting with contracts that specify (and rationalize) the mix of services provided.

Sound institutional purchasing can provide incentives to deliver more efficient, more appropriate, and higher-quality care. For health insurance agencies, moving from simply "paying the bill" to active purchasing will be key to promoting a system that puts patient care and cost effectiveness above revenue maximization by providers. International experience suggests that purchasers can do a great deal to incentivize providers to improve quality processes and results while contributing to cost containment. Explicit contracts linking payment to performance have been shown to be effective instruments for improving patient satisfaction, quality, and efficiency (Preker and Langenbrunner, 2005). For example, in the Brazilian state of Sao Paulo, the state government crafted contracts with public and private hospitals that specified production targets for a large array of services, along with cost-based budgetary caps. The contract also mandated quality improvement measures and data reporting requirements. A portion of financing was tied to successful compliance with these mandates.

DEEPENING PENSION SYSTEM REFORM

Current Status and Challenges

China needs to deepen its pension system reform to achieve the goal of "full coverage, basic protection, multilayered and sustainable" pension system outlined by the 18th National Congress of the Communist Party of China. Although much progress has been made in the last decade, China still faces a large unfinished agenda, in part due to the rapid pace of reform to date. Given the major demographic changes discussed earlier, the pension system also faces the challenge of providing adequate old age protection to a wider population while remaining fiscally sustainable. The system must deal with the dual challenges of handling a rapidly aging population while serving the needs of an increasingly diverse and mobile labor force. Addressing the historically low coverage of rural, migrant, and urban informal sector workers remains a challenge.

The key structural challenges for the pension system to support urbanization and rural-urban integration include:

- *Fragmented pension systems*, which result in low levels of pooling and limit portability. The urban worker pension scheme pools contributions and payout responsibility at the municipal level, with only a partial adjustment fund established at the provincial level. Rural and urban resident pension schemes are mainly pooled at the county and city levels. The transfer of pension entitlements across pension schemes remains unsettled. The multiplicity of urban pension schemes for workers, PSU employees, civil servants, and in some areas residents and migrants as well as the differences in parameters between urban workers schemes in different cities create disparities in benefits and barriers to cross-sectoral worker mobility.
- *The legacy costs of earlier, more generous urban worker pension provisions* which are largely financed through current pension contributions, sustaining high contribution rates and creating incentives for under-reporting of wages and non-participation. These legacy costs are not affordable to many local governments.
- *Design weaknesses* in the pension system, such as a low retirement age and outdated annuity factors, affect incentives and fiscal sustainability.
- *Low returns on individual accounts* such that pension replacement rates have been significantly less than anticipated when the system was developed in the 1990s.
- *Weak management and service delivery capacities*, particularly in the face of rapid pension system expansion.

Proposed Policy Responses

Moving to an integrated design for the pension system

An integrated pension system can help facilitate labor mobility, promote equity and rural-urban integration, ensure financial sustainability, and achieve full coverage of the population in rural and urban areas. The reform measures also include a financing strategy with multiple sources to fill in the gaps, upgrading financial and risk pooling at the central level to relieve local budgets of some spending obligations, enhancing labor mobility and addressing spatial disparities in old-age income protection, and improving system performance, including retirement age and returns on individual accounts.

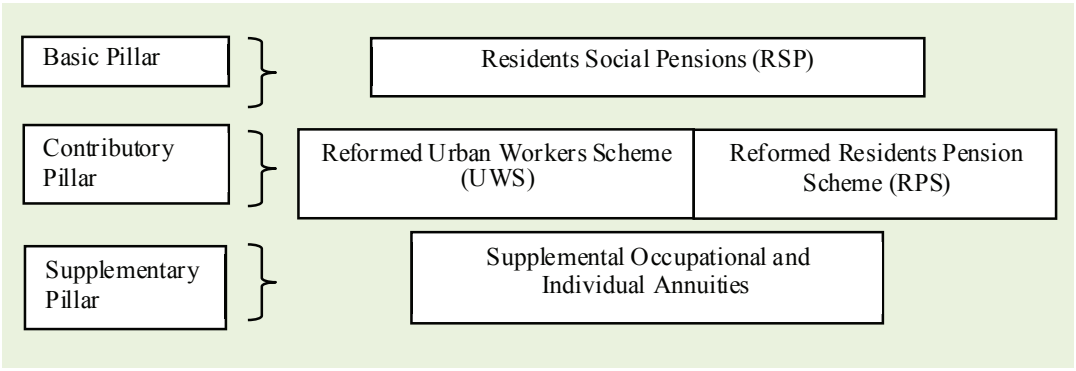
An integrated pension system design would aim to address the needs of all workers and retirees while allowing for diverse circumstances. Such a design would no longer distinguish along urban and rural locational or *hukou* lines. However, it would ensure that pension provisions take into account the wage- or non-wage basis of employment and the capacity of individuals to make contributions.

The proposed reform uses a notional defined contribution (NDC) approach to anchor the design and financing of contributory pensions. It provides an integrated framework of five instruments under three pillars to cover diverse worker needs and circumstances (Figure 4.12). The three pillars are:

(i) A *basic pillar* providing minimum elderly poverty protection through noncontributory Residents Social Pension (RSP) benefits;
(ii) A *contributory pillar* with a mandatory NDC scheme for wage-based workers with labor contracts (modifying the current UWS) and a voluntary defined-contribution pension savings scheme for the urban and rural populations with non-wage incomes (modifying the current rural/urban resident pension schemes—reformed Residents Pension Scheme (RPS)); and
(iii) A *supplementary pillar* providing voluntary occupational and personal pension savings options that may supplement other pension benefits (building upon the existing Enterprise Annuity scheme).

The three-pillar approach builds upon features of the existing pension system while providing a common basis for addressing fragmentation, portability, pooling, and sustainability

FIGURE 4.12 Proposed Overall Design of the Pension System



issues. For wage-based workers, the NDC design proposed for the UWS would provide stronger incentives for participation and introduce reforms to strengthen portability and financial sustainability.[52] For non-wage workers, the proposed RPS has some similarity with the NRPS/URPS in its voluntary and defined-contribution design, while also sharing similarities with the reformed UWS in key parameters such as qualifying conditions and the benefit formula. These could support the transfer of pension rights and benefits between the two schemes. The combination of the RPS and RSP mimics the existing NRPS/URPS but broadens the scope of benefits for all retirees and introduces a benefit adjustment factor to reduce the fiscal burden on a sustainable basis. The introduction of the RSP could help achieve the policy goal of full coverage.

Upgrading the pooling level

Although China should first aim for provincial-level financial pooling, the long-term objective should be national-level pooling. Financial pooling will need to be achieved at the provincial level, including consolidation of all contributions and (unified) benefits. However, the ultimate objective should be to achieve national-level financial pooling. Cross-subsidies between regions with net surpluses and those with net deficits are expected, as well as between regions with lower system dependency rates and those with higher ones.

Financial pooling of contributions and reserves helps smooth disparities and diversifies risks to members, but the level of pooling remains low across most of the country. Two types of financial pooling approaches are currently used in China: (i) *full pooling* of all contributions, accumulations, and disbursements and (ii) *partial pooling* through the use of provincial adjustment funds which aims to redistribute a portion of contribution revenues. Among 31 provinces, Beijing, Tianjin, Shanghai, Chongqing, Shaanxi, Qinghai, and Tibet have realized full financial pooling at the provincial level, while the other provinces have achieved partial pooling or no pooling. Transfers to provincial adjustment funds are levied based on total municipal or county wage payrolls, pension account balances, or budgetary contribution revenues. Table 4.14 indicates the proportion required to be transferred. Some provinces such as Guangdong have fully realized the financial pooling of pension contributions, accumulations, and disbursements at the prefecture city level, while a number of provinces have full financial pooling only at the county or city level.

Unification of parameters and pooling of data and management are essential for financial pooling. A national pension system needs to be grounded in standardized policies for

[52] Combining the UWS with an occupational annuity scheme can provide options for integrating civil servants and PSU employees into the reformed UWS.

TABLE 4.14 Proportion of Pension Contributions Transferred to Provincial Adjustment Funds

Province	Proportion (%)	Province	Proportion (%)
Shanxi	3	Hubei	5
Inner Mongolia	2	Hunan	0.5
Liaoning	10	Guangdong	9
Jilin	5	Guangxi	1
Jiangsu	1.5	Hainan	1
Zhejiang	2	Sichuan	5
Jiangxi	3	Xinjiang	1

Source: Authors' compilation based on the latest provincial policy documents.

contributions, qualifying conditions, and benefits. Without unification of parameters, those communities with the lowest benefits can end up transferring resources to those with more generous benefits. Local consumption and poverty parameters should be used in determining the social pensions benefit level. Support for accounting, financial control, and accountability systems can help ensure the integrity of the financial pooling process. Unique identification, validation systems, data standards, and other policies are essential for recordkeeping and to enhance information flows across space.

A vertical management approach which builds upon local capacity could help ensure provincial-level accountability. Under this approach, individuals in local social security and finance departments would be accountable to provincial (not municipal) authorities. However, even with such vertical management, legal, regulatory, and supervisory mechanisms will be needed to ensure that national standards are applied at the local level.

Achieving financial sustainability

Financing sources should be diversified from the current largely contribution-based financing to a greater mix of sources, with a rebalancing of the level of risk-sharing between the citizen and the state (Table 4.15). Social pensions and legacy costs would be financed from current government revenues, while the other schemes would be contributory either with a pay-as-you-go or fully funded approach. A separate financing strategy is proposed to partially pre-fund future pension costs. Automatic benefit indexation using publicly disseminated indices and GDP-linked rates of return shields workers and retirees from risk. Similarly, annuitization protects retirees from having to bear or pay for coverage of longevity risks.

TABLE 4.15 Proposed Financing

Scheme	Financing Approach	Sources of Financing
Residents Social Pension Urban Workers Scheme	Non-contributory and un-funded • Contributory pay-as-you-go • Legacy costs unfunded – paid from Government budgetary allocations • Separate external pre-funding to address long-term demographic changes.	Government budgetary allocations • Employer and employee contributions • Government budgetary allocations • Government external pre-funding
Reformed Residents Pension Scheme	Contributory pay-as-you-go	• Workers • Matching contribution subsidies from Government at different levels
Occupational and Personal Annuities	Contributory and fully funded	• Employers • Employees and self-employed

Three policy measures would help achieve long-term financial sustainability and improve the incentives to participate:

- *Parametric changes* to reduce long-term costs, including gradually increasing the minimum retirement age to 65, automatically adjusting the annuity factor to reflect the life expectancy at retirement age, and automatically providing hybrid indexation based on wages and per capita GDP growth.
- *A separate partial-funding strategy* to address the future cash-flow funding requirements that will arise as old age dependency ratios increase and contribution revenues prove insufficient for benefits in the years ahead. Such a funding strategy would lead to the establishment and financing of buffer reserve funds on a provincial basis, based on projected cash flow needs.
- *Financing of legacy costs from general revenues* rather than from pension contributions. Financing legacy costs from outside the pension system would reduce contribution rates, thereby substantially improving the affordability of contributions to the reformed UWS.[53]

4.2.4 Sequencing of reform measures

To realize the policy goals of full coverage, equity, portability, and financial sustainability, the sequencing of pension policy reforms will be critical. Possible short-, medium-, and long-term measures are proposed below.

In the short term:

- *Initiating an increase in the UWS minimum age for receipt of benefits*. Given the need to do this gradually, initiating an increase in the pensionable age sooner rather than later seems advisable.
- *Implementing other parametric reforms to the UWS*, including elimination of the minimum wage subject to contributions, dramatic reduction in the vesting period, and initiation of a process to reduce contribution rates (linked to financing of legacy costs from general revenues).
- *Increasing the matching contributions provided under the URPS/NRPS while initiating measures to delink a basic monthly benefit social pension from a vesting period of contributions*. This can further improve coverage, particularly for younger workers and workers who may find it difficult to satisfy the current 15 year vesting requirement.
- *Taking preparatory design steps to integrate the PSU, civil servant, and urban workers' pension frameworks*. Ultimately, the PSU and civil servant schemes should aim to be fully integrated with the UWS. The key design question is how to integrate these workers into the UWS while avoiding a dramatic downward adjustment in replacement rates. This would in turn require integrated policy development of PSU and civil service pension reform with broader compensation reforms.

In the medium term:

The main medium-term challenge will be to promote greater harmonization across schemes and make progress on integration of schemes for different groups. Key medium-term measures could include:

[53] imulations suggest that an average contribution rate of 28 percent could be reduced to 16 percent with the same approximate replacement rate for a full-term worker, provided that the retirement age was increased to age 65 (see Dorfman et al., 2013).

- *Putting in place the information systems to facilitate portability of pension rights and pooling.* Common data standards and data sharing protocols under the lead of MOHRSS are needed, along with development of a data management system strategy for phased convergence. Social insurance information systems within provinces also need to be integrated to prepare the way for eventual sharing of beneficiary data and financial information across provinces.
- *Promoting greater harmonization across schemes and making progress on integration of schemes for different groups.* This includes (i) completing integration of PSU and civil servant workers into the reformed UWS and (ii) integrating the rural and urban residents' schemes and their management under one policy and institutional umbrella.[54]
- Separating legacy cost financing using a clearly defined financing strategy. A framework for legacy cost estimation and identification needs to be developed and implemented. The legacy costs could be financed by the government at different levels and be shared with workers and retirees.
- Meeting pre-funding targets under the overall financing strategy, which would require effective supervision and oversight measures including supervision of investment management.
- *Completing provincial pooling of pension funds.* This would require putting in place the incentive framework to implement provincial pooling of financial flows and provincial financial management.

In the long term:

- *Transitioning from provincial pooling and management to national-level pooling and management.* The nationally pooled and integrated system would need to be underpinned by an integrated national data management system.
- *Moving to a pension system that continues to distinguish between those with wage employment and those without it, such as self-employed and informal workers,* but this could likely be undertaken as different programs come under a unified institutional framework.
- *Introducing funded defined-contribution pension instruments* to the degree that the financial markets are liberalized, well-regulated, well-supervised, and well-governed.

SOCIAL ASSISTANCE

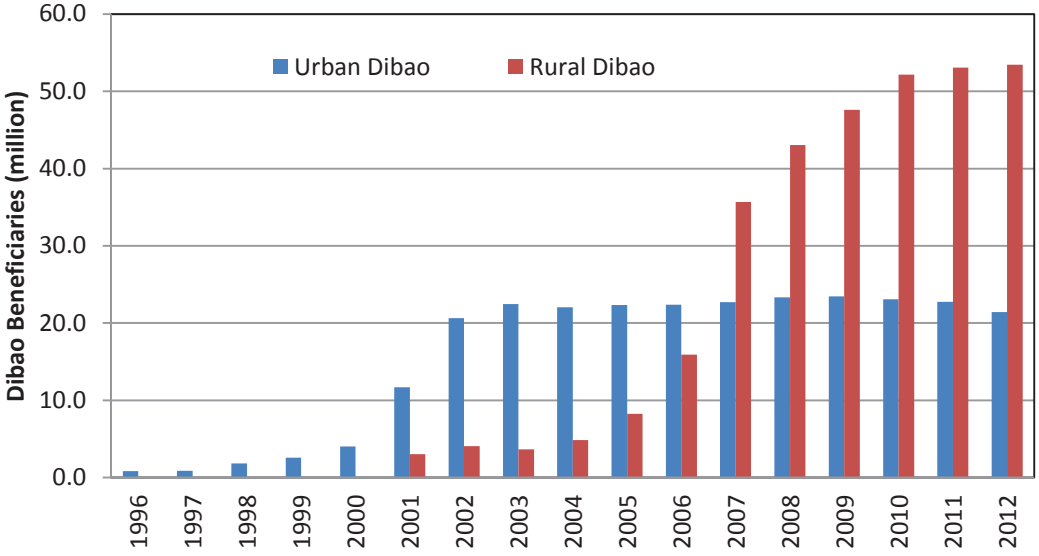
Background

The minimum living allowance program (*dibao*) has become the backbone of China's social safety net. Urban *dibao* was introduced in 1997 to assist SOE reform and provide income support for laid-off workers and their families, then rural *dibao* was introduced as a national program in 2007. By 2012, China had 23.4 million urban *dibao* beneficiaries, accounting for 3.0 percent of the urban residential population, and 53.5 million rural *dibao* beneficiaries, accounting for 8.3 percent of the rural population (Figure 4.13). The *dibao* programs provide non-conditional cash transfers, aiming to serve as the last resort of income support for urban and rural poor households with per capita incomes below locally determined thresholds. The targeting approaches are based on an income plus asset test to measure actual household income so as to top up the gap compared with local *dibao* thresholds.

In addition to *dibao,* China has traditional social assistance programs and special/temporary social assistance programs which are important components of the social assistance system. Traditional social assistance programs such as wubao in rural areas and the "three-no's" program in urban areas were established to provide income support for those who do not have

[54] 12 provinces have integrated rural and urban resident pension schemes.

FIGURE 4.13 Urban and Rural *Dibao* Beneficiaries in China, 1996–2012



Source: NBS, 2012 China Social Statistical Yearbook, China Statistics Press; Ministry of Civil Affairs, 2012 Statistical Bulletin of Social Services Development, www.mca.gov.cn.

dependents, have lost their ability to work, and have no income sources. In 2012, wubao beneficiaries numbered 5.5 million in rural areas, while urban three-no's beneficiaries numbered 99,000. China also has special/temporary social assistance programs such as medical financial assistance, education assistance, and housing and heating subsidies which provide temporary cash and in-kind support for the poor and low-income families. Medical financial assistance is the largest of these programs, providing support for 84.5 million people in urban and rural areas in 2012 (Table 4.16). Other temporary assistance programs covered 2.6 million urban households and 3.8 million rural households in 2012.

After the dramatic national expansion, social assistance system is now facing second generation issues, including: (a) developing a more systematic approach to determination of *dibao* eligibility thresholds and benefit levels across urban and rural areas and across provinces; (b) focusing on the primary objectives of *dibao*. Refining the policy objective also requires clarifying the protective versus promotional role of *dibao*. The program plays a useful role in helping low-income households cover extraordinary educational and medical costs, but it is unclear if these are always the poorest households; and (c) promoting greater synergies between social assistance programs and anti-poverty interventions in poor counties. Improvements in

TABLE 4.16 *Dibao* and Medical Financial Assistance in Urban and Rural China, 2012

	Urban Areas	Rural Areas
***Dibao* programs**		
Thresholds (RMB/month)	330.1	172.3
Benefits received (RMB/month)	239.1	104.0
Total fiscal inputs (billion RMB)	67.4	71.8
Medical Financial Assistance		
Medical cost reimbursement (RMB per capita)	858.6	721.7
Subsidies for medical insurance contributions (RMB per capita)	84.0	57.5
Total fiscal inputs (billion RMB)	7.1	5.8

Source: Ministry of Civil Affairs, 2012 Statistical Bulletin of Social Services Development, www.mca.gov.cn.

the design and implementation of the social assistance programs would be desirable in order to increase their contribution to poverty alleviation.

Proposed Policy Responses

Promoting integration of the rural and urban components of social assistance programs requires clearly defined financing roles and responsibilities of government at various levels. In China, the increasing role of the central government provides a channel for standardizing and equalizing *dibao* programs. The central government could take on a bigger role for the *dibao* and temporary social assistance programs by assuring fiscal inputs and income transfers to cover both developed and lagging areas. This would ease the fiscal burdens of city governments in coastal areas to incentivize them to treat long-term migrant families on par with urban residents.

To facilitate the convergence of approaches and equalization of *dibao* thresholds and benefits, the central government could upgrade the authority to establish *dibao* thresholds from the county (city) to provincial level. At present, both the method of determining *dibao* thresholds and the levels themselves vary enormously, reflecting the highly decentralized nature of implementation. Developed countries often apply a unified formula for the threshold level for social assistance programs, taking into account regional cost-of-living differences. Similarly, China could gradually move the responsibility for setting thresholds from county (city) to prefecture, from prefecture to province, and finally from province to the national level. A systematic approach is needed to ensure that the standard reflects the true cost of living and is adjusted accordingly over time. The authorities could also consider adopting a common benefit floor for all localities in China, while allowing local government to establish a higher level as capacities allow. MOCA has made progress in this direction, and assessment of emerging experience can inform future policy development.

Dibao and temporary social assistance programs could better utilize the limited public resources available through improved targeting. While the design of *dibao* programs is conceptually clear in targeting income poverty, in practice, *dibao* programs are used to target consumption poverty and even provide support for low-income families. The ambiguous policy objectives and boundaries have resulted in low targeting efficiency.

Another consideration is the role of social assistance programs in addressing the equity issue between the poor and "near poor." While the *dibao* program has performed well in excluding the non-poor, its design raises risks of "poverty traps" for households just above the *dibao* eligibility threshold. Eligible households have their incomes topped up to the *dibao* threshold and also receive non-cash benefits including exemptions or reductions for education fees, subsidized health insurance, and public housing and subsidized utilities. As a result, they may be better off than households just above the *dibao* threshold who are not entitled to such non-cash benefits but have only slightly higher incomes.

In parallel, deeper reform of the social assistance system is needed to help better achieve its poverty alleviation objectives and improve coherence with other programs. Additional resources will be needed to develop the information management system, increase staffing levels according to the population or families served, and develop business processes and performance standards. The reforms should also promote greater synergies and coherence among social assistance programs, social insurance schemes, labor market programs, regional anti-poverty programs, and housing programs. In particular:

- For social insurance schemes, with the expansion of basic pension benefits to rural and urban informal retirees in the coming years, the interaction with measurement of household income for *dibao* needs to be examined closely. Currently, basic pension income is ignored in determining *dibao* eligibility, but in the longer run it may be necessary to look more closely at the rationale for such an approach as the pension system expands.

- For labor market programs, some cities provide job training for family members of *dibao* beneficiaries, encourage community works participation, and allow a graduation reduction of transfers after they find jobs. Those are good practices that could provide strong incentives for the poor to re-enter the urban labor market.
- Regional anti-poverty programs have been operated based on a regional development approach in parallel to household-based social welfare support.
- As discussed in Chapter 2, the government has placed greater emphasis on affordable housing for lower-income households, in addition to public housing for the poor. While this is a welcome policy direction, it will also require more rigorous valuation of the implicit value of social assistance packages that include free or subsidized public housing and the relationship to subsidies offered to households not in social assistance programs.

ACCOUNTABILITY AND SOCIAL SERVICES DELIVERY

Introduction

To improve results in service delivery across the social sectors, China faces the challenge of increasing accountability through three broad channels: government systems, citizen-based, and choice-based. Compared to most countries, China has traditionally placed less emphasis on citizen- and choice-based accountability channels in the social sectors. For citizen-based accountability, this is due to the lack of client voice in service delivery. For choice-based accountability, it is due to the dominance of public sector provision resulting in lack of client choice and provider competition.

The potential of each channel of accountability will vary according to the type of service considered, the nature of the market in which it operates, and the nature of outcomes and performance improvement to be promoted. Most social services will be amenable to enhanced accountability through budgetary and public financial management (PFM) systems. However, there will be stronger variation in the potential role for choice-based channels depending on the degree of contestability of services. The following sections discuss each of the three broad channels of accountability in turn.

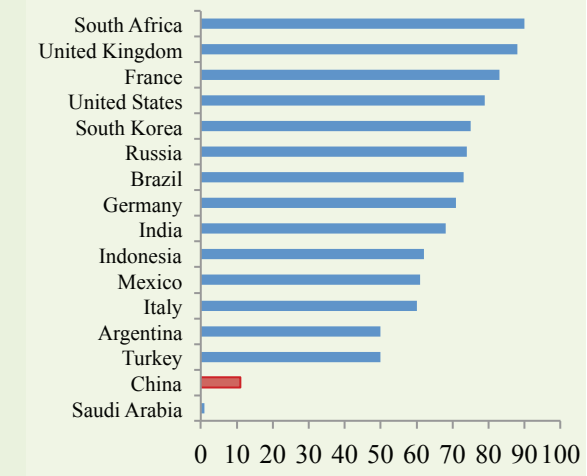
Government systems and accountability to promote better service delivery

China's overall level of budgetary transparency is low by the standards of G20 countries and has fallen in recent years. Figures 4.14 and 4.15 show China's overall rating on budgetary transparency compared to G20 countries and the individual elements of the budgetary system ratings for China in 2008 and 2012. While some indicators such as in-year reporting are solid, others related to review and actual budget enactment are very low. Stronger performance on these indicators will be needed to move from a budget compliance culture to a performance-oriented budgetary approach.

While China has substantially increased central and provincial transfers to support social services in recent years, the majority of China's provincial and sub-provincial governments have a low level of fiscal transparency (OECD, 2005). Information on actual expenditures, off-budget transactions, and government performance is particularly limited in the public sphere. Therefore, it is not easy to assess the differential impacts of central and even provincial spending in terms of the outcomes that matter most or the efficiency in achieving desired outputs. Monitoring of outcomes for poor and vulnerable communities is a particular weakness, especially for those without local *hukou*.

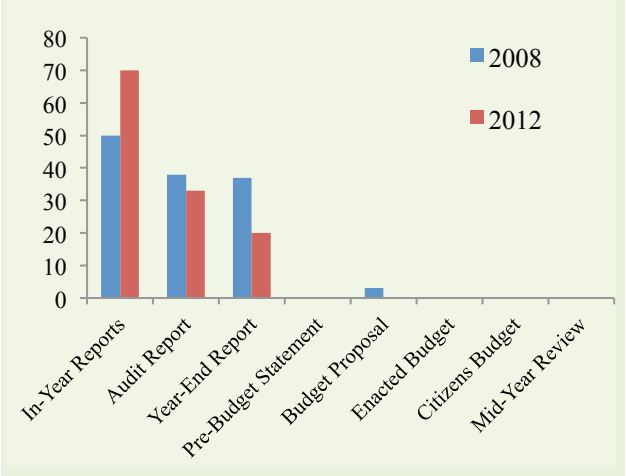
The global trend for middle- and high-income countries has been toward increased emphasis on performance budgeting (Arizti et al., 2010). Performance budgeting brings focus on the results that are being delivered rather than just the amount of money being spent, and it aims to strengthen resource allocation, effectiveness, efficiency, and accountability. Over two-thirds

FIGURE 4.14 China and G20 Fiscal Transparency Indicators, 2012



Source: Open Budget Survey 2012.

FIGURE 4.15 Elements of Fiscal Transparency Indicators for China, 2008 and 2012



Source: Open Budget Survey 2012.

of OECD countries now include non-financial performance information in their budget documents, drawing on sources such as strategic spending reviews, performance audits, and scorecards and benchmarking exercises.[55]

Because performance-informed budgeting places new demands on budgetary systems, sectoral agencies, and service providers, it is important to have realistic and gradual goals in increasing the performance orientation of the budget process. It is also important that the outputs or outcomes measured are reasonably attributable to the service provider. The experience of Korea in introducing performance-informed budgeting after the Asian crisis is useful for understanding some of these risks. It is also helpful for understanding the need to focus initially on the quality of performance information and the capacity and willingness of both budgetary and line agencies to use the information generated in a manner that constructively focuses on sustained improvements in performance and is not overly mechanical in its application (Park, 2010).

Just as budget systems aim to increase accountability for performance through various channels, human resource (HR) and compensation systems may do the same. The most obvious example is performance-related pay (PRP). China already has a significant element of this in education and health services. As of the mid-2000s, two-thirds of OECD countries had PRP for public sector workers or were introducing it (OECD, 2005; World Bank, 2013). However, the evidence on its impacts is mixed. For example, studies in the United States have found no impact on learning outcomes of bonus schemes for teachers in New York and Nashville schools. In contrast, recent evidence from developing country evaluations of bonus-pay incentive schemes for teachers suggests a more positive picture, although none of the evaluations to date have looked at long-term impacts.

However, PRP has given rise to particular challenges in China's health sector. While fee-for-service provider payments and strong emphasis on profitability of individual providers closely link pay with performance, the performance indicators of volume and value of services are not closely linked to quality and cost-effectiveness. As discussed earlier in this chapter, over-emphasis on volume and value indicators results in incentives for providers to over-service

[55] See www.oecd.org/gov/budget/database; and Aritzi et al., 2010.

and sometimes even provide harmful treatment. Future payment systems need to focus much more on quality-related information (e.g., infection rates, medical error rates, adverse events) to assess provider and facility performance, which in turn requires improved facility information systems, improved measures of "performance," and revised case-based payment systems that encourage efficiency.

China is gradually trying to strengthen its regulation, accreditation, and licensing capacity in the social sectors and beyond, but realizing the potential of such systems to drive quality improvements remains a challenge. The importance of more sophisticated regulation, accreditation, and licensing systems will increase as private and non-profit providers become a more common feature of the service delivery landscape in the future. The health sector, in particular, has the potential to benefit substantially. Globally, accreditation systems are playing an increasingly important role in driving quality and efficiency improvements in hospital care. Although China accredits its hospitals, the underlying hospital information systems needed to generate the data for more effective accreditation are usually absent.

Many developing countries have reformed management at the facility level to enhance both autonomy and accountability, as in the school-based management (SBM) model which is being explored in parts of China. This is a clear policy direction for education in China, with the 2010 National Educational Development Plan for 2010–2020 promoting the establishment of such school councils on a nationwide basis. Some provinces have extended the model to kindergarten and higher levels of secondary schools.

While empirical evidence on the impacts on school performance in China is limited to date, evidence on SBM from other middle-income countries such as Brazil and Mexico indicates that educational outcomes vary according to the degree of genuine autonomy given to schools. Greater autonomy is generally associated with better student performance. Several studies also show lower repetition rates and failure rates of students (Bruns et al., 2011). Globally, the countries with the highest levels of autonomy for schools have the highest scores in PISA and are rated among the best performing (e.g., Finland and Sweden).

Citizen-based channels for enhancing accountability

At the sub-national level, China has made efforts in recent years to improve the information available to the public on public finances. Guangzhou was the first city to publish all budgets from 2009, and the practice subsequently spread throughout the province. China also has program-specific transparency initiatives such as the publication of *dibao* applicants for public scrutiny and new requirements for budgetary management of extra-budgetary funds.

Many countries, including OECD and G20 countries, have found that increasing transparency of information about public service financing and delivery has created conditions conducive to better performance in service delivery. One tool which around 26 countries globally (including Indonesia, Brazil, Thailand, and Mexico) employed by 2012 is a "citizen's budget," which presents basic revenue, expenditure, and fiscal data in a user-friendly format to communicate directly with the public. OECD practice is also promising—for example, Korea's web-based D-Brain system [http://digitalbrain.go.kr] offers real-time access to fiscal data and citizen participation throughout the budget process. Many OECD countries also have sector-specific "report cards" generated by government agencies on facility-level performance, particularly in the health sector but also in education.

One tool is the citizen scorecard or user satisfaction survey, which provides quantitative feedback on citizen satisfaction with service delivery. Some hospitals in China undertake their own user satisfaction surveys in an effort to improve the efficiency of their facilities. Such a citizen report card was developed and provided the basis for a large-scale survey conducted in 2006 (Brixi, 2009). Globally, there are three broad models for such surveys: through fully independent third parties (such as NGOs), through the service-providing government agencies

themselves (who may contract out the survey but control the dissemination of findings), and through public agencies autonomous from the service provision agencies.

A related tool which may be more integrated into the regular processes of service delivery programs is the social audit, which allows citizens to review and cross-check information on a public program against user feedback and perceptions. This can be a useful tool where there is a solid authorizing environment for the social audit (such as a requirement in program implementation regulations) and a clear channel for the findings and recommendations of the audit to feed back into formal grievance and redress processes. Depending on the situation, facilitation of the social audit process by a neutral third party such as an NGO may also be useful. Perhaps the most famous example of a social audit is India's National Rural Employment Guarantee Program.

There is growing experience within China in incorporating citizens directly into management and oversight institutions for services, echoing experiences from other parts of the developing world.[56] The directions for enhanced citizen involvement in social services are also clear in some sectoral policies, such as the National Education Development Plan. Globally, there is positive experience in incorporating client satisfaction information into formal accreditation systems for hospitals.

Chinese practice and global experience also point to the importance of a sound legal and administrative authorizing environment for citizen participation in oversight and management of social services. Unless citizen roles are required rather than simply tolerated, and unless the redress mechanisms for failure of providers and administrators to give authorized powers to citizens have firm legal backing, such mechanisms will likely be simply cosmetic and will not fundamentally increase the accountability of providers to citizens. There is emerging practice within China in this regard, with Shandong province and Chengdu city having regulations that seek to clarify the scope of authority and underlying processes of the councils in order to give them a firmer jurisdiction.

Choice-based channels to promote accountability

To date, China has not fully exploited the potential for using client choice as a means of improving provider performance. Furthermore, the role of the private sector as a source of competition and quality comparison has been limited in China. However, urbanization offers greater potential for agglomeration of service providers and thus potentially enhanced choice for clients.

A first step to enhance client choice and use it as a driver of performance improvement is greater reliance on demand-side financing of services where appropriate. China invests public resources overwhelmingly on the supply side of social services, with notable exceptions such as health insurance. Where feasible, some financing could be shifted to the demand side through direct payments to citizens who then exercise choice among providers. A good example is the experiments in parts of China (e.g., Jiangsu, Meizhou in Guangdong) with vouchers for skills training.

A second area in which China can do much more to leverage improved service delivery outcomes is public purchasing of social services. This channel for promoting accountability has the most obvious potential in the health sector and for any social services for which provision is outsourced. As mentioned earlier in the chapter, the dominant position of local health insurance agencies as purchasers, through their reimbursement of insured services, provides an opportunity to improve provider performance. There is considerable experience within the East Asia and Pacific region (e.g., Thailand and Cambodia) and beyond in shifting to more

[56] See Gong and Yu (2011) on election of school principals by parents, students, teachers, and experts (Kunming); school councils (Nanjing and Shandong); and medical disputes councils with citizen representation (Nanjing).

active purchasing (Langenbrunner and Somanathan, 2011). In the education sector, the case of Shanghai in compulsory education for migrants is also instructive.

A third major area for reform is leveling the playing field between public and private providers of social services in order to deepen choice and competition. There is a range of social services for which private providers could potentially compete for public funding, such as higher-end health care, aged and long-term care, higher education, skills training, and preschool education services. The government is looking to encourage greater entry of private providers, including international health care investors who can bring global best practices in facility management and quality assurance. Global practice offers lessons in contracting out management of public hospitals to non-profit organizations, as has been done successfully in middle-income countries such as Brazil and a number of high-income countries.

4: STRENGTHENING INSTITUTIONS FOR AN INCLUSIVE AND PRODUCTIVE LABOR MARKET

In addition to ensuring equitable access to social services, a critical component of inclusive urbanization and rural-urban integration is having an inclusive labor market. Matching people to jobs where the private and social returns to their labor and human capital are maximized, as well as facilitating not only geographical but also sectoral and occupational mobility to underpin efficient job matching, are ever more crucial. Continued improvements in the skills of existing workers to make them more adaptable to technical changes are also key to increasing demand for skilled workers. This chapter looks at the remaining challenges in reducing barriers to labor mobility in China, with a particular focus on the key areas of skills accumulation and labor market institutions. In the area of skills accumulation, it assesses progress and proposes reforms in the technical and vocational education and training (TVET) system and higher education. It then examines the labor market institutions for wage setting, labor taxation, labor law, and labor dispute mediation.

CONTEXT AND CHALLENGES

While encouraging progress has been made in recent years, China still faces challenges in integrating migrants into the urban labor market. These challenges include:

- *Improving worker skills*. Migrant worker wages have increased very rapidly in recent years, and the end of "cheap Chinese labor" has already been documented (Li et al, 2012).[57] When wage increases outstrip productivity increases, firm profitability is affected negatively. In fiercely competitive sectors, this can lead to failure or relocation to lower-cost countries. For workers, this requires upgrading their skill levels so they can take up higher-skilled jobs, but rural migrants are considerably less educated compared to the urban workforce. With available jobs increasingly becoming jobs that are higher up on the value chain, migrants will have difficulty finding and keeping jobs.
- *Strengthening labor market institutions*. Despite progress in enforcing the labor laws and expanding social insurance coverage, rural migrants are overrepresented in the informal sector, with limited movement between informal and formal employment. In 2010, over 60 percent of migrant workers were in the informal sector (Park and Cai, 2011). As illustrated by Table 4.17, which shows flows into and out of the formal sector among those who changed jobs for both the 2001 and 2010 CULS survey rounds, the rate of movement among local residents both into and out of the formal sector was very low. The share of migrants moving from formal to informal sector employment was significantly higher, suggesting that relatively modest increases in migrant employment in the formal sector are easily reversed. Even when employed in formal sector jobs, migrants may have weaker attachments to formal sector employment. This is likely driven by a combination of factors such as shorter contract duration for migrants and lower attractiveness to migrants of formal sector employment benefits (Giles et al., 2013).

Beyond the integration of rural migrants, China faces other labor market challenges. Labor force participation is low among local urban workers over 50, especially women, due in part to low retirement age and limited possibilities for lifelong learning (Giles et al., 2011). At the

[57] For more on whether China has entered the Lewis turning point, see Cai, (2010); Zhang (2009); Wang (2010); Yao, (2010). At present, there is a consensus in the literature that rural surplus labor in China is depleted.

TABLE 4.17 Share of Job Changers Moving between Formal and Informal Employment

	2001	2010
% Moving from Informal to Formal Sector		
Urban Residents	1.1	1.3
Migrants	7.2	5.2
Total	2.1	1.9
% Moving from Formal to Informal Sector		
Urban Residents	14.5	2.6
Migrants	31.8	9.4
Total	17.2	3.6

Source: China Urban Labor Survey (2001, 2010).

same time, young college graduates are experiencing persistent unemployment (Bai, 2006). Due to the wage setting mechanism, substantial wage premiums exist in the state-owned enterprise (SOE) sector and PSU sector (World Bank, 2013). Although China's urban labor market has a relatively low degree of informality, a high tax wedge threatens to push both migrant and low-skilled urban workers to the informal sector.

Policies need to shape a labor market that is inclusive of migrants and efficient for all workers (Wu, 2004). As mentioned above, in an inclusive and productive labor market, workers can move to jobs where the returns to their labor and human capital are maximized, which requires geographical, sectoral, and occupational mobility. At the same time, to increase demand for skilled workers, continued improvements are needed in the skills of existing workers. Labor market and related institutions must provide channels for lifelong upgrading of skills, as well as balance wage and productivity growth. These areas of reform are discussed in greater detail below.

DEEPENING THE SKILLS BASE

While the overall quality of China's labor force has improved significantly since the 1980s, it remains a human resource-poor country compared to more developed countries. Of the 761 million employed, only 114 million are considered high-skilled. Half the workers have attained only the nine-year compulsory education, and among technical workers, only one quarter are qualified as high-skilled workers with skills certifications. Only 20 percent of Chinese workers have attained an education at the upper secondary level or above, compared with an average of 74 percent for OECD countries and 47 percent in the United States (OECD, 2013). According to the 2010 census, only about 10 percent of China's labor force is college-educated, a rate well below that of Korea, Japan, and the United States, where the college-educated share of the labor force is over 40 percent (OECD, 2013).

Even in the less developed areas of the country, skills shortages and mismatches have begun to emerge. A survey conducted in 2012 in Yunnan province showed that as many as 28 percent of the firms identified worker skills and education levels as the most severe constraint to growth, the second most common of all factors.[58] "Lack of required skills" was cited as a main problem encountered by firms in hiring for managerial and professional positions as well as for operative

[58] The results also revealed that in professional and managerial occupations, 34 percent of the firms consider leadership skills to be most important, followed by job-specific technical skills and communication skills. For frontline operational occupations, communication skills, job-specific technical skills, and numeracy skills were most commonly cited as the most important job-related skills. See Liang and Chen (forthcoming).

skilled workers. Notably, among China's 253 million rural workers (including 159 million migrant workers), as many as 69 percent have not received any type of training (NBS, 2008).

International experience shows that when economies move up the technology ladder, their need for education and skills at all levels grows, particularly at the tertiary level. As a provider of high-quality skills relevant to current and future labor market needs, higher education systems can improve human capital formation and allow entrepreneurs, managers, and skilled workers to perform well, thus supporting technological mastery, productivity, and competitiveness. Effective higher education systems can also help develop countries' technological capability by undertaking research, supporting technology transfer, and providing workers with skills for innovation. The subsections below discuss two important channels for skills accumulation in China: TVET and the higher education system.

Technical and Vocational Education and Training (TVET)

Current Status and Challenges

China has made numerous achievements in strengthening its TVET system. These achievements include: (a) dynamic school-industry collaboration at the majority of TVET schools and colleges, including student internships, customized training for enterprises, "factory in school" opportunities, establishment of training bases in industries for students and faculty, and even product research and development (R&D); (b) improved image and branding for TVET; (c) greater labor market relevancy of TVET curricula, along with more student-centered and hands-on pedagogy; (d) graduation of about 6 million students from secondary TVET schools annually, with a 95 percent employment rate since 2005, and about 10 percent continuing to tertiary-level studies; and (e) graduation of about 3 million students from tertiary TVET annually, with an employment rate of about 80 percent over the last few years.

However, a number of challenges still need to be addressed, such as the level of enrollment in TVET. As mentioned earlier in this report, the government set a policy goal for the enrollment ratio of TVET and academic programs to reach 50:50 at both the secondary and tertiary levels. While the current ratios are very close to 1:1, it will be increasingly difficult to maintain a 1:1 ratio at the secondary level as parents continue to favor general high school over secondary TVET schools. Ultimately, it may not even be desirable to aim for a 50:50 ratio between the academic and vocational tracks. A large majority of TVET students are from rural, migrant, or otherwise disadvantaged or "blue collar" backgrounds, and the 50:50 target may have unfairly pushed more migrant and rural children to the vocational track. In several EU and middle-income countries,[59] at least 60 percent of upper secondary students are enrolled in general programs, even though pre-vocational and vocational programs are offered. About 25 percent of total secondary enrollment in Singapore is in the TVET track, while in Korea, approximately 40 percent of secondary students chose to enroll in TVET institutions (UNESCO-UNEVOC, 2010).

Another challenge is the continued fragmentation of TVET governance, management, and provision across public sector agencies and a growing private sector. Both the Ministry of Education (MOE) and the Ministry of Human Resources and Social Security (MOHRSS) and their local departments are involved in TVET. For certain economic sectors such as transportation, health, and agriculture, line ministries share responsibility for delivering sector-specific training. No single government ministry or agency is in charge of TVET affairs in China, although MOE has been charged with a leading role in implementing TVET system reform under the direction of the Medium- and Long-Term Education Development Plan.

[59] Brazil, Canada, Chile, Estonia, Greece, Hungary, Iceland, India, Indonesia, Ireland, Israel, Japan, Korea, Mexico, New Zealand, Portugal, and the United Kingdom.

Quality assurance also remains a challenge. Reflecting the education and human resources dual-track provision of TVET, there are two parallel arrangements for quality assurance for education and training providers in China. Standards developed by both MOE and MOHRSS tend to be input-based, requiring a minimum level of school infrastructure, training facilities and equipment, number of majors, and qualifications of institutional head and teachers. Occupations and the corresponding competencies required have been changing rapidly, and the classification and competency standards need to be updated accordingly with further input from industry. Because schools must rely on their own capacity to revise and develop new training programs, the quality tends to be very uneven across schools. The overall lack of up-to-date, industry-led, competency-based occupational standards seems to have affected the overall quality of training programs. China does not yet have third-party accreditation of TVET providers.

Another challenge is to improve how TVET funding is allocated. More than 80 percent of total TVET financing comes from the government. The allocation of public funds in TVET relies predominantly on a formula based on the number of students and a fixed per-student expenditure. Allocation remains primarily supply- and input-driven, with very little demand-side intervention apart from student subsidies and localized examples of vouchers such as in Jiangsu and Meizhou in Guangdong. With the current resource allocation, huge disparities exist in secondary TVET across cities and prefectures and between urban and rural areas. Special funds for TVET tend to disproportionally benefit already stronger schools.

In terms of adult and labor force training, although the government clearly considers it a priority, the effectiveness and relevance of current government training programs need to be examined further. Training of surplus rural labor is critical for facilitating the transfer of rural workers to the secondary and tertiary sectors and preparing them for migration. Recognizing the importance of such training, the government has invested in a number of national training schemes in recent years. Although evidence indicates that such training improves rural household income (Liang and Chen, 2013), monitoring and evaluation of the various government training programs are lacking. Furthermore, the training programs often do not have clear links with employer demand.

Evidence indicates that work-based training is uneven across enterprises. The recent government requirement for enterprises to contribute 1.5–2.5 percent of the wage bill to training left implementation to individual enterprises. A recent study in Yunnan province found that while 90 percent of enterprises did provide some form of training, most provided training to less than 10 percent of their employees. Small- and medium-sized enterprises, in particular, face capacity constraints in forecasting and planning for employee training.

Proposed Policy Responses

The effectiveness and efficiency of the TVET system could be improved by greater coordination among government, education, and industry. In the short and medium term, the role of existing coordination mechanisms such as Interdepartmental TVET Coordination Committees could be strengthened for policy development, planning, and service delivery at both the provincial and local levels. In the long term, China might consider consolidating policymaking, planning, financing, and service delivery for TVET into an agency such as a new Skills Development Authority or into one of the existing ministries. This would eliminate the distinction between schools governed by the Department of Education and those governed by the Department of Human Resources and Social Security, as Shanghai has already done for its secondary TVET institutions. Consolidated governance and management will be even more critical for non-formal training, which appears to be even more fragmented and less structured.

Further efforts are needed to increase demand-side interventions and on-the-job training and to balance technical and non-technical skills training. Specifically:

- *Non-formal and rural training.* Public, private, and industry sources of funding for non-formal training could be consolidated into a single fund. A set of transparent funding criteria for the disbursement of training funds would be necessary and should be outcome-based rather than input-based to assure quality of training. Training vouchers would be another option, creating a competitive market for non-formal training while giving participants more choices.
- *On-the-job training.* As mentioned above, employers are currently required to dedicate 1.5–2.5 percent of their total wage bill to training, and China must ensure the effective implementation of that requirement. Other mechanisms that provide more incentives and quality assurance for work-based training should also be considered. In a few successful East Asian countries such as Korea, Singapore, and Malaysia, centrally pooled training funds have been used to improve the overall efficiency and equity of training.

Public investment in TVET could be improved further. More public resources could be directed toward promoting equity of financing and bridging gaps between rural and urban areas and between schools. Public finance should be targeted at helping TVET schools in disadvantaged localities, low-income families, and poor-performing schools with more resource constraints.

In addition to financial assistance, the government should provide technical and institutional assistance to facilitate the provision of work-based training, especially by small- and medium-sized enterprises. Technical assistance is particularly needed in the areas of needs assessment, training design and implementation, and monitoring and evaluation. Institutional support might include organizing groups of small- and medium-sized enterprises to reduce the cost of training design and delivery. The government can also systematically help firms build partnerships with training providers.

To enhance the relevance and effectiveness of TVET, the linkage between school and enterprise needs to be strengthened. Industry and employer involvement can play a key role in ensuring that the educational and training system, especially at the TVET level, is responsive to labor market demand. System- and school-level industry involvement should be legalized and institutionalized and its functions expanded to include contributing to a diverse range of policy issues, including setting skills development priorities, developing competency standards for skills certification, allocating resources, and monitoring performance.

The existing qualifications framework needs to be updated with standards and competencies that reflect labor market demand. In the long run, adoption of a common standard for assessing competencies would promote greater integration across the education system and with other countries. A National Qualifications Framework (NQF) could play an important role in this regard. Country-level frameworks have proven to be valuable in a number of countries, including Russia, the Netherlands, the United Kingdom, Ireland, and Australia. The EU has also established a voluntary European Qualifications Framework to promote mutual recognition of educational and skills qualifications. The potential benefits of such a system in China, with its diversity of institutional sub-systems of education and training, are substantial and could contribute to needed improvements in educational quality and labor market relevance.

The TVET system can benefit enormously from greater private provision. To help encourage greater plurality in TVET provision, the financing system for TVET would need to allow for public financing of non-state provision, within a solid regulatory framework to ensure that non-state providers meet quality standards.[60] Licensing and accreditation for non-state provid-

[60] On the supply side, this could be achieved by allowing for public financing of accredited non-state training institutions. On the demand side, public funds could be used to provide vouchers to students who would freely choose among public and non-state institutions. Local-level experiments with training vouchers in China (e.g., Meizhou in Guangdong; Jiangsu province) can provide lessons for potential demand-side interventions.

ers is very under-developed in China and would benefit from the experience of countries with well-developed training markets. For example, in Chile, the *Servicio Nacional de Capacitacion y Empleo* (SENCE), a specialized agency of the Ministry of Labor, maintains no in-house capacity for training provision and procures training services from public and private providers.

Stronger monitoring and evaluation are needed to help ensure implementation of policies and gauge the effectiveness of TVET efforts. The very fact that the monitoring system exists and works creates an incentive for local authorities and schools to implement required policies and adhere to standards. Evaluation results can be further used to promote good practices within the system and replicate them on a wider scale.

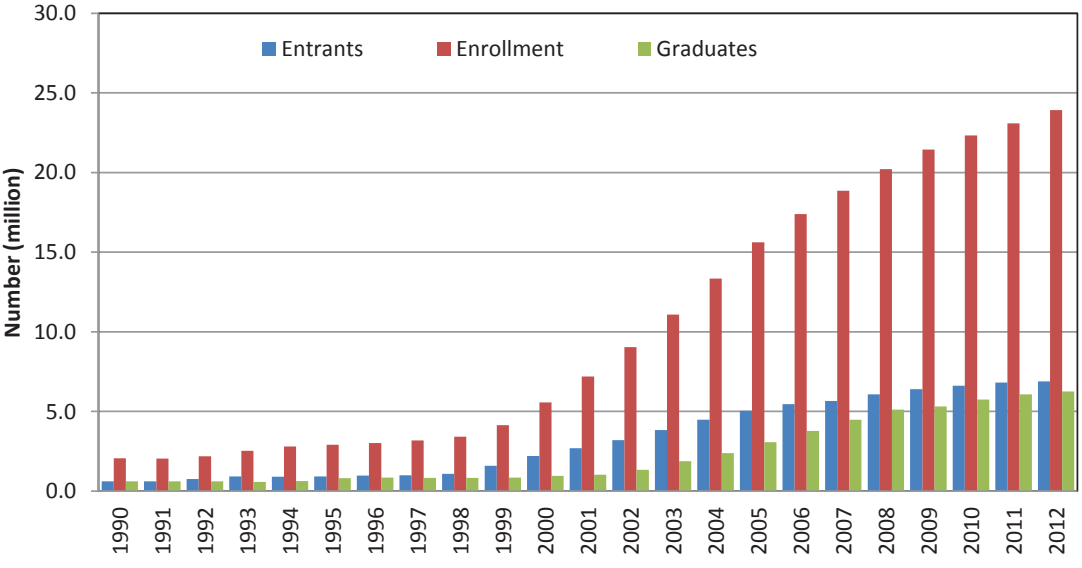
Higher Education

Current Status and Challenges

Higher education in China has expanded rapidly since the late 1990s. Historically, higher education in China was an elite institution, with a gross enrollment rate of less than 10 percent. In 1998, the Chinese authorities made the decision to expand higher education, starting with a target of increasing the gross enrollment rate from 9.1 percent in 1997 to 11.0 percent in 2000 (Ministry of Education, China's Education Revitalization Action Plan toward 21st Century). Rapid expansion took place between 1999-2009, with annual growth of more than 20 percent for both college entrants and graduates (Figure 4.16). By 2012, the gross enrollment rate reached 30 percent (Yue, 2013). China aims to achieve a higher education gross enrollment rate of 36 percent in 2015 and 40 percent in 2020 (Ministry of Education, China's Medium and Long-Term Education Reform and Development Plan 2010–2020).

This rapid expansion of higher education brought about lower labor force participation of young workers and appears to have resulted in difficulty for college graduates in finding jobs. With greater access to colleges, millions of youth chose to study longer and postpone entering the urban labor market, which is one reason for the emerging labor supply shortage in China (Wang, 2005). At the same time, it appears that college graduates have difficulty finding jobs—the employment rate measured at six months after graduation declined from 93.7 percent in

FIGURE 4.16 Expansion of Higher Education in China, 1990–2012



Source: China Statistical Yearbook (NBS, various years).

TABLE 4.18 Trends in Employment and Wage of College Graduates, 2008–2012

Year	2008	2009	2010	2011	2012
Employment rate (%)					
University graduates	87.6	88.0	91.2	90.8	91.5
Vocational college graduates	83.5	85.2	88.1	89.6	90.4
Average	85.5	86.6	89.6	90.2	90.9
Monthly wage (Yuan)					
University graduates	2133	2369	2815	3051	3366
Vocational college graduates	1647	1890	2142	2482	2731
Average	1890	2130	2479	2766	3048

Source: China College Graduates Employment Report (MyCOS, 2010, 2013).

1996 to 73.0 percent in 2004 (Lai and Tian, 2005). Evidence also indicates that the increased supply of graduates has had a downward effect on their wages (Wu and Zhao, 2010). Yet according to other sources (see results of a sample survey conducted by MyCOS in Table 4.18), the six-month employment rate of university graduates after graduation has been improving and rose from 87.6 percent in 2008 to 91.5 percent in 2012, while average initial monthly wage increased from 2133 RMB to 3366 RMB during the same period. Nonetheless, underemployment (part-time work or working in an unrelated field) among university and college graduates six months after graduating was high at 14 percent in 2011 (2012 Chinese college Graduates' Employment Annual report, MyCOS, 2012).

Both supply and demand factors likely contribute to the difficulty faced by college graduates in finding attractive, well-paid jobs. College graduates now account for nearly half of new urban labor market entrants. From the labor demand side, the urban labor market needs time to generate opportunities for skilled workers and absorb them. Another possible contributing factor to higher unemployment rates of recent college graduates is that new graduates with high expectations for jobs may be willing and have sufficient resources to take time to find the right job.

Although China is home to world-class universities, the rapid expansion of higher education has led to a decrease in the average "quality of graduates." China has dominated the first BRICS and emerging economies ranking of higher education institutions, taking 23 slots in the top 100 universities. Peking and Tsinghua universities ranked first and second (published by *Times Higher Education*). On average, however, the rapid expansion of higher education has been accompanied by a decline in the quality of education. Li et al. (2012) find a 26.4 percent return to attending an elite university for new graduates before controlling for student ability (proxied by examination scores) and a 10.7 percent return after doing so. Zhong (2011) analyzes data from 2002 and finds that the difference in earnings between graduating from a high-quality university and a low-quality university is 28 percent, with the gap being larger for those who graduated later. These findings suggest that school quality (or rank) provides some information on graduate quality and subsequent returns, and it is likely that students enrolled in new expansion colleges may be perceived to be of lower quality.

Decentralized financing and allocation of budgetary resources is an important factor in the decline of higher education quality. Although the expansion of higher education enrollments is impressive, the budgetary expenditure per student dropped from 8529 RMB in 1998 to 5941 RMB in 2005 (Yue, 2013). The allocation of budgetary resources is severely biased toward key universities and coastal provinces, but most of the enrollment increase has come from universities run at the provincial level. In 2011, the ratio of budgetary expenditures per student between key universities and provincial universities was 2.1:1, but provincial universities accounted for 83.1 percent of total enrollments.

Insufficiently qualified faculty and varying standards have also contributed to a decline in education quality. To meet the ambitious expansion targets, secondary vocational schools were

often upgraded to vocational (three-year) colleges, and vocational schools were upgraded to four-year regular colleges without obvious improvements in the quality of instructional staff or facilities. Some colleges also expanded enrollments without matching student increases with comparable increases in teachers and facilities. From 1990 to 2007, the student-faculty ratio rose steadily from 5.2 to 17.3.

The mismatch between higher education institutions and the skills needs of employers is a critical issue for quality of higher education.[61] The oversupply of college graduates for some majors partly reflects a disconnect with the urban labor market. Better matching of graduates to jobs may be greatly facilitated by reforms to increase the labor market relevance of higher education. In addition to problems finding workers with the right job-specific knowledge, there is also a broader criticism that the Chinese education system—including its universities—still does not do a very good job of teaching students some of the general skills desired by employers such as leadership, creativity, teamwork, and communication.

The unfinished governance reform has profound implications for the administration of higher education institutions and the quality and relevance of higher education. China has taken a gradual approach to shifting from its traditional "state-control model" to a "state-supervising model" for universities (World Bank, 1997). The autonomy of higher education institutions has increased in enrollment expansion, curriculum development, faculty recruitment, and international exchanges, and the majority of higher education institutions have been decentralized from the central ministries to provinces. However, universities are far from autonomous in their administration and management (Wu, 2011), and the roles between government and universities are not well defined.

Inequality in access to higher education is another significant challenge, due in part to university enrollment quotas. University enrollment quotas among provinces have been used since the 1950s, with a higher quota for the host province or city. In the late 1990s, some key universities—largely financed by the central government—started receiving support from local governments and started returning the favor by providing even higher quotas to their host provinces or cities. As a result, the chance of getting into Beijing University may be 100 times higher for a Beijing resident than an otherwise equivalent non-Beijing resident.

Another gap is evident in the enrollment disparities across different economic and social groups. Although more than 60 percent of the Chinese population resides in rural areas, a survey of Beijing university enrollment in 2007 showed that only 29 percent of the non-Beijing enrollment was from rural areas. The percentage of parents in China with college and higher degrees is only 5 percent, but the same survey showed that 31 percent of enrollees had parents with college and higher degrees. Ethnic minorities generally have a lower participation rate in higher education than Han Chinese.

Proposed Policy Responses

Greater efforts are needed to increase the labor market relevance of higher education, for example by strengthening the links between the higher education system and industry. Governments can improve their stewardship by ensuring that private and public providers complement each other, especially in meeting the skills needs of employers. They can ensure favorable policies,

[61] Of course, differences in employment outcomes could reflect differences in the ability of students studying different majors or the quality of colleges from which they graduated. Wage regressions based on surveys of college graduates from 19 colleges in 2010 by scholars at Tsinghua University, which distinguish among nine different categories of majors and which control for students' college entrance exam scores, the university they attended, and gender, find that the recent college graduates with majors with the highest starting salary are in engineering. The other types of majors and their negative wage premium relative to engineers are: other social sciences (not including economics) and liberal arts (3.4 percent), law (3.5 percent), natural sciences (8.1 percent), management (9.2 percent), education (12.9 percent), economics (17.1 percent), and agricultural sciences (26.7 percent). See Shi (2013).

clear and efficient regulation and information, and better access to student loans for both public and private providers. Governments can also connect firms and providers of skills and research by sharing best practices—from collaborating in curriculum development to setting up university incubators—and by offering incentives to make these university-industry links work.

Increased resources and improved investment efficiency for higher education are needed, which includes tapping the potential of private provision and financing sources. More public financial resources should be considered to improve teaching conditions and facilities, especially in lagging regions. Greater efficiency means being more selective and performance-based in the allocation of public funds across institutions for teaching and research and targeting scholarships and loans more effectively. One option is to review the current financing approaches and resources for both recurrent and capital funding so as to reward efficiency and encourage expansion at below-average cost. It is also important to encourage the expansion of private universities. Variable fee policies combined with effective loan schemes are one effective way to mobilize private resources while protecting access for the poor and disadvantaged.

Within the system for managing public higher education institutions, universities should have greater institutional autonomy and accountability. China should continue the transformation from a state-control model of higher education governance to a scenario in which it plays the crucial role of planner, coordinator, and supervisor, involved nationwide in quality assurance in terms of standards setting, monitoring, and evaluation. Further reforms include providing more institutional autonomy with clear accountability, a quality assurance and accreditation framework, credit transfer system, strategic and equitable financing, better coordination in overall planning (including the possibility of setting up an autonomous higher education commission), more exchanges with world-class universities, and improved student loan and scholarship programs.

The current provincial quota system among higher education institutions should be reviewed. There have been various proposals on how to revise the current quota system, a system that tends to favor provinces with the most tertiary institutions. The most favorable proposal is to slowly increase the quota for more populous provinces rather than abolish the quota immediately, as the latter may result in increased inequity if admission is based only on college entrance exam results.

ALIGNING LABOR MARKET INSTITUTIONS TO BETTER SERVE THE NEEDS OF THE URBAN LABOR MARKET

Regulation of the employment relationship has evolved with the transition to a market economy, with China's legal labor standards becoming more protective over time. Box 4.1 provides an overview of some of the country's main labor laws.

Labor market institutions can have important impacts on labor mobility, income distribution, and social cohesion. These are key for balancing the twin objectives of productivity enhancement and maximization with distributional fairness. This section focuses on four key labor market institutions that have important implications for the urban labor market: wage setting (including minimum wage and collective bargaining), labor taxation, labor law, and labor dispute mediation.

Building a Modern Wage Setting Mechanism

Current Status and Challenges

Real minimum wages (MW) have increased rapidly across China since the mid-1990s, as illustrated by Figure 4.17. With the notable exception of 2009 (when no provinces adjusted MW due to the shocks of the global financial crisis), the share of provinces making upward adjustments in MW has increased significantly in recent years. The ratio of minimum wage to average

BOX 4.6 Main Labor Laws in China

National Labor Law (1994): This was the first National Labor Law and came to be a foundational law that set out key principles and institutions to guide the reform of labor relations in China, moving away from the previous system of state administration of employment, lifetime employment, extensive enterprise-provided welfare, and limited labor mobility. This national law enshrined features such as: a labor contract system that stipulated written contracts to establish a labor relationship; five types of social insurance that rely on employer and employee contributions to socialized pools; a system of labor dispute resolution that resolves labor conflict via mediation, arbitration, and litigation; and legal standards for working hours and vacation time. In important contrast to the previous era which enshrined deep divides between workers based on work-unit and *hukou* status, the 1994 law also aspired to cover most workers in most types of firms. The law also featured articles on minimum wage regulation, although more detailed guidelines on minimum wage setting did not emerge until 2004 and 2007. The first provisions on collective contracts can also be found in the 1994 Labor Law, and a series of guidelines and regulations have been issued periodically since then.

Labor Contract Law (passage in 2007/implementation in 2008): The Labor Contract Law was passed in order to enhance legal protections of China's workers, improve working conditions, increase wages, stabilize employment, and improve participation in social insurance programs. This was done in many ways, including mandating that companies sign open-ended contracts with employees after completion of two fixed-term contracts. It also provides the legal framework (supplemented by the 2010 regulations for the "Rainbow Plan" of MOHRSS) for expansion of collective contracting in firms with trade unions. More recently, the National People's Congress has been working to close loopholes in the 2008 law related to labor subcontracting. The 2012 revisions to the Labor Contract Law placed new restrictions on labor subcontracting and introduced stricter regulations on the establishment of labor subcontracting agencies, including stipulating that labor subcontracting can only be used for workers who are "temporary," "auxiliary," or "substitutes" for workers on leave.

Labor Dispute Mediation and Arbitration Law (2008): This law changed some aspects of the resolution system considerably and expanded access to the labor dispute process for employees. It reduced the fees to go to arbitration and litigation, lengthened the statute of limitations for labor violations to one year (from sixty days), and simplified the dispute resolution process for some disputes, including making some disputes final at arbitration (without the opportunity for court hearings). The new law also placed more of the evidentiary burden on employers, even when the employee initiates the dispute. In short, it followed the general spirit of President Hu Jintao's administration in placing more emphasis on mediation as the primary and preferred way to resolve labor disputes.

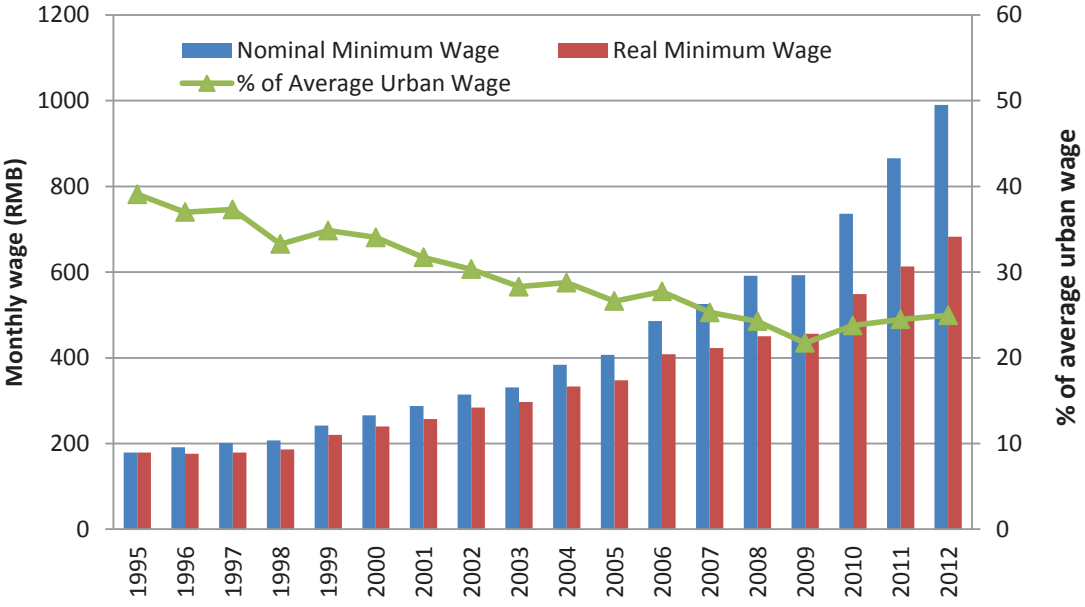
Other noteworthy laws that offer increased employment protection are the **Employment Promotion Law (2008)** and the **Social Insurance Law (2010).** The former strengthens restrictions on discrimination, while the latter extends social insurance to more workers and increases the likelihood of portability of insurance across administrative jurisdictions.

Source: World Bank staff compilations from various sources.

urban wage increased from 21.7 percent in 2009 to 25.0 percent in 2012. According to the 12th Five Year Plan, the policy goal is to increase the minimum wage with an annual growth of 13 percent, reaching more than 40 percent of local average wage in most provinces. In comparison, the average ratio of minimum wage to average wage ranges from 19.0 percent in Mexico to 51.0 percent in New Zealand, with an average of 37.2 percent in OECD countries (World Bank, 2013).

The minimum wage is increasingly not a wage that workers generally are paid in urban areas but a reference point significant in its relationship to overall wage levels and to social benefits

FIGURE 4.17 Urban Minimum Wage Adjustments, 1995–2012



Source: World Bank Team, calculated from Minimum Wage Dataset from labor bureaus and yearbooks.

and thresholds. While minimum wages have adjusted sharply upward in recent years, the vast majority of formal and informal workers in urban areas have labor incomes above the official minimum. Empirical results reveal that almost all workers—migrant or local, men or women—receive labor income above the city-level minimum wage (Cai et al., 2011b).

The multiple policy objectives of the minimum wage in China may at times dilute its pure labor market function. The current MW policy functions as a broader social policy, a signaling device of the government's concern for low-income workers, and perhaps also as an instrument of local industrial policy in terms of cross-prefecture competition. The social policy trade-offs have been masked by a wide set of indicators and criteria in China's MW guidelines and practice. To date, these trade-offs have perhaps not mattered since labor productivity has outstripped average wage growth and since migrant and low-income workers have had to "catch up" after relative stagnation of their real wages in the 1990s. However, this period will not last forever, and it may become necessary to adopt a more scientific approach to MW policy.

Proposed Policy Responses

The basic function of the minimum wage should be reoriented by shifting from the current "living wage" approach to a "wage floor" approach, which is more common in OECD countries. The primary function of the minimum wage is to ensure that workers are not exploited due to their limited bargaining power and that they receive a wage that fairly reflects their contribution to productivity growth. It is not intended on its own to keep families out of poverty, which is the purpose of other policies, particularly social protection programs. Setting minimum wages too much according to their poverty function can actually harm low-income workers by increasing unemployment or pushing them into the informal sector.

The key distinction between the "living wage" and "wage floor" approaches is that some measures of productivity growth or competitiveness are the primary factors in the "wage floor" approach. Like the current approach, the "wage floor" approach takes into consideration numerous factors in determining the minimum wage, many of which are already reflected in China's minimum wage guidelines. However, while price inflation and other factors remain important under the "wage floor" approach, the key is adjusting minimum wages to reflect productivity

growth. China has elements of this approach in its current policy, but the relative balance between a needs-based approach and a productivity-based approach is toward the former.

In order to shift toward a "wage floor" approach, the system of labor market statistics must be improved so timely and reliable measures of productivity are available to the authorities setting minimum wages. At present, the Chinese statistical system does not produce such measures on a timely basis. Deeper reforms of labor market statistics systems will be necessary, with regular surveys of representative samples of firms and workers.

More broadly, wage outcomes in the urban labor market indicate that varied mechanisms are driving wage setting. In the competitive and private sectors, there have been positive signs of rapid wage convergence between migrant workers and between migrant and local workers, indicating that the labor market fundamentals of demand and supply are overcoming rigidities in wage setting mechanisms. The convergence can be seen in the falling differential in average hourly wages over the 2000s and in the degree of difference that can be explained by observable individual and job characteristics. In contrast, evidence on wages in monopoly sectors (mainly dominated by SOEs) shows that a high wage gap remained between SOE workers and those in competitive sectors. Around half of that difference could not be explained by the human capital characteristics of workers in the monopoly and competitive sectors (Yue et al.).

Enforcing wage discipline in the SOE sector will be challenging but could yield significant benefits for the Chinese economy and a more equitable distribution of wages across society. The current wage premia of SOEs reflect underlying distortions in the operating environment of SOEs and are difficult to justify on efficiency or equity grounds. A robust and transparent system of benchmarking wages could be established to determine SOE wages by reference to relevant comparators in the wider labor market, rather than simply the amount of profits available for distribution to workers. In the case of local monopolies, it would also be useful to benchmark their wages across regions to get a broad sense of within-industry comparability and identify outliers. Over the longer run, the direction of reform would be to have SOEs conduct collective consultation and bargaining in the same way as other firms under current labor legislation.

For the public sector, wage setting is determined separately, and the mechanism for wage setting is not systematic. A big question for China is the extent to which it wishes to have performance-based pay as an element in setting wages for workers in the education and health sectors. As discussed earlier, it is clear that pure PRP is not suitable for teachers and health providers due to the perverse incentives that may result, so if it is to be applied, a base compensation with some degree of bonus would be more appropriate. International experience also suggests that a "one size fits all" approach to PRP should be avoided. The issues in wage setting for PSUs are somewhat distinct, with the additional challenge of promoting accountability of public sector workers while ensuring that they are compensated adequately. Given the unsystematic nature of PSU wage setting, it would be desirable in the short to medium term to develop a national strategy for PSU wage setting reform, including for social services.

Collective bargaining is still at an early stage of development and needs further reform to transition from "wage consultation" to true bargaining in the international sense.[62] Evidence shows that such consultation has reduced labor confrontations in multinationals that have such mechanisms, but it is also clear from the rising incidence of labor disputes in China that much remains to be done. A key challenge in developing truly tripartite wage bargaining is the role of the All-China Federation of Trade Unions (ACFTU), which is still evolving toward a role as the representative of workers in wage discussions. As growth moderates, it is important to provide an effective voice for both workers and employers in the bargaining process to reach a win-win situation.

[62] See Shen and Benson (2008) for a useful comparison of Chinese wage consultations and typical ILO standard wage bargaining. Bai (2011) discusses the role of ACFTU and interactions with the interests of capital and labor.

TABLE 4.19 Social Insurance and Housing Fund Contributions in Urban China

Type	Employer	Employee
Social Insurance		
Pension Insurance	Mostly 20% (10-22%)	8% (no variation)
Unemployment Insurance	Mostly 2% (0.5-2.5%)	Mostly 1% (0.2-1%)
Medical Insurance	Mostly 8% (5-12%)	Mostly 2%
Work Injury Insurance	0.5-2%	No contribution
Maternity Insurance	0.5-1%	No contribution
Sub-Total	31-33%	11%
Housing Fund Contributions	Roughly average 10% (5-20%)	Roughly average 10% (5-20%)

Source: World Bank staff compilation based on various documents of MOHRSS and DHRSS.

Reducing Labor Tax

Current Status and Challenges

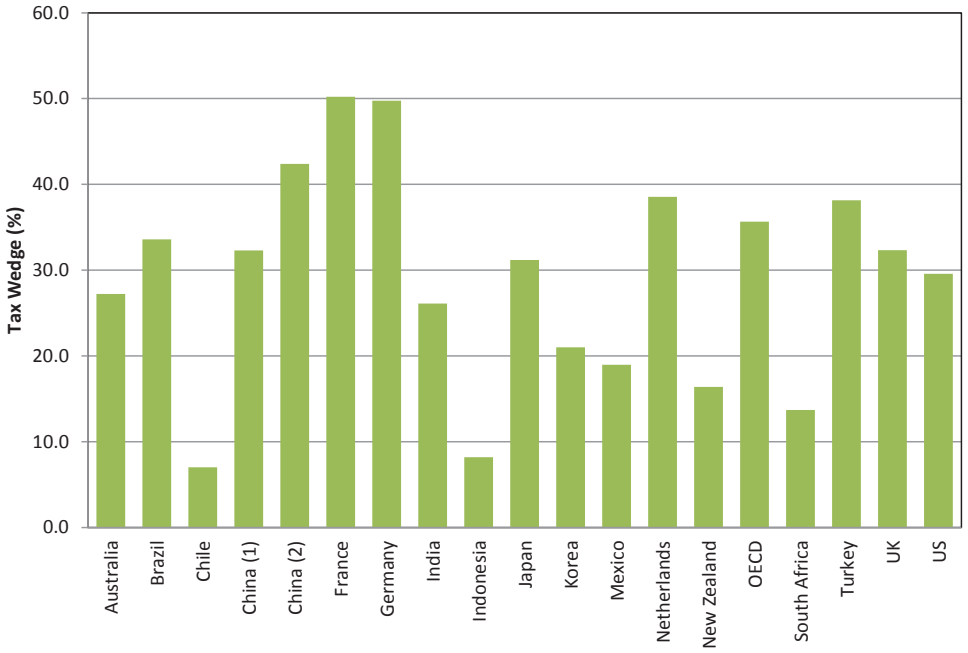
China taxes labor at a high rate, with five compulsory social insurance schemes and one urban compulsory housing fund program that require contributions. As shown in Table 4.19, employers are required to contribute for all five insurance schemes (pensions, medical insurance, unemployment insurance, work injury insurance, and maternity insurance) and the housing fund program, while employees are required to contribute for three insurance schemes (pensions, medical insurance, and unemployment insurance) and the housing fund program. The rates of social contributions are high by any standard and exhibit considerable variation across cities and within provinces. Pensions dominate social insurance contributions, largely due to the high costs of funding legacy pension costs. Contributions for the housing fund, which aims to provide financial support when workers purchase new housing, are also high, and it is not clear that this program has significant benefits for middle- and low-income workers.

Furthermore, social insurance contributions are based on minimum payments that imply significantly higher contribution rates for low-income workers. The urban social insurance contribution requires a minimum payment for workers equal to that which would be paid by a worker earning 60 percent of the local average wage and a maximum payment of 300 percent. Therefore, if a worker earns less than 60 percent of the local average annual wage, the worker and employer must make the same contribution as a worker earning exactly 60 percent of the average wage. This non-linearity at low-income levels introduces a significant disincentive for low-wage workers—primarily part-time workers, migrants, and lower-income self-employed workers—to participate in social insurance. Studies show that about one-third of all workers fall below the minimum contribution base threshold (DRC and World Bank, 2012).

An international comparison reveals that the "tax wedge" on workers is higher than the average of OECD countries, other big emerging countries (such as Brazil, India, Indonesia, Mexico, and South Africa), and East Asian regional comparators. Figure 4.18 shows the "tax wedge" on labor for a single worker on average wage in urban China compared with other countries.[63] With housing contributions, China's tax wedge of 42.4 percent in 2012 is very high. It approaches the average of OECD countries even excluding housing fund contributions and is still higher than most comparators. In addition, the share of social insurance

[63] The tax wedge is calculated as (total labor cost - net take home pay)/total labor cost. So for China, assume payroll = 100 RMB, then total labor cost (100 + 42) = 142; net take home pay (100 – 22) = 78; and tax wedge = (142 – 78)/142=45.1 percent. For many countries, one would also calculate the PIT levied after deduction of SI contribution, and OECD also allows for transfers from the state (e.g., income tax credits). In China, neither of these is included in the calculation for the average urban worker who falls below the PIT threshold. See OECD for data across countries.

FIGURE 4.18 An International Comparison of Tax Wedge, 2012



Source: OECD, 2013. Gandullia, et.al, 2012.
Notes: (a) Results for China (1) exclude housing fund contribution, while for China (2) include housing fund contribution, which are calculated by the World Bank team; (b) Results for Brazil and India in 2010, results for Indonesia in 2009.

contributions in the total tax wedge is even higher, as most countries have a tax wedge comprised of social contributions and personal income tax (PIT), while the average worker in China does not pay PIT.[64]

High labor taxation has implications for China's labor market dynamics and long-run competitiveness. It places heavy burdens on both employers and workers and likely encourages informalization of the labor market. Employers game the system in numerous ways, while workers have incentives to opt out of participation in social insurance schemes. In response, local city governments may choose different treatments of social insurance and housing fund programs for local and migrant workers in order to avoid high labor taxation on employers. For example, Shanghai only applies three social insurance schemes (pension insurance, medical insurance, and work injury insurance) to cover rural migrant workers. Notably, most urban social insurance funds continue to generate significant surpluses, a situation that can be justified for a maturing pension system but not for other forms of insurance.

As in other developing countries, high mandated contribution rates provide a strong incentive for employers to evade compliance through the use of labor dispatch services and underreporting of employment and wages (Aterido et al., 2011; Gallagher et al., 2013; Perry et al., 2007). This phenomenon is particularly pervasive among private enterprises and self-employed businesses, but it occurs even among firms with considerable state or foreign investment. While estimated evasion rates have fallen from a high of 41 percent in 2000 to 2.4 percent in 2010, this apparent improvement comes with caveats and should be interpreted with caution appropriate to the use of administrative data voluntarily provided by firms.

[64] For PIT tax relief, China has raised the monthly deduction from RMB 2000 between 2008 and 2010 to RMB 3500 since 2011. The taxable earnings on average for all provinces in 2012 do not need to pay PIT by applying the new standard.

Evidence from the 2010 China Urban Labor Survey suggests that similar evasion of participation may be occuring in China, particularly for migrant workers. Giles et al. (2013) show that higher labor taxation has negative impacts on the participation of local *hukou* workers but not on migrant workers. Local *hukou* workers facing a higher labor tax wedge are less likely to be covered, with a 1 percent increase in the labor tax wedge associated with a 0.24 percent reduction in the probability that a local *hukou* employee will participate in the urban worker pension scheme. However, there is no impact on the participation of migrant workers, perhaps due to selective formalization and limited expected returns. Employers may use dispatched workers or collude with migrant workers to refrain from participating. Under the current pension program, a worker who moves out of a city has access to the 8 percent individual contribution but loses 88 percent of the employer contributions. The limited transfer may lower the expected value of participating for migrants far more than for local *hukou* workers, given their high mobility.

Proposed Policy Responses

As part of its overall adjustment of the tax structure, it would be desirable for China to lower the tax burden on labor over time. Even within the current system, labor taxation could be reduced together with social sector reform without unduly lowering the benefits that workers derive from their contributions. Another issue that could be addressed in such reforms is the high marginal contribution rate for low-paid workers, which would be important to consider as part of a wider strategy to incentivize formal sector participation. More specific measures are discussed below.

The pension contribution has potential for reduction, although it is a more complex matter if worker benefits are to be protected. However, there is a space through a sound master design to reduce contribution rates significantly while protecting the replacement rates of pensions on the basis of sustainability. As discussed in Chapter 3, measures could include: (i) using a Notional Defined Contribution (NDC) approach to reform the urban workers scheme and resident pension scheme; (ii) developing a financing strategy to resolve the "legacy costs" outside the reformed pension system, prefunding to cope with the acceleration of population aging, and improving pension reserve management; and (iii) upgrading the full pooling from city to province and finally to the national level, and strengthening data and information management.

Given the surpluses of Employment Funds and the sustained low unemployment rate in China, another option is to reduce the unemployment insurance contribution. The unemployment insurance contribution is currently at 3 percent. The use of such funds for training and other purposes could be substituted by general revenue financing and would most likely induce efficiencies which are not promoted currently through the guaranteed revenue of the unemployment insurance contribution. In fact, some cities like Beijing have reduced contribution rates and mobilized the surplus funds to provide training for workers.

The housing contribution is another area for reducing social contributions. The high share of workers and employers who have already opted out of the housing scheme points to low demand for the program, in large part due to negative real returns, inadequacy of benefits, and inequitable usage of funds (World Bank, 2013). While there is a huge need to look at housing policy for workers, housing funds have proven to be an ineffective way of achieving the desired protection and may have helped inflate property markets by acting as a cheap source of liquidity for local authorities. The primary source of resistance to such a reform would thus likely be local authorities rather than workers or employers.

Implementing the Labor Contract Law

Provisions of the 2008 Labor Contract Law (LCL) have reversed the trend toward informalization of China's labor market. The 2008 LCL introduced much more severe penalties for failure

to sign a written contract in a timely fashion. Firms that do not sign written labor contracts after one month of employment must pay double wages for the time the worker was employed without a contract (article 82, LCL). The firm can also be forced to sign a non-fixed term contract with an employee who works for one-year without a written contract (article 14, LCL).

The LCL and the overall trend toward increased worker protections have benefited migrant workers. Despite weaker enforcement of the LCL after the onset of the global financial crisis in 2008, research shows that the proportion of workers with written labor contracts has increased significantly, particularly among migrant workers. The 2010 CULS found that 71 percent of local resident workers had written labor contracts, an increase from 65 percent in 2005, while the proportion of migrant workers with a contract increased from 12 percent to 34 percent. However, regional variation in enforcement and compliance with the law remains significant (Gallagher et al., 2013; Freeman and Li, 2013).

Social insurance participation has also improved since passage of the LCL, although the rates of participation are still much higher for local residents than they are for rural migrants. In 2005, 77.5 percent of local resident employees had pension coverage, and 68.9 percent had health insurance provided by their employers. These rates increased to 88.5 percent for pensions and 85.8 percent for health insurance by 2010. For migrants, these coverage rates increased more modestly, from 22.2 percent to 23.8 percent for pensions and from 20.4 percent to 21.8 percent for health insurance. As discussed earlier, evidence suggests that employers and rural migrants may collude to avoid paying into social insurance programs in exchange for higher wages (Gallagher et al., 2013; Giles et al., 2013), indicating that enforcement is not only a problem of firm non-compliance but also of worker non-compliance. Worker non-compliance is related to lack of confidence in the portability of these programs among highly mobile, young migrant workers.

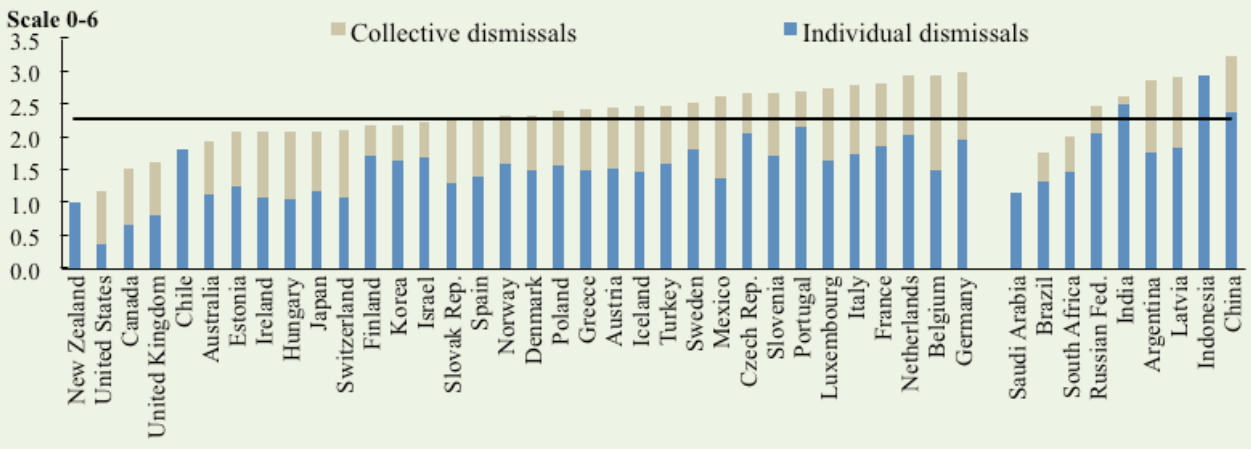
The LCL's restrictions on the use of short-term contracts, which increased employment security for workers, significantly raised costs for employers. Article 14 of the LCL states that a worker who has concluded two fixed-term contracts should be extended a "non-fixed term" contract for the third extension of the labor relationship, and workers on these contracts can be terminated only with cause. Showing cause for termination is a lengthy process and usually requires significant documentation and justification. Furthermore, the earlier Labor Law required severance when contracts were terminated early for cause but not for expiration, but the LCL requires severance upon expiration, with one month of wages for every year of employment.

Given the reduction in flexibility and the added costs associated with open-ended contracts, the LCL also created incentives for employers to expand use of labor subcontracting. According to a report issued by the ACFTU, workers hired under labor subcontracts numbered 37 million, or 13.1 percent of the workforce, in 2011. The ACFTU found labor subcontracting used extensively in large SOEs, many government and social organizations, as well as some foreign-invested and private enterprises (ACFTU, 2012). Subcontracted workers usually earn less than formally employed workers and receive lower social insurance contributions.

Since 2008, the National People's Congress (NPC) has worked to close loopholes in the 2008 law related to labor subcontracting. The 2012 revisions to the LCL placed new restrictions on labor subcontracting and introduced stricter regulations on the establishment of labor subcontracting agencies. While the revisions went into effect as of July 2013, the MoHRSS has yet to release detailed guidelines on the maximum proportion or number of workers that may be employed through labor subcontracting. Since the 2012 revisions to the LCL were passed, companies began looking for other ways to avoid using open-ended contracts, such as using outsourcing companies. Some localities such as Jiangsu have responded by restricting the use of outsourcing companies.

China's labor laws now exceed the OECD average for employment protection considerably (Figure 4.19). In areas such as individual dismissal and collective dismissal, China's protections exceed those of many other developing countries and those of all OECD countries. According to the OECD Employment Protection Indicator, in 2008, the average rate of protection for

FIGURE 4.19 Protection of Permanent Workers against Individual and Collective Dismissals, 2013



*Data refer to 2013 for OECD countries and Latvia, 2012 for other countries. The figure presents the contribution of employment protection for regular workers against individual dismissal (EPR) and additional provisions for collective dismissal (EPRC) to the indicator of employment protection for regular workers against individual and collective dismissal (EPRC). The height of the bar represents the value of the EPRC indicator.
Source: OECD Employment Protection Database, 2013 update. www.oecd.org/employment/protection

OECD countries was 2.25 (on a scale of 0 to 6). Among the ten developing economies examined in the report, only Indonesia exceeded China's protection level. Both Indonesia (3.0) and China (2.75) were considerably higher than the OECD average.

The medium and long-term impacts of enforcing this law should be carefully monitored so that improvements and amendments can be made as needed.

Mitigating Labor Disputes

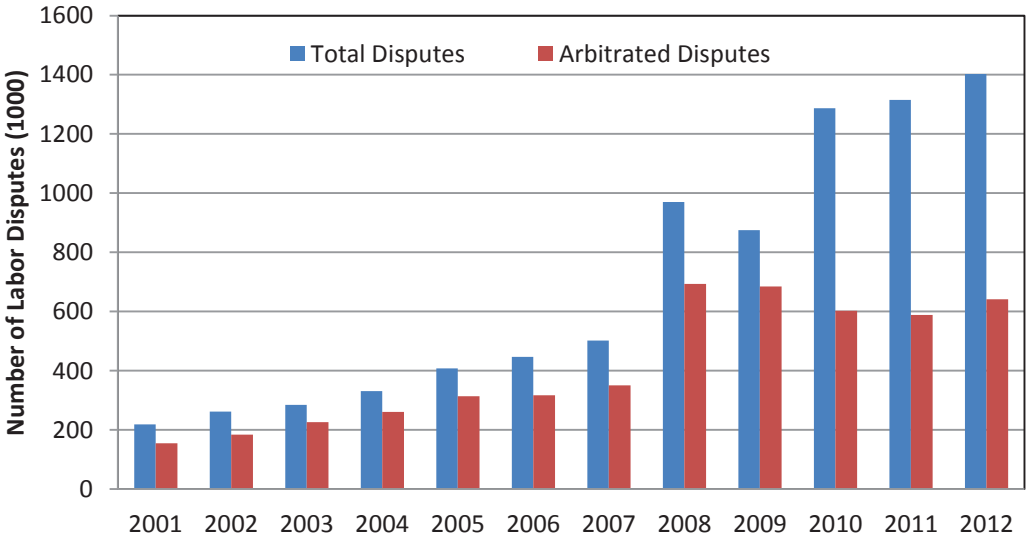
The number of labor disputes has exploded since the passage of new laws in 2008. In 2008, the NPC passed the Labor Dispute Mediation and Arbitration Law, which changed some aspects of the resolution system considerably and expanded access to the labor dispute process for employees.[65] As shown in Figure 4.20, labor disputes nearly doubled in 2008 and continued to rise afterward. In 2011, 34 percent of all arbitrated disputes were about compensation; 25 percent were about social insurance; and 20 percent were contract termination disputes. About 53 percent of all social insurance disputes were about work injury insurance. Rural migrant workers are involved in the majority of labor disputes.

Labor disputes are becoming more complex, more difficult to resolve in a timely fashion, and more likely to have large impacts on public opinion and social stability (Labor Dispute Statistical Analysis Report, 2010). The dispute process can be long and complex, particularly for workers with lower levels of education and little legal assistance. Enforcement of arbitrated and litigated judgments can be difficult, especially when they require action on the part of employers such as reinstatement and job reassignment. Aggrieved workers, while continuing to make use of the resolution process and the courts, are also becoming more strategic in their use of the media, social media, and public opinion to garner sympathy and to put pressure on the government, the judicial institutions, and their employer to reach a favorable decision.

A large number of disputes are settled through mediation before reaching arbitration, but the number of cases proceeding to arbitration is still rising due to the total increase in disputes.

[65] The law canceled the fees for labor arbitration and extended the statute of limitations on labor violations from sixty days to one year. The new law also placed more of the evidentiary burden on employers even when the employee initiates the dispute.

FIGURE 4.20 Total Disputes and Disputes Settled through Arbitration, 2001–2012



Source: China Labor Statistical Yearbook (NBS 2012b); MOHRSS, Statistical Bulletin of Human Resources and Social Security Development (MOHRSS 2008–2012).

In 2012, there were about 1.4 million labor disputes, with 54 percent resolved by mediating units before reaching arbitration. Despite the push for more mediation, the number of suits going to the courts has also increased sharply. Arbitration is compulsory, so all disputes after mediation must go through arbitration. However, arbitration is not necessarily final since either side may appeal and proceed to civil court for a new hearing on the case. In 2005, more than 35 percent of all arbitration judgments in Shanghai were appealed in court (Dong, 2008).

Many local governments have lacked the capacity and expertise to handle the large increase in disputes since 2008 efficiently and effectively. China's recent promotion of mediation is unusual in that it relies on non-specialists, local government officials or cadres, and neighborhood volunteers to resolve complicated employment issues. Local courts report very large caseloads, long wait times, and frustrated litigants (Zhao, 2008). The wait time for an arbitration hearing has lengthened to several months, and workers who appealed rulings to civil courts often face a one- or two-year wait for final resolution (Gallagher et al, 2013). In the case of large labor conflicts that threaten social stability, local governments have developed cross-unit stability preservation committees to manage large incidents.

While the resolution system may be effective in the short term, it carries the risk of inefficiency and creates incentives for escalation. The current strategies for dispute resolution are very reactive to problems as they occur, and they fail to prevent disputes from arising in the first place. They lead to the loss of economic gain for employers and employees and also rely heavily on the government in terms of staffing and resources. Furthermore, in the context of large conflicts—sometimes involving thousands of workers—there are strong incentives for extreme action to draw the attention of the public and the media and to put pressure on the government for a settlement favorable to their demands.

China's system of labor dispute resolution is much more centralized than the systems of the United States, Japan, and United Kingdom. When disputes are numerous, as they have been since 2008, this centralized system puts great pressure on arbitration committees and local civil courts. China's labor inspection system is much less central to the dispute resolution process, unlike in the United States and Japan where administrative agencies play an important role in investigating and handling statutory violations. China's system is also more open-ended than processes in many other countries, which can lead to a very lengthy resolution process.

The current dispute resolution system is organized to settle "rights" disputes but not "interest" disputes.[66] As Chinese workers' consciousness of protections has increased, and with tight labor markets putting upward pressure on wages for migrant workers and manufacturing workers in general, an increasing number of disputes in China are "interest disputes" rather than "rights disputes." Some of the recent high-profile collective work actions in China (such as the 2010 Guangzhou Honda strike) involved such disputes, but China's system of labor dispute resolution does not include structures to resolve interest disputes. This institutional vacuum may partly explain why collective work actions such as strikes and demonstrations have increased in recent years.

A pressing need for China is to develop a system to mediate and negotiate "interest disputes." Because enterprise trade unions in China do not serve as strong representatives of the workforce, interest conflicts are often managed reactively, after workers have spontaneously protested by striking or taking some other kind of industrial action. Reactive settlement leads to loss of production for the company and loss of wages for the workers. In many cases, the local government must be called in to manage the negotiation.

[66] "Rights disputes" are disputes that involve statutory or contractual claims, while "interest disputes" are disputes over interests (e.g., wages, work conditions, and work organization) that do not involve allegations of violations of minimum legal standards or contractual obligations.

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Supporting Report 5

China's Urbanization and Food Security

The text of this Supporting Report is in progress and will be shared at a later date.

Supporting Report 6

Financing Urbanization

Introduction

China's current approach to financing urbanization has been reasonably successful in mobilizing the resources that cities needed to grow their economies, build the infrastructure required by the economy, and deliver services to the expanding urban population. China has experienced a high growth of urbanization rate for three decades, and the way China proceeded with urbanization has been pro-growth, with resources being effectively mobilized and geared toward industries and productive infrastructure. In turn, the high economic growth contributed to improvements in household welfare through higher income and better public services and infrastructure. This approach has served China's interest fairly well.

As China enters a new stage of development, the downsides of this old pro-growth urbanization model have become more apparent. The existing urbanization model has relied heavily on land conversion and land financing, and on production-based derivative taxation, which has caused urban sprawl and, on occasion, ghost towns and wasteful development of industrial parks and real estate. In addition, China now faces dual-dualism—a "new dualism" between local *hukou* and migrant populations and the "old dualism" of urban and rural disparities. This dual dualism, along with its accompanying unequal access to public services between people with and without urban hukou, has acted as a barrier to labor mobility, which has kept China's urbanization rate too low. At the same time, the large influx of migrants puts pressures on urban services, and urban citizens perceive an erosion of service quality. Further, despite progress in environmental standards and policies, the cost of pollution to the nation's health is rising as China's population is increasingly concentrated in cities. At the same time, land-intensive urbanization has reduced availability of farm land, increasing competition for scarce water resources and adding to pollution that undermines agricultural productivity.

China's shift to a new urbanization path—one that is efficient, inclusive, and sustainable—to support its transformation into an innovative, modern, and harmonious economy in the next decades will require adjustments in the financing system. Given the expected economic and social trends, as well as the policy goals pursued by the political leadership, maintaining past financing policies unchanged is neither feasible nor desirable. First, the cities—now hosting more than 700 million people—can expect up to 300 million more migrants over the next two decades. Second, the disparities between original and new urban residents, and the backlogs in the quantity and quality of public services in rural regions, must be addressed. Third, economic growth will slow as the economy matures. These changes will have significant impacts on the demand for public services, on the cost and ways of delivering them, and on revenue mobilization. Many are concerned about the budget implications of such changes and wonder which public finance reforms are needed to ensure that China can afford urbanization in the next decades.

This report first reviews the main features of the new urbanization, measures the costs of urbanization, and evaluates its affordability. It then explores how well suited the existing urbanization finance system is to the challenges posed by the new urbanization by focusing on three sectors—public social services, infrastructure investment, and affordable housing. It concludes that the existing finance system that has worked well in leading an investment-driven economic growth strategy will work less well in a new, more urban China. In fact, some fundamental weaknesses in the existing system have already emerged, causing significant efficiency, equity, and environmental costs and threatening financial sustainability. The challenges for financing urbanization are, therefore, more about addressing these underlying weaknesses than filling the financing gap for public services and infrastructure spending.

As the main part of the report discusses, the centerpiece of the reforms in urban finances will be a move toward a system that more clearly separates the traditional function of government—the provision of equitable and efficient levels of basic public services—from commercial investment and production functions. The emphasis of subnational governments will be on the delivery of local public services, and the rewards for local leaders should depend on how well

they perform this responsibility. The fiscal system will need to encourage people and enterprises to move to the places where they are most productive, not to where they get the best tax or land deal from a local government. Revenues from land conversion are likely to taper off, so new local revenue sources are needed to replace lost revenue, whereas properly regulated access to borrowing will be needed to finance infrastructure investment. The financial sector will need to intermediate capital efficiently to meet local governments' needs for infrastructure finance, while at the same time imposing financial discipline on local governments and avoiding financial sector disruption. The private sector will need to play a larger role in financing and delivering infrastructure investment and other public services.

To move in this direction, government will need to make important decisions about numerous key features of the financing system, including:

Aligning public finance with functions. Functions need to be appropriately assigned to either the central government or local governments; functions with strong externalities such as funding social security could be centralized; the tax base could be shifted from production-based to consumption; revenue responsibilities between the central and local governments could be reassigned to follow the functions; local governments need to be given revenue-raising powers, and the transparency and accountability of local governments should be strengthened; a stronger interprovincial and intraprovincial equalization program needs to be put in place; and the budget system needs to be reformed in a way that will give subnational governments the ability to effectively plan and control the allocation of fiscal resources.

Abandoning the monopoly on land leases. The increments in land value that emanate from better infrastructure services must be captured in a less distorted way (through property taxes, for example), and these funds used to subsidize investment in infrastructure. Government should also develop regulatory rules to mitigate the fiscal risks emanating from land market volatility while obtaining the best economic value of land assets that local governments have already acquired.

Developing stable and sustainable debt finance. Local government financing vehicles should be either absorbed by government or converted to special purpose vehicles (SPVs); local governments should be allowed to borrow on budget; a rigorous regulatory framework needs to be developed to better manage the debt risks; the sources of long-term financing for local governments and SPVs need to be diversified; and the incentives for local governments, SPVs, and their lenders should be aligned so that all of them pursue creditworthy financing.

Promoting the involvement of the private sector in broader urban development.

Clarifying the role of housing provident funds (HPFs) in the affordable housing program. Alternative means of financing the program need to be explored, including direct subsidies from government revenues, contributions from employers, and partnerships with the private sector.

Urbanization in transition and its implication for financing

Can China afford the new urbanization path? Provided a major structural reform of its financial model is implemented, the answer is an emphatic yes. Managing the government sector, especially the urban local governments, will present a serious public policy challenge. The government will need to decide whether public financing policy in the next two decades is dictated by finding quick fixes for the problems, or whether a major structural reform should be undertaken to get ahead of the problems.

Financing challenges from the new urbanization path

Urbanization will challenge government expenditures and the capacity to deliver social services. The next two decades will see 300 million more people living in urban areas. The urban population will increase to about two-thirds of the total population by 2030, from slightly more than half currently.[1] Along with the expected rebalancing of the growth pattern and increasing income levels, new demands from urban households and business will have to be met. Families living in metropolitan areas, especially the hoped-for emerging middle class, will be looking to upgrade their housing and access better urban amenities and social services. New service industries will be asking for locations closer to population centers and for a different package of infrastructure and social services from that sought by manufacturing industries (Yusuf 2013). Compliance with the environmental protection standards set by the central government also will be an issue (see Supporting Report 7 on green urbanization). Against this backdrop, significant additions to the existing urban infrastructure and improvements in service delivery will be required to ensure that cities can accommodate new residents and meet new demands. Local governments in particular will feel the budget pressures associated with capital and operation and maintenance expenditures.

For urbanization to be inclusive and to avoid social fragmentation, cities must provide equal access to public services to both original and new urban residents. For most public services such as compulsory education and health, a national residence-based system is now in effect.[2] In practice, however, some cities offer better entitlements to public services and easier access to resident worker permits than do others. Disparities in access to affordable housing are already a concern, with only 10 percent of migrants owning their urban residence compared with 84 percent of hukou residents. Equalization policies, therefore, will have to address the existing duality between urban residents with hukou and those without. In addition, equalization policies will have to manage the additional economic and social pressures that further migration to cities potentially could bring. Only 20 percent of migrants now move to cities with their entire family, but this pattern will change in the future as adequate education, health services, and affordable housing become available to them (Wang, Shen, and Li 2008). Because of the large gaps in the quantity and quality of public services across provinces and between rural and urban areas, any policy change facilitating the access of migrant workers to urban services should go hand in hand with improvements in rural services, lest rural residents be encouraged

[1] Much of this growth will come from migrant workers, who have less human capital than the existing urban population, and to a lesser extent the conversion of rural areas into urban areas with the concomitant reclassification of the resident population.

[2] Official policy requires residence-based, compulsory education for all children. In general, local governments are in compliance with this policy. A recent survey shows that about 80 percent of migrant worker children are now enrolled in public schools.

to migrate to cities solely to access better social services.[3] Finally, local resentment toward the migrant worker community may arise from the fear that larger demands will cause overall service levels to deteriorate or that migrants will receive preferential treatment without paying their fair share of the costs. China will have to manage integration challenges of this kind, which the United States and Europe also have experienced.

Expenditure management needs to be adapted to the new urbanization path. Annual economic growth in China is projected to remain at around 7 percent for the next few years, gradually declining to about 6 percent by 2020 and to 5.5 percent by 2030. Even though that is healthy economic growth by world standards, it will not generate the fast-growing revenues and large fiscal surpluses of the past two decades. If government officials in charge of expenditure programs were to make budget plans based on a growth rate extrapolated from the past trend, they would risk planned expenditures growing much faster than actual revenues, which ultimately would raise public financing concerns. In addition, government officials should plan for new spending pressures, notably an aging population demanding higher pension and health outlays and a society more concerned with environmental sustainability, which requires actions to cope with congestion and pollution. As revenue growth slows and new spending pressures arise, the expansion of some government spending programs will have to be contained and more emphasis given to cost rationalization and control.

Structural reform is necessary to manage the expenditure pressures from the new urbanization path, particularly as the hukou system is removed and urban-rural disparities are narrowed. The immediate financing problem is to absorb and service the new residents and workers in cities without harming the quality of life of the existing urban population.[4] New financing policies that address resource constraints and insufficient service delivery capacity, especially among local governments, must be formulated to ensure that expenditures and revenues grow hand in hand, thus avoiding a buildup of unsustainable fiscal pressures. Incentives for government officials to implement these policies effectively will have to be in place as well. In this regard, urbanization in China is less efficient, inclusive, and sustainable than the central government would like it to be. Local governments have not fully complied with many goodwill policies that have been issued by the central government, suggesting that incentive is a major issue to consider in designing a reform.

Structural reform is also indispensable to mobilizing additional resources to finance increasing urbanization costs, especially at the local government level. Urbanization potentially can generate sufficient fiscal resources to cope with the increasing expenditures. Migrant workers can reduce the labor shortage that constrains the expansion of private sector output and thus help attract more capital and exploit economies of scale and agglomeration effects. That should lead to an increase in value added and incomes, therefore also raising revenue from major tax sources. Migrant workers also can add to the government revenues with their taxable consumption and their contributions to social security schemes.[5] Yet the potential revenues from urbanization will materialize only to the extent that the right incentives to local officials are in place. Incentives to promote manufacturing and generate land revenues in sprawling cities must be replaced by incentives to promote services and mobilize new revenue sources in dense cities (see Supporting Report 1 on economic growth and urbanization). In addition, incentives facing the local cadre system should include a longer-time horizon and place more weight on providing

[3] Lall, Timmins, and Yu (2009) evaluated the relative importance of wage differences and public services in migrants' decisions to move in Brazil. Their findings showed a distinction in preferences according to income level: for relatively well-off people, basic public services were not important in the decision to move, but for the poor, differences in access to basic public services did matter.

[4] Woetzel and others (2009) estimated that the increased expenditure of the public sector will accumulate continually, reaching RMB 1.5 trillion, or 2.5 percent of projected urban GDP in 2025.

[5] For example, 1 million of 4 million migrant workers in Liaoning province reportedly made social security contributions.

the particular bundle of services that the local economy needs to support an efficient, inclusive, and sustainable urbanization (Zhou 2007; Li and Zhou 2005).

Structural reform will have to deal with heterogeneity of urbanization across China. The budgetary impacts of urbanization will be anything but uniform across cities. Needs, resources, goals, and social values differ widely throughout China. Residents and businesses in some cities will demand higher levels of service, the cost of service provision will be greater in others, and the backlog of infrastructure needs will be larger in yet others. Even if the additional fiscal revenues from urbanization turns out to be large enough at the aggregate level to cover the incremental cost of providing basic services in all urban areas, they will not be large enough for every individual urban area. To accommodate these differences in preferences and expenditure needs, local governments should be given more control over the amount of revenues that they can raise to meet their responsibilities. In addition, the net cost to the government budget would be significantly reduced if fiscal resources were distributed based on serviced population; for example, transfers and subsidies for education, pensions, and health insurance benefiting the rural population can be reallocated to cities if and when workers migrate to there.[6]

Can China afford the new urbanization path?

How much will urbanization cost the Chinese economy? A quantitative model developed by World Bank staff estimates the total costs of all urban public services, infrastructure, and social housing. Significant investments would be necessary to meet demands arising from the current pattern of urbanization and the government policies in place. Consistent with the macroeconomic and demographic projections obtained from China's Development Research Council (DRC) model for the period 2013–30, the model projects capital, operation, and maintenance expenditures required to erect urban infrastructure (including roads, subways, draining, sewage, landscaping, garbage treatment, water, and heating) and to supply social housing, education, and health to urbanites, covering both the capital expenditure (CAPEX) and the current expenditures such as the operation and maintenance expenditure (OM), as well as the labor cost of urban education). Simulations focus on the gross cost of delivering infrastructure and social services to migrants at urban standards, without deducting savings (if any) that may be attained by eased spending pressures in the rural areas from which the migrants originate. Annex 6 provides a technical annotation to the modeling methodology.

In the costing model, the volume of physical investment in the selected sectors that is required to support urbanization responds to fundamentals (such as the size and density of the population living in cities, the number of students, the number of households benefiting from social housing) as well as to public policies determining coverage of social services and eligibility criteria to access them. The *unit cost* of investing in physical capital is calibrated using historical data and projections that follow trends in urban incomes and prices. Public policies regulating quality and generousness of social services also affect unit costs.

Simulations from the model suggest that overall costs of urbanization will gradually decline as a share of GDP. The total annual costs of all urban public services, infrastructure and social housing would average 6.1 percent of GDP in 2013–30, with a peak of 7.3 percent in the early period (2013–17) due to migrant integration and the government's ambitious social housing program (table 6.1; figure 6.1). As a consequence of the policy stimulus pursued in 2009–12 to cope with the global crisis, the projected investment bulge in the next few years reflects the ongoing construction plans to extend social housing programs. Long-term cost estimates phase out these temporary phenomena and acknowledge that the urbanization process will persist,

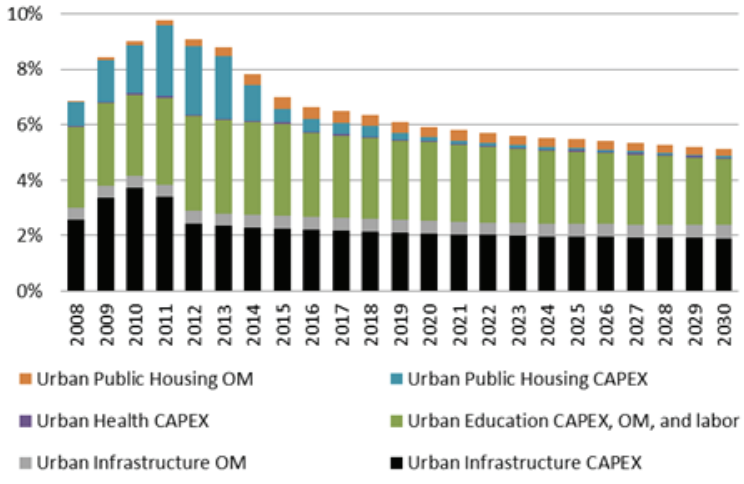
[6] Migrants from rural regions receive subsidies on education, pension, and health insurance in regions of origin, with the central government funding most of these subsidies in the lagging regions. With respect to pension and health insurance schemes, rural residents are charged lower premiums for pension and health insurance schemes, and receive deeper benefits, than are urban residents.

TABLE 6.1 Urbanization costs and fiscal space: baseline scenario
As a share of GDP

	2008-2012	2013-2017	2018-2030	2013-2030
Urbanization costs (CAPEX and OM)	**8.6**	**7.3**	**5.6**	**6.1**
Infrastructure investment	**3.5**	**2.7**	**2.5**	**2.5**
Roads	1.9	1.4	1.2	1.3
Subways	0.5	0.6	0.6	0.6
Draining	0.1	0.1	0.1	0.1
Sewage	0.2	0.1	0.1	0.1
Landscaping	0.4	0.3	0.2	0.2
Garbage treatment	0.1	0.1	0.1	0.1
Water	0.2	0.1	0.1	0.1
Heating	0.1	0.1	0.1	0.1
Social services	**5.1**	**4.6**	**3.1**	**3.6**
Social housing	2.0	1.4	0.5	0.7
Education (includes labor costs)	3.1	3.2	2.6	2.8
Health	0.0	0.0	0.0	0.0
Central and local governments Unchanged land and debt financing policies				
Fiscal space	**33.3**	**31.8**	**30.4**	**30.8**
Fiscal revenues	25.0	26.5	25.9	26.0
Net borrowings	8.3	5.3	4.5	4.7
Total expenditure	**31.9**	**31.1**	**29.6**	**30.0**
Recurrent primary expenditures	23.6	23.6	23.3	23.4
Capital expenditures	6.0	4.7	3.4	3.8
Interests	2.3	2.9	2.9	2.9
Central and local governments Abandoning land and debt financing policies				
Fiscal space	**33.3**	**29.5**	**27.3**	**27.9**
Fiscal revenues	25.0	25.8	25.2	25.4
Net borrowings	8.3	3.7	2.1	2.5
Total expenditure	**31.9**	**30.9**	**28.7**	**29.3**
Recurrent primary expenditures	23.6	23.6	23.3	23.4
Capital expenditures	6.0	4.7	3.4	3.8
Interests	2.3	2.7	2.0	2.2

Source: Staff estimation.

FIGURE 6.1 Cost of urbanization, percent of GDP



Data source: staff estimation.
Note: CAPEX means capital expenditures, OM means operation and maintenance expenditures.

but at a slower pace than in the past. For 2013–30, the annual capital, operation, and maintenance expenditures related to urban infrastructure would reach 2.5 percent of GDP, on average; those costs associated with education and health would be 2.8 percent of GDP; and social housing would amount to 0.7 percent of GDP.

How much of the estimated capital, operation, and maintenance expenditures would central and local governments bear? Public and private sectors will share these increased costs of urbanization. The model assumes that the proportion taken by the public sector remains at the historic level, around three-fourths. For instance, the public sector finances 62 percent of all urban infrastructure; 100 percent of social housing, health (hospitals), and compulsory education (primary and junior-middle schools); and 29 percent of noncompulsory education (vocational and senior high schools). Operation and maintenance expenditures are fully funded by the government in all urban infrastructure sectors, social housing, and health. The government also funds all of these costs for compulsory education, but only about 75 percent of the recurrent costs of noncompulsory education, with tuitions and donations covering the remaining amount.

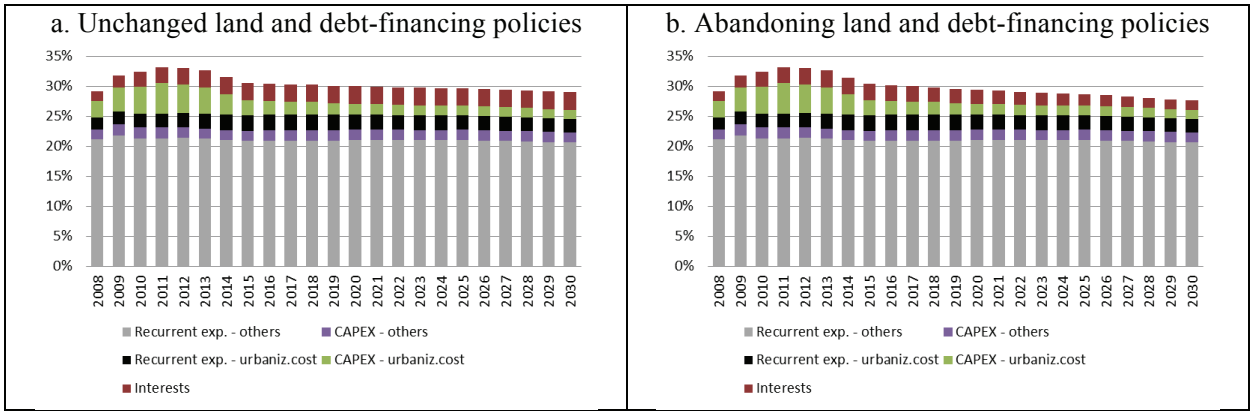
Will the fiscal space be sufficient to finance the investments required by urbanization in its current form, under the existing public policies? The resource envelope available to fund expenditures, also referred to as the fiscal space, comprises two financing sources: government revenues resulting from fiscal policies, and government borrowings (both on- and off-budget), whose level is consistent with preserving debt sustainability and financial stability. Whether the prospective fiscal space would be enough to accommodate urbanization costs and other public expenditures responsibilities is a key question.

The costing model assesses the affordability of urbanization costs (or lack thereof) by confronting estimates of fiscal space and total expenditure, for which it projects fiscal revenues, government net borrowings, and public expenditures other than urbanization costs. Fiscal revenues include taxes, nontax receipts, and land-leasing receipts (net of land acquisition and relocation compensation costs). They are driven by the DRC macroeconomic projections and assumptions on land financing policies. Borrowings include all direct government debts and the indirect debts of local governments contracted through their financial vehicles. Net borrowings are projected assuming a target level of public debt relative to GDP, with the target summarizing outcomes pursued by debt-financing policies. Expenditures other than urbanization costs are projected consistently with the DRC model and the prospective nominal GDP rate. These expenditures are added to the estimated urbanization costs to obtain the projection of total expenditure.

If the current policies concerning land and debt financing were continued into the future, the fiscal space would just cover the total inclusive expenditures of urbanization costs. With unchanged policies, the annual net land-leasing receipts would be 0.8 percent of GDP in 2013–30, whereas the annual net borrowings would amount to 4.7 percent of GDP, maintaining the public debt-to-GDP ratio at 53 percent (which was the level reached in 2012, after large borrowings by local governments to fund fiscal stimulus and cope with the global crisis). Model simulations suggest that fiscal space could afford the costs of urbanization borne by the government: in 2013–30, on average, the estimated annual fiscal space is 30.8 percent of GDP and the total expenditure is 30 percent of GDP (figures 6.2a, 6.3a). Even the expected investment bulge in the next few years would be affordable within the projected fiscal revenues and net borrowings. But the fiscal space leaves very little margin to cope with unforeseen, unfavorable events, and thus public finances would be in a fragile position and lack flexibility. More important, a continuation of the current policies governing land and debt financing would mean that inefficiencies would persist in the urbanization process, including excessive urban sprawl, social problems related to land conversion and compensation to displaced farmers, and risks associated with off-budget borrowing.

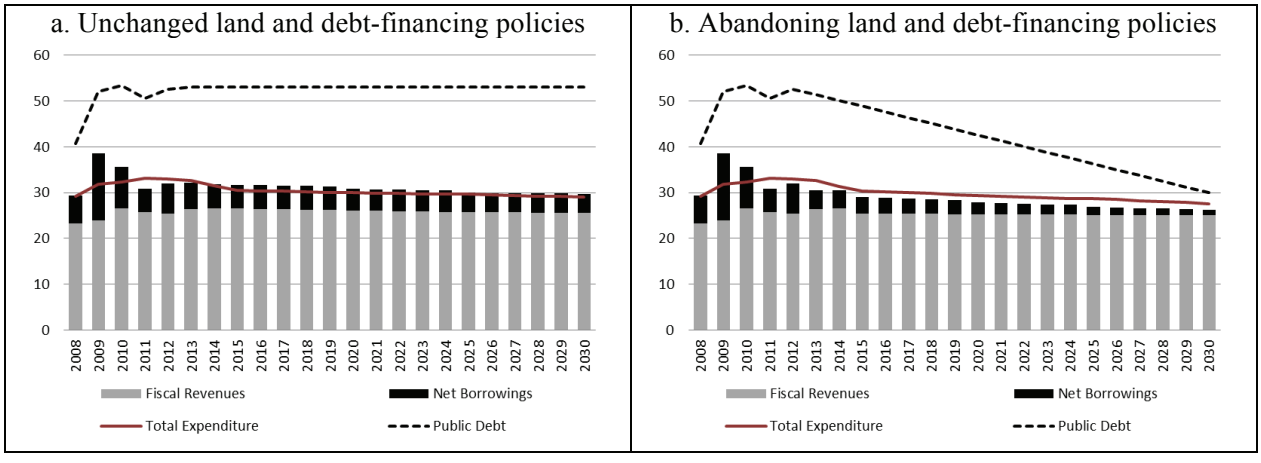
Abandoning the current policies concerning land and debt financing altogether, rather than reforming them properly, would significantly reduce the fiscal space and risk derailment of the new urbanization path. Alternative model simulations assume that farmers are given full compensation, which causes net land-leasing receipts to drop in 2015–30 (yet continuing with land leases and urban sprawl), and that the local governments' net borrowings (most notably the

FIGURE 6.2 Government expenditures as a share of GDP



Source: staff estimation.

FIGURE 6.3 Fiscal space, government expenditures, and public debt as shares of GDP



Source: staff estimation.

off-budget debts) are severely restricted to reduce the public debt-to-GDP ratio from 53 percent in 2012 to 30 percent in 2030. With these radical policy changes, the annual net land-leasing receipts are zero after 2015 and the annual net borrowings would amount to 2.5 percent of GDP on average. Costs of urbanization would no longer be affordable: in 2013–2030, on average, the estimated annual fiscal space is 27.9 percent of GDP and the total expenditure is 29.3 percent of GDP (figures 6.2b, 6.3b). Proper structural reform, therefore, should guide the revision of financing policies.

Would structural reform leading to a more efficient, inclusive, and sustainable urbanization path ensure that such an urbanization path is also affordable? The high-quality urbanization scenario envisions an ambitious (yet feasible) structural reform package to achieve a higher urbanization rate, a faster real GDP growth, a rebalanced economy with more consumption expenditure and service output, and smaller urban-rural income disparities compared with the baseline scenario. In addition, policies concerning land and debt financing are properly reformed in two directions. First, land policy reform aims at transforming local government

TABLE 6.2 Urbanization costs and fiscal space: reform scenario
(Percent of GDP)

	2008-2012	2013-2017	2018-2030	2013-2030
Urbanization costs (CAPEX and OM)	**8.6**	**6.9**	**4.9**	**5.5**
Infrastructure investment	**3.5**	**2.1**	**1.7**	**1.8**
Roads	1.9	1.0	0.7	0.8
Subways	0.5	0.6	0.6	0.6
Draining	0.1	0.1	0.0	0.0
Sewage	0.2	0.1	0.1	0.1
Landscaping	0.4	0.2	0.1	0.1
Garbage treatment	0.1	0.1	0.1	0.1
Water	0.2	0.1	0.1	0.1
Heating	0.1	0.1	0.1	0.1
Social services	**5.1**	**4.8**	**3.2**	**3.6**
Social housing	2.0	1.4	0.5	0.7
Education (includes labor costs)	3.1	3.3	2.7	2.8
Health	0.0	0.0	0.0	0.0
Central and local governments Reform scenario				
Fiscal space	**33.3**	**29.8**	**29.9**	**29.9**
Fiscal revenues	25.0	26.7	26.7	26.7
Net borrowings	8.3	3.1	3.3	3.2
Total expenditure	**31.9**	**30.6**	**28.3**	**29.0**
Recurrent primary expenditures	23.6	23.6	23.2	23.3
Capital expenditures	6.0	4.3	3.0	3.4
Interests	2.3	2.6	2.1	2.2

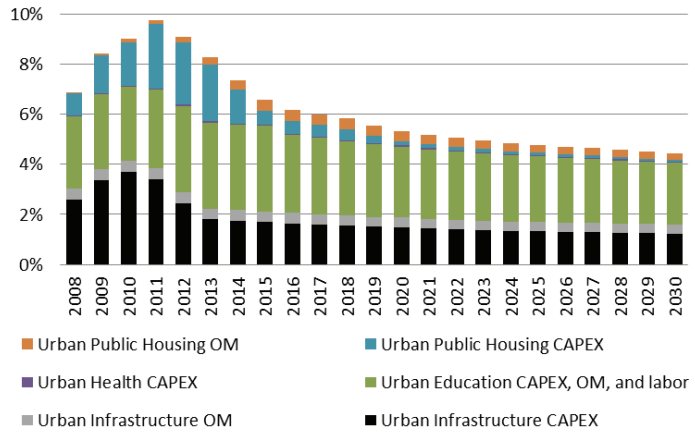
Source: Staff estimation.
Note: Figures are annual averages for selected periods.

revenues from a land-transaction basis to a real estate-property basis, creating incentives to rationalize the use of land resources and to redirect the urbanization pattern from a horizontal expansion of cities toward a vertical expansion with higher population density. Second, debt policy reform seeks to establish a sound legal and operational framework for local governments to borrow on-budget and in a sustainable manner, as well as to significantly slow down the rapid pace of indebtedness incurred by local governments.

Given fewer incentives to seek a horizontal urban expansion (that is, sprawling cities), the built-up urban area is assumed under the model to stabilize at the current level, and thus urban population density increases going forward. Higher density reduces the required capital, operation, and maintenance expenditures related to urban infrastructure by 0.7 percentage points of GDP vis-à-vis the baseline scenario (table 6.2; figure 6.4). Most savings result from the need to invest less in building roads when urban population is more concentrated. Infrastructure expenditures financed by the government, in turn, decrease by 0.4 percentage point of GDP. The property tax could raise revenues by 1.6 percent of GDP annually in 2015–30, more than offsetting the loss of land-leasing receipts that would happen if and when land leases and urban sprawl are discontinued. Net borrowings are assumed to reduce the public debt-to-GDP ratio from 53 percent in 2012 to 40 percent in 2030, and thus the average annual amount borrowed would be 3.2 percent of GDP in 2013–30.

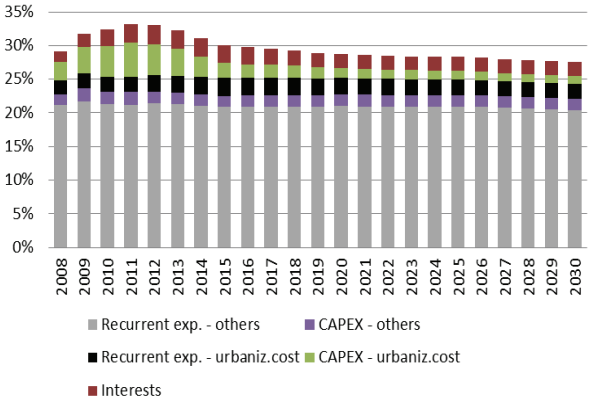
Model simulations suggest that in the reform scenario the more efficient, inclusive, and sustainable urbanization path is affordable. In 2013–30, on average, the estimated annual fiscal space is 29.9 percent of GDP and the total expenditure is 29 percent of GDP (figure 6.5; figure 6.6). Compared with the baseline scenario with unchanged land and debt-financing policies, the reform scenario delivers a slightly higher margin to cope with unforeseen, unfavorable events, and corrects distortions induced by the current policies.

FIGURE 6.4 Cost of urbanization in the reform scenario, as a share of GDP



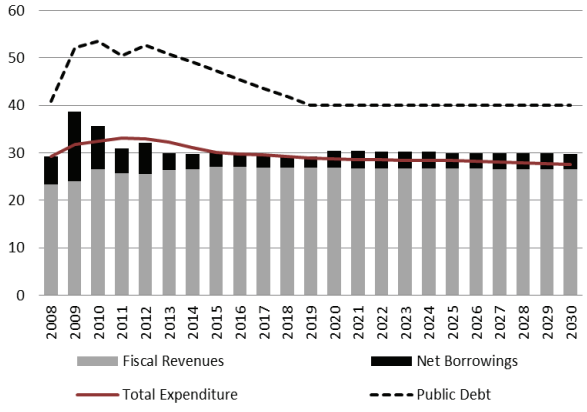
Source: Staff estimation.

FIGURE 6.5 Government expenditures in reform scenario as a share of GDP



Source: Staff estimates.

FIGURE 6.6 Fiscal space, government expenditures, and public debt in reform scenario as shares of GDP



Source: Staff estimates.

Financing Urbanization in 2013: Key Issues

The urban finance challenges of China today are less the result of unwise policy decisions than of China simply outgrowing its system. The structure and growth of the economy changed dramatically in the past three decades since the major 1994 reforms; the economy draws on market principles to fuel its growth, but the financing system has lagged and even held on to some of the features of the pre-reform system. The harm caused by many of these outgrown features has been made more apparent by China's urbanization. This section analyzes China's current approach to urban finance with a focus on three sectors: public social services, infrastructure investment, and public housing.

Social services and public finance

Economic growth and urbanization have increased demands for government services. Over the past two decades, the public finance system has been very successful in mobilizing revenues to finance the increasing demand for public social services. The results have been good: public services have been significantly expanded. Nine years of education are now provided free. The number of licensed (assistant) doctors increased from 1.56 to 1.94 per 1,000 population, and the number of hospital beds increased from 2.3 to 3.9 per 1,000 populations. In addition, more people are covered by the social security net. By 2012, 484 million people participated in the urban or rural residents' pension program, 304 million were in the employee pension program, and 265 million were in the employee health insurance program. (See Supporting Report 4: Inclusive Urbanization and Urban-Rural Integration for detailed discussion.)

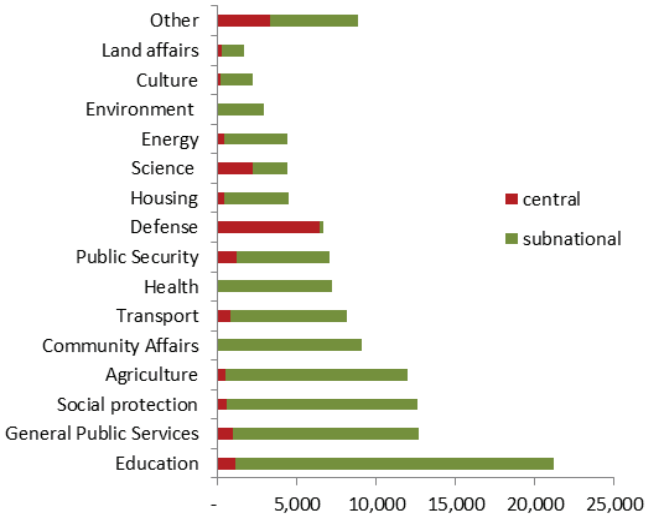
Most of China's public services, such as education, health care, social security, environmental protection, transportation, and community affairs, are provided and financed by local governments.[7] Education (94 percent local) and health (95 percent local) are the fastest-growing public expenditure categories. The result is that China's local governments account for more than 80 percent of all general government expenditures. This high share does not include local government spending on social security or infrastructure (figure 6.7). As a result, China is an extreme outlier in terms of the subnational share of government expenditures. The local government share of government spending is 41 percent in such decentralized countries as Canada and Germany and 48 percent in the United States.

In stark contrast to the highly decentralized nature of spending, taxing power is highly centralized. Local governments have no ability to set the tax rate or to determine the size of the legal tax base. The central government designates some taxes as "local revenues"—taxes collected by the local governments and retained at the local level. In general, these local taxes have narrower tax bases and less stable revenue yields than the central and shared taxes. Local governments may impose user charges, but these too are usually subject to approval by higher-level governments, and full cost recovery is rare. Using the Chinese definition for "local taxation," the subnational government share is about 30 percent. If the definition of local taxes is amended to include the ability to set the tax rate, then the subnational government share is negligible. Germany takes a similar approach in centralizing most tax rate and base decisions, as do Mexico and Indonesia among the large developing countries. On average, the share of local government taxes is about 23 percent in the industrial countries and about 11 percent in the developing countries (Bahl and Sethi 2012), which is very different from the almost complete revenue centralization in China.[8]

[7] In China, "local" is used for all subnational governments.

[8] There are two important qualifiers to this discussion of revenue centralization in China. First, the payroll contributions to social security are in the subnational government budgets, and the rates of charge vary across

FIGURE 6.7 Central and subnational expenditure, by function, 2012 (100 million yuan)



Source: China Statistical Yearbook, 2013.

Intergovernmental transfers finance most subnational government expenditures in China and play an important role in shaping interregional equity. The 1994 Tax Sharing System reform established a new framework for the intergovernmental transfer system in China, replacing the ad hoc, negotiated transfers of the past with a rules-based mechanism (Bahl 1999; Qiao and Liu 2013). The current transfers between the central government and the provinces consist of two types—shared taxes, and general and conditional grants.[9] The first, shared taxes (a 25 percent claim on value added taxes, or VAT, collections and a 40 percent claim on income tax collections), accounted for about 15.6 percent of all local government revenues in 2012 (excluding government fund revenues). The second type, general and conditional grants, accounted for 20 percent and 18 percent of local government revenues, respectively. The trend in industrial countries is toward unconditional transfers, reflecting a desire to give more budget autonomy to subnational governments (Blochinger and Vammalle 2010). But in China, general grants account for 58.5 percent of total grants, and 49 percent of general grants are earmarked for certain program activities. The supported programs range widely, from grants to compensate for the loss of the agricultural tax to compulsory education grants. The interprovincial distribution of these grants, and in many cases how they are actually used, is affected by these earmarks.

China's general grants might be grouped into three categories. The equalization transfer, introduced in 1995, is designed to reduce fiscal disparities among provinces. The distribution is based on a formula that incorporates objective measurements of fiscal capacity and expenditure needs for the provinces. The actual amount distributed is calculated on the basis of the gap between standard current expenditures and standard current needs, adjusted for coefficients that take into account the size of the gap. The overall envelop of equalization transfer is decided on the basis of resource availability and policy considerations. Its share in general grants has

provinces. These contributions are collected by the state tax bureau as an agent for subnational government. Second, local governments are responsible for administering the sale of land leases, including setting the purchase price of the farmland and the price of the land lease. Land revenues were equivalent to about 7 percent of GDP in 2012, almost 30 percent of general government revenues, and exceeded the revenue yield of social security contributions.

[9] General transfers in this report include *yi ban xing zhuan yi zhi fu* and *shui shou fan huan* in Chinese official documents.

been growing. The second category of general grants is the "tax rebate," a return of some additional share of tax collections to richer provinces to lower resistance to tax reforms. Third, the resource shortfall at the subnational level arising from vertical imbalance is addressed with gap-filling transfers to local governments (Bahl and Qiao 2013).

The conditional grants carry conditions about the purposes for which the funds will be used and in some cases about the standards of service to be provided; the grants also often require a copayment from local governments. Hundreds of specific-purpose grants are associated with a variety of programs at the central level. An example is the "compulsory education transfer," introduced by the central government in support of the rural compulsory education program. Another example is the transfer introduced to subsidize the issuing of state bonds. Among the most important targets of specific transfers are transportation, affordable housing, and education. Many of the conditional transfers were introduced to address specific, immediate needs. Most of these transfers are monitored by a controlling central line ministry or its provincial counterpart.

With a few exceptions, the transfers from provincial to subprovincial governments are at the discretion of the provincial government. Provincial governments have considerable latitude in deciding expenditure assignments to subprovincial governments, how much of the intergovernmental transfers received from the central government they will retain for their own uses, and how they will allocate transfers among their cities and counties. This "federal" financing approach preserves provincial-level autonomy and allows the use of local information advantages. The result is a good deal of variation across provinces in how the allocations are made to the lower level city and county governments. In some cases, taxes are shared on a derivation basis—with the localities from which they are collected. Formula allocations, specific grants, and mandated pass-through of the funds also are used. Provinces have the authority to issue special grants on a project-by-project basis. With respect to the public finance budget, provincial governments have more autonomy in determining the size of their revenue envelope than do either cities or counties. On average, county governments account for about half of all subnational government spending. Counties are financed more heavily by grants than by shared taxes. For example, in 2009, grants represented 53 percent of all revenues of county-level governments and below, but just 29 percent of prefecture revenue and 23 percent of provincial revenue. The land-leasing program has changed things, shifting more revenues to the lower-level governments, particularly to cities.

China's highly asymmetric public finance system, with its highly decentralized expenditure assignment and centralized revenues, implies that subnational governments have some control over what services they can deliver but relatively little control over the level of financing. Arguably, such an arrangement was the right approach during the past 30 years when the goal was to reward areas that were developing fast by giving them investment money to continue the growth. The strategy to "let some get rich first," as noted by Deng Xiaoping, was an important part of the early development of the industrial economy. This approach has advantages—it allows the central government to set the size of the total resource envelope and therefore to control the level of local government expenditures (importantly, spending from land-lease revenues is not directly controlled by the central government). Revenue centralization also has the advantages of allowing central control of the distribution of tax burdens and a capturing of economies of scale in tax administration. Finally, there is an inducement for increased tax effort. Local governments can directly encourage a higher effective tax rate by improving assessment and collection rates. The shared revenues provide an incentive for these revenue mobilization efforts. (Bahl 1999; Bahl and Wallich 1992)

Equity and inclusiveness in access to public services remain major concerns, however. Newcomers to the cities have limited access to urban services because they do not have urban hukou, even though they now account for more than one-third of the urban labor force. This discrimination means that migrants often are forced to leave their families in rural areas where access to quality public services may be limited compared with those in urban areas. These challenges

to equality in the delivery of public services are intertwined. Reforms such as the elimination of the hukou constraints on access to public services and better portability of pension and health benefits will equalize access to services, encourage labor mobility, and promote household consumption by reducing the need for precautionary savings (see Supporting Report 4: "Inclusive Urbanization and Rural-Urban Integration").

The size of general government has grown significantly since 1994 and is roughly in line with the size of government in upper-middle-income countries. China's expenditure structure differs from the industrial countries in two important aspects: the government spends a relatively larger share on economic activities including subsidies to firms, and a relatively smaller share on health and social protection services (World Bank and DRC 2013); and subnational governments deliver a very high share of services. These two observations suggest that the equity and inclusiveness problem stems less from a financing constraint and more from the incentives and capacity of local governments and from distribution of resources across China. A comprehensive analysis of the public finance system reveals that expenditure assignments, revenue structure and assignments, and intergovernmental relations all play a role in shaping the incentives and capacity of local governments in delivering equitable and sustainable public services.

Expenditures

The high decentralization of expenditure responsibilities may be explained by China's size to some extent, but with the new urbanization pattern, decentralization is raising concern about allocative efficiency losses. Most of the concern centers on three areas: what government should do and what the private sector should do, which level of government should be responsible for financing social insurance programs, and whether urbanization has made the case for centralization of more responsibility. All three concerns have profound implications for the cost of urbanization and for its financing.

With increasing urbanization, cities are better connected and externalities less able to be localized, making the fallout from expenditure assignment more apparent. If subnational governments are assigned responsibility for services where they cannot internalize externalities, or where they cannot capture economies of scale, the result will be an underprovision of the service or delivery at a higher unit cost. The classic example of spatial externalities is air pollution. Dust and particulates produced in one province can easily reach cities in a neighboring province, and emissions caused by agricultural activities can worsen urban pollution problems. The same result occurs in the case of competition for the use of water. A city government with responsibility for regulating water pollution may choose not to impose costly inspection measures, and this decision could have a negative impact on the national welfare. Or a city government might offer the children of migrant workers a lower-quality primary education, which could lead to undesirable equity effects now and lower labor productivity in the future. In some cases, these interurban effects call for direct regional or central government participation in service delivery, and in other cases it requires upper-level governments to play a strong coordination role, for example, in ensuring everyone benefits from universal public health and education services, and consumer safety. (Lou 2013; Bahl, Linn, and Wetzel 2013; Rojas 2008).

Fiscal subsidies to industries have led to an inefficient pattern of industrial allocation and inefficient land use. Subnational governments frequently use tax exemptions, rebates, and subsidized land to attract industries to their provinces or cities. In the early phase of economic development when domestic savings were insufficient to finance industrial investment, competition among cities to attract foreign direct investment encouraged subnational governments to improve the business environment and infrastructure services. That is one of China's success stories. As China developed to be upper-middle-income country with abundant domestic savings and a vibrant private sector, the downside of local governments' role in industrial promotion has become apparent. Rather than increasing investments, the subsidies merely relocate

investment from one city to the next, without national gains. In the absence of a subsidy, market forces would drive the location decision of the enterprise. This type of competition among cities also favors local governments, typically in rich regions with more discretionary revenues, and this "beggar thy neighbor" approach can affect another's success. Industrial subsidies also can lead to a siphoning of funds away from mainstream government functions and to a horizontal inequality with unsubsidized firms. (Keen and Marchand 1997; Boadway and Shah 2009). Industrial subsidies may have merit when they are targeted at pioneer industries or technology development industries, but in these cases, the granting of the subsidies should be the function of central government.

Fragmented social insurance programs (pensions and health insurance) in China increasingly become a barrier to labor mobility and inclusiveness. These programs are the responsibility of the city and county governments, are managed in a separate local government fund for social security, and are financed by payroll tax contributions and government subsidies. The national guidelines for combined employer and employee contributions are equivalent to about 40 percent of wages, but there is considerable variation among the provinces. The new urbanization model will require increased labor mobility to promote economic growth. The need to support this mobility with portability of benefits, the national nature of the benefits from these programs, and the need to focus more heavily on equalizing real incomes in the population will all push in the direction of increased central financing.

China's decentralized management and financing of pensions is a significant departure from international practice. Most industrial and developing countries have centralized or largely centralized their old-age pension insurance financing programs. In general, the reasoning is that uniformity in benefits and some guaranteed minimum funding of these programs is in the national interest. A further problem with the decentralized delivery in China is that county and some city governments cannot do the necessary risk pooling to finance these programs at mandated national levels. That has led to pooling at the prefecture or provincial level in some provinces. Although this broader base has reduced the risk, there still have been pension arrears and defaults that have forced continuing central and provincial government subsidies (Martinez-Vazquez and Qiao 2011).

The health insurance program, being managed at the county and district level of government in China, is highly fragmented. Effective reimbursement rates vary across counties and districts, due to differences in deductibles, copayments, and ceilings. These rates in turn are a function of disparities in the levels of contributions and local government subsidies. Besides the equity concerns associated with these disparities, overall risk is higher because of the small size of these insurance pools. In addition, migrants face significant challenges in accessing health care, and there is overlap in registration in the rural and urban programs (Zheng 2012). The international practice on the centralization of health care financing is mixed. The information advantages give state or provincial governments a comparative edge in program management, and there may be a demand for local tailoring of some services. A not uncommon model is to use conditional grants from the national government to finance a significant share of subnational government expenditures on health care. In the United States, the federal government finances and delivers pensions and medical care for retirees but shares the cost of financing medical care for the poor with the state governments. Provinces have exclusive responsibility for health care provision in Canada and are supported by federal grants.

The provision of public services within China's urban areas is also more interrelated and increasingly calls for more intergovernmental cooperation in planning and service delivery. The need for better coordination is most clear in the case of transportation. Each component of the public transport system is usually of good quality, but door-to-door trips by public transport are inconvenient because of poor physical and service integration, often characterized by excessive distances between transfer points, mismatched schedules, separate ticketing systems, and lack of easily accessible transfer facilities. These problems stem mostly from institutional fragmentation at the city level, where different agencies (metros, buses, road construction, traffic

management, and land use) are responsible for different aspects of urban transportation (see Supporting Report 2: Connecting Cities).

In addition, ambiguous assignment for expenditure responsibilities undermines the accountability of local governments. Many industrial countries assign expenditure responsibilities to their subnational governments and provide a list of who is responsible for what, although some countries do not specify these responsibilities in a central place but rather work them out in sector laws (de Mello 2010). Unlike many countries, China has no exclusive list of functions that is reserved for either the central or the subnational governments. Rather, a very general description of responsibilities in the Constitution leaves much latitude for interpreting the division of functions. Responsibility is delegated by administrative decision and varies from province to province, leading to a lack of clarity about exactly who is responsible for what. The result can be a costly duplication in service delivery, a failure to deliver some services, or an inability to identify the level of government responsible for a public service failure. More generally, lack of clear definition and assignment of responsibilities can become a hotbed for either intergovernmental turf wars or buck-passing, and accountability is in no way guaranteed (Lou 2013).

Revenues

Highly centralized revenue assignment also raises some important public financing problems. First, it means that subnational governments have no way to adjust the tax rate or tax base to pursue new initiatives that require resources above what they are allocated by the transfer system. Nor do they have any discretionary resources to pledge against debt or to cover unexpected deficits. These shortcomings, and the pressing needs related to urbanization, explain some of the appeal of land-based financing in recent years.

Second, the existing system leaves subnational governments vulnerable to discretionary tax policy or revenue sharing changes by the central government. This set of vertical arrangements not only makes local revenue budgets vulnerable, but it also weakens the accountability of local government officials to both the local constituency and to the upper-level authority.

Third, the absence of formal local government taxing powers has encouraged subnational governments to find creative backdoor approaches to financing service delivery. The relatively unregulated sale of land leases with retention of most revenues, and local government borrowing through intermediaries such as the local government financing vehicles (LGFVs) are cases in point. (Bahl 1999; Wong 1997; Liu and Qiao, 2013).

These problems notwithstanding, revenue centralization has worked reasonably well in China. Tax revenues and subnational government expenditures more than doubled as a share of GDP between 1994 and 2012. That explains how the central government could safely increase the income tax retention rates, and abolish local taxes, without fear of local government budget shortfalls. But this situation may change. Increased urbanization will bring significant new expenditure pressures, and a slowdown in the economy will slow revenue growth. The land-leasing bonanza also may slow down with stronger property rights for farmers and better use of existing urban land (see Supporting Report 4). The absence of a way for local governments to mobilize more of their own budgetary resources may compromise their ability to deliver adequate local services and certainly will compromise their ability to deliver discretionary services of their own choosing.

In addition, several issues concerning the tax structure remain. The tax structure has been further modernized since 1994. The changes have been gradual rather than the result of a "big bang" reform, but they have been effective. The general direction has been toward a more simplified system with broader tax bases, lower tax rates, and improved collection practices, and toward a heavier use of indirect taxes. The value added tax was converted from a production to a consumption basis beginning in 2004, the differential rates between domestic and foreign companies under the enterprise income tax were removed in 2008, the coverage of the excise tax has been expanded in recent years, resource taxes have been shifted to an ad valorem basis,

and most recently, the business tax is being absorbed into the VAT to better cover the service sector and provide relief to companies that make heavy use of service inputs.

The general structure of the individual income tax has not been changed since 1994, but the threshold for payment has been continuously increased. This has resulted in a significant erosion of the tax base. The number of income taxpayers decreased to 3 percent of the total population after the 2011 reform—a relatively low rate of coverage. With China's unequal distribution of income, one might expect a more intensive use of the tax that is designed to address this issue.

At the same time, China imposes a high tax rate on labor income, largely to help finance social insurance schemes (pensions, health, and unemployment compensation). The current level of contributions (employee and employer) is equivalent to about 40 percent of wages, which is high by international standards. There are prospects for lowering this rate by moving some noninsurance costs and pension "legacy costs" to general revenue financing (see Supporting Report 4). Social security contributions impose perhaps the major constraint on developing a more broadly based individual income tax.

Property taxation has been much discussed as an option for a major local government tax in China. Under the existing regime, China levies five taxes on property: the urban land use tax, which is levied on the physical area of the property, the real estate tax for business use, which is levied on original value, the land value added tax, which is levied on appreciation in land value, the farmland occupation tax, which is levied on area, and the deed tax, which is levied on the self-reported value of property at the time of transfer. Together, these taxes on real property account for more than 8 percent of national tax revenues (Man 2013). The current levies total 1.6 percent of GDP, well above the rate for developing countries (although below the average rate of 2.2 percent for industrial countries). The problem with the current structure is that it is a hodgepodge of taxes on the physical area and transaction values of properties with no provision for taxing updated values on an annual basis. As a result, the property tax is not used to help shape more efficient land use, to capture value created by public investments, or to provide significant support to local government budgets.

Chongqing and Shanghai municipalities are implementing an experimental annual tax on residential property. The pilot is in its third year in Chongqing. Some progress has been made: the compliance rate is good, and an identification system for all properties has been completed. Shanghai authorized a property tax on owner-occupied property in 2011. However, both of the pilot projects introduce property taxation with limited coverage of properties and with a very low effective rate of taxation. The pilots do not attempt to integrate the property tax with the other forms of property taxation, and the issues of valuation and revaluation have been bypassed.

Another emerging revenue source is the environmental levy, or so-called "green taxation" approach (Merk and others 2012). Most resource use and pollution occurs in cities or is caused by demand from cities, which also bear some of the greatest impacts. While China has removed many environmentally harmful subsidies and other distortions in the production of energy, it has not yet fully accounted for the costs imposed on health, ecosystems, and the climate that result from resource production and use. The simplest way to impose such a charge is an energy or resource tax on water use to encourage conservation and carbon taxes that specifically place a charge on greenhouse emissions (see Supporting Report 7).

Intergovernmental transfers

Several important problems arise with the shift of development objectives toward building a harmonious society, and the menu of issues to be addressed by intergovernmental transfers is formidable: Is the vertical allocation (between the central and local governments) of central taxes used to support local government spending still "right," especially given the need to cope with significant urbanization costs? Has the central government achieved the right level of

equalization across local governments and is it using the right instruments to achieve this? Has the transfer system become too complicated to administer effectively? Finally, are the arrangements for sub-provincial revenue sharing in step with government objectives?

Fiscal incentives. China's version of intergovernmental transfers is different from the mainstream practice in other industrial and developing countries, largely because of its emphasis on derivation-based revenue sharing. The major shared taxes (VAT and the corporate and personal income taxes) are shared with the local governments based on the location of collection. This arrangement distorts the allocation of resources in two ways: it encourages local governments to hold on to enterprises that should move to new locations because the government derives taxes from them. In addition, the derivation-sharing arrangement disproportionally benefits large cities, because these are often the location of a firm's headquarters and frequently the place where it pays taxes. This fiscal incentive reinforces the political incentive for industrial promotion and encourages local governments to place more emphasis on serving firms and industries and less on its core role of providing public services to residents. This pattern can easily be seen in the composition of the government's expenditures as well as in land use.

Equalization. In more recent years, the grant component of the transfer system has grown and has done a better job of reducing fiscal disparities. Wang and Herd (2013) find that grants have generated equalization effects both within and between provinces. Persson and Eriksson (2006) report a similar finding based on an empirical study of the 1998–2003 period. Hofman and Guerra (2007) find that interprovincial disparities in the Human Development Index—indicators of service levels—are less than disparities in per capita GDP. Nevertheless, the interprovincial fiscal disparities remain large and are only slightly less dispersed than those in per capita GDP.

These disparities are not surprising given the wide disparities in the natural advantages of some provinces. They also suggest that the public finance system could do more to reduce them. The tax rebate grants and the general tax sharing components are decidedly counterequalizing. The latter are based on where taxes are collected rather than on where expenditure needs are greatest. Currently, the tax sharing and tax rebates together account for about 60 percent of all transfers to local governments. The higher-income provinces, where most taxes are collected, are favored under the shared tax system. The simple correlation between per capita revenue sharing transfers and per capita GDP is 0.89, indicating a systematic favoring of higher-income provinces. Equalization grants have played some role in reducing fiscal disparities. The simple correlation between per capita equalization grants and per capita GDP is –.41, suggesting that, on average, lower-income provinces receive larger equalization grants. The equalization grants represent only 19 percent of all intergovernmental transfers, however, and therefore have not been effective in significantly reducing fiscal disparities across provinces.

Complexity. The earmarked grants are extremely complicated, and this complication comes with cost. There are about 200 conditional grant programs, each of which should be monitored by higher-level governments to insure proper compliance. Conditional grants in essence are (partially) funded mandates, and unless they are properly designed to stimulate spending to capture a spillover benefit, they will compromise local government budget autonomy and may not enhance efficiency. These conditional grants also impose an administration cost on the central government and a compliance cost on the subnational government. Finally, conditional grants usually lead to strong bureaucratic and ministry interest in maintaining these programs, as well as a local government constituency, creating a formidable resistance to abolishing these programs when they are no longer necessary (Blom-Hansen 2010).

Subprovincial transfers. Provincial governments have considerable discretion to place revenues where they are seen as most needed. A provincial government might decide to adopt equalizing

distributions across local governments or choose an investment stimulation strategy. China is too large a country to govern effectively without this provincial discretion. But this hierarchical arrangement for revenue sharing also presents some problems. The provincial government may pick off too great a share for itself, at least in the eyes of the lower-level governments, or it may not make the subprovincial allocations on a needs basis. In particular, provincial governments may not adequately recognize the needs of city and county governments to deal with financing problems associated with urbanization. Yet, the information advantages concerning expenditure delivery and tax collection may well be greatest at the lowest levels of government. And, more generally, the problems that come with delivering services to accommodate urbanization and financing them will fall heavily on the cities, but equalization objectives of a province might tend to redirect funding away from cities.

Another problem with this hierarchical approach is that subprovincial allocations may compromise central government policy objectives. For example, the central government might adopt a program of allocating revenues among provinces according to expenditure needs indicators. But the provincial government might decide to distribute them among cities and counties according to where revenues are collected. This possibility opens the door for a discussion about whether central grants to provinces ought to contain more mandates about how the central funds should be passed through to provincial governments.

Financing infrastructure investment

China's infrastructure financing model is astounding, given how much revenue has been mobilized to finance infrastructure over the past 20 years. China spent around 10 percent of GDP a year on infrastructure investment, far higher than 3–4 percent average of other developing countries, or 2 percent average in developed countries. In addition, China's investments in schools, hospitals, cultural centers, and public housing have gained momentum with the shift of government development strategy toward building a harmonious society. Remarkably, the urbanization of new territories on urban-rural fringes proceeded mainly with physical infrastructure being built ahead of or in sync with demand for land from developers, through an urban "big push." China's cities not only successfully accommodated 500 million new residents between 1980 and 2010 but also achieved significant improvements in basic infrastructure and living standards. For instance, access to piped water in China urban areas doubled in three decades, the wastewater treatment rate increased from almost none in 1981 to 84 percent by 2011, and the road surface area per capita increased seven times during the same period.

Local governments in China take almost exclusive responsibility for urban infrastructure investments and financing. As table 6.3 shows, China invested RMB 5.9 trillion in fixed assets for public utilities, infrastructure, and facilities in 2011, equivalent to 12.5 percent of GDP. More than 80 percent of this investment was sponsored by local governments and their entities. The central government played a dominant role in financing railway investment (85 percent) and a relatively large role in gas supply (37 percent), but it played a negligible role in urban infrastructure. The investments in city connections (railways and expressways) are generally the responsibilities of the central and provincial governments.[10]

Looking at the sources of infrastructure financing, the Chinese model shows several salient features.

- User charges in China, including tolls, water tariffs, and garbage collection fees, are widely applied to finance infrastructure services. But they often achieve low rates of cost recovery, despite the central government's policies and guidance that encourage utilities to be self-financing. For example, a recent study of approximately 600 urban water utilities showed

[10] "The State Council's Decision on Reforming Investment Regime," No. 20 of *Guo* fa 2004, stipulates that the central government is responsible for investing in project across jurisdictions and river basins.

TABLE 6.3 China's investment in public utilities, infrastructure, and facilities in 2011

	Total Volume (bil RMB)	As Percentage of Total Investment				
		By Investment		By Source of Funding		
		Central	Local	Budget	Bank Loans	Others
Public Utilities	1465.9	30.5	69.5	6.3	31.3	62.4
ow. Power	1160.3	37.2	62.8	5.5	35.9	58.6
Gas	124.4	11.3	88.7	2.0	15.5	82.5
Water	181.1	1.2	98.8	14.9	11.8	73.3
Transportation	2490.2	24.7	75.3	13.6	34.8	51.6
ow. Railway	591.5	85.3	14.7	11.5	44.9	43.7
Roads	1385.6	3.5	96.5	17.0	30.0	53.0
City transport	222.5	1.9	98.1	8.4	52.5	39.1
Public Facilities	1950.6	1.0	99.0	13.3	15.2	71.5
Subtotal: Utilities and Infrastructure	5906.7	18.3	81.7	11.6	27.5	60.9
Irrigation and Environment	501.5	11.6	88.4	25.2	10.6	64.1
Education, Health, Cultural and Sports Faciliti	790.0	3.9	96.1	19.1	7.8	73.1
Public Administration	564.8	5.6	94.4	23.5	4.5	72.1
Total	7763.0	15.5	84.5	14.1	22.7	63.2

Data source: China Statistic Yearbook, 2012.

that only 44 percent generated positive net margins, even though real tariffs had grown 3.7 percent annually over the previous five years (World Bank n.d.). Continued government subsidies provided the necessary financing in most cases.

- Only a fraction of infrastructure investment is financed directly from government budget. Government expenditures on fixed assets were equivalent to roughly 5 percent of GDP in 2009; about 1.5 percent of GDP was spent on investments in utilities and infrastructure, accounting for 11.6 percent of total investments in these sectors (see table 6.3).
- Land lease revenues have emerged as an indispensable source of capital financing for China's city infrastructure investment. During 1996–2012, a total of 50,000 square kilometers were converted from rural to urban use (and from collective to state ownership). An estimated 40 percent of these lands were for industrial use, and local governments often charge low rent for industrial land. The majority of the land for commercial and residential use is auctioned in a competitive bidding, and revenues from the auction are used for infrastructure investment. In 2012 alone, China acquired RMB 2.85 trillion from land auctions, equivalent to 46.7 percent of total public finance revenues of local governments.[11] The net revenue, after deducting compensation to farmers and land development costs, is much smaller, however, only around 20 percent of gross revenues.
- China imposes strict restrictions on the borrowing powers of local governments.[12] To circumvent this regulation, local governments have set up around 10,000 LGFVs to borrow and finance infrastructure investments.[13] Local government borrowing proliferated to

[11] Finance Minister's Report to National People's Congress, March 2013 and staff calculation.
[12] Article 28 of the Budget Law of the People's Republic of China (1994) stipulates that "the local budgets at various levels should be compiled according to the principles of keeping expenditures within the limits of revenues and maintaining a balance between revenues and expenditures, and should not have deficits. The local government may not issue local government bonds except as prescribed by laws or the State Council."
[13] The LGFVs were capitalized by local governments, mostly with free or subsidized user rights to land, and in some cases with a dedicated revenue stream from the local government budget, and in some cases by ad hoc transfers from the local government budget. A typical form of LGFV is an urban development and investment corporation (UDIC). Public utilities enterprises and even schools and hospitals could also serve as an LGFV. Some LGFVs may have no other function except for financing.

finance stimulus packages amid the 2008–09 global financial crisis. By end-June 2013, the explicit debts of local governments amounted to RMB 10.9 trillion; local government guaranteed debts, RMB 2.67 trillion; and other contingent debts, RMB 4.3 trillion, with the total around 33 percent of GDP.

- Private participation in infrastructure services is still limited compared with other developing countries, despite encouragement from the central government. Since 1990, while China had over 1,000 public-private partnership (PPP) transactions in infrastructure (transport, water, energy) for a total value of $166 billion (PPI Database), Brazil and India had much larger private investment in infrastructure during the same period, $325 billion and $273 billion respectively.

Notwithstanding the success, a number of important problems have arisen, ranging from concerns about poor investment choices made by some local governments, overinvestment in infrastructure compared with other urban services, urban sprawl, social and equity issues surrounding the practices in transferring farmland to urban use, and the level of land-based debt that is implicitly guaranteed by local governments.[14]

The first concern relates to the role of financing in shaping local governments' incentives and capacity for selecting, designing, and providing infrastructure projects. Enormous infrastructure investment in China is generally justified by the rapid rate of urbanization and high growth of income; however, some of these infrastructure investments are driven by distorted incentives of government officials. Because their tenure is short—often less than five years, local government and party officials depends largely on achieving short-term economic development targets and visible results to advance their career. Short of alternative revenues, local governments resorted to land-concession revenue and unregulated borrowing from LGFVs. While the use of land-based revenues for capital finance should reduce overall capital financing risk, overreliance on land finance, together with distorted incentives, contributes to inefficient use of land, corruption, and abuse of government power in land acquisition. Municipal governments may even act like profit-maximizing land monopolists, by acquiring as much land as possible as cheaply as possible at the urban fringe, converting it into municipally owned urban land, and selling the land use rights to developers at the highest price the market will bear, potentially contributing to a land asset bubble. Economic distortions are compounded by deliberate government policies that assign zero or low values to land as an incentive to attract industrial investments and that then heavily invest in infrastructure to service these newly developed lands. This urban development strategy led to a pattern of urban sprawl that is costly and has channeled interest away from more compact, infilling strategies for urban growth. The strategy also can increase carbon emissions because it generates longer commutes and less use of mass transit, increases living space per person and therefore more emissions from home heating and general power consumption, and leads to less intensively used infrastructure, which in turn raises emission levels (Baeumler, Ijjasz-Vasquez, and Mehndiratta 2012; Liu, Z., and Salzberg 2012).

Local governments' capacity in selecting and designing good and appropriate infrastructure is also handicapped by a fragmented budget and lack of a medium-term perspective in financial management. City governments tend to spend more on new infrastructure and less on maintenance and operation; more on above-ground infrastructure such as roads, transportation, and public gardens and less on underground infrastructure like sewage systems and flood protection. Chronic underinvestment in maintenance and repair shortens the lifetime of assets, which, in turn, increases long-term costs, which can threaten the long-term sustainability of cities. Capital finance is conducted ad hoc, on a project-by-project basis, and through multiple intertwined channels including many government bureaus, LGFVs and their subsidiaries, and many other public utilities firms. Not all investments in property and infrastructure are accounted for and reported on the government books (box 6.1). Economic classification is not introduced in budget management, and the budget is managed on an annual basis. The lack of

[14] For a comprehensive analysis of the issues, see Supporting Report 1: "Urbanization and Economic Growth."

BOX 6.1 Reporting and budgeting of infrastructure finance

Government budgets have four separate components. The largest is the "public finance budget"—the general fund that is reported in most statistical compilations. The recurrent expenditures of government (other than social security) are recorded in this account, as are the ordinary revenues raised by the local government. Most expenditure on urban infrastructure facilities is made through the "Government Fund budget." The main financing source for this budget is land revenues. The "SOE operating fund budget" is for transfers of dividends from enterprises owned by local governments to the general budget. Finally, the social security budget includes the pension, health, and worker protection programs and the payroll contributions and subsidies that finance these programs.

These four budgets are managed by many different departments, an arrangement that present a challenge to efficient public financial management. In particular, current and capital expenditures appear in all of the accounts, but government departments do not record or report their activities by economic classification not separating current and capital expenditures), making it difficult to track the overall budget health of the local government.

Moreover, the local government budget is intertwined with the budgets of LGFVs and public utilities enterprises, and a substantial portion of capital investment made with public funding might not be reflected in the municipal budget as such. Thus, capital construction by state-owned enterprises themselves is not shown in the municipal budget, even though it is funded, at least partly, by subsidies and transfers from the municipal budget. Furthermore, the private sector's contribution through various channels is impossible to estimate.

a multiyear and integrated budget prevents local governments from more effective public investment planning. If investment plans were supplemented with a full-cost budgeting plan over the life span of the project (cost of construction plus future costs of operation and maintenance and asset renewal), some of the investments would not be justified from a cost-effectiveness basis (Mikesell and Mullins 2011; Kaganova and Windolph 2012).

The second concern with China's financing model is equity. The policy on how to pay for the infrastructure investments—from general budget revenue, user charges and connection fees, or debt finance—has direct implications about who will ultimately bear the cost of infrastructure. Subsidies to utilities of a private goods nature, such as water and electricity, not only come at the cost of lower economic efficiency but also tend to be regressive, as wealthier households, who consume disproportionately more, receive the largest share of the benefit.

When infrastructure services are financed from land-concession revenues, those who use the services benefit at the expense of the previous owners of the land use rights, who were forced to sell at a rate well below market price, or of citizens in general who are the ultimate owners of the land, depending on how one looks at it. In addition, neither the collective nor the farmers may sell land to end users, and the user rights of farmland owners are only weakly guarded. Only the local government can convert farmland to urban use. Local governments use their monopoly powers to claim farmland at a value reflecting agricultural use, which is well below the market value of urban land. In many cases, the land is expropriated, further raising the level of unrest among those with user rights over farmland (see Supporting Report 3).

If infrastructure investment were financed only from savings on the general budget, cities would not be able to meet the rising demand from urbanization. In addition, financing only from savings would raise intergenerational equity problems, because the infrastructure investment benefits future generations while the costs would be borne by the current generation of taxpayers. With urban migrants likely to make up a large portion of future generations, financing totally from savings further raises the social unrest between existing residents and migrants.[15]

[15] However, when infrastructure is badly planned and managed, borrowing to finance it can burden future generations with debt without corresponding benefits.

The third concern is the potentially serious risk to fiscal sustainability. The absence of a strong regulatory regime governing borrowers, land finance, debt finance, and PPP entails fiscal risks.

Land-based revenues for capital finance complement borrowing by reducing the uncertainty surrounding future debt repayment capacity and the need to generate future revenue streams to meet future debt service. Thus the use of land-based revenues for capital finance should reduce overall capital financing risk. Because, however, urban land values are highly volatile, land financing creates volatility in capital budgets and debt repayment funds. Land prices can swing as much as 50 percent in either direction, and in times of crisis even more, as demonstrated during the Asian financial crisis of the 1990s and again during the market collapse starting in 2008. Systemic risks are increased when the entire subnational sector relies heavily on land values to provide security for borrowing (Liu, L., and Peterson 2013).

China's overall public debt, including sovereign and local government debt, is low by international standards. The sovereign debt remained at around 18 percent of GDP at the end of June 2013 (or 22.7 percent if all contingent debts are included). By including an estimate of the local government debt based on a report by the National Audit Office, the overall direct and contingent public debt was about 55.6 percent of GDP, far below the most conservative warning line—60 percent of GDP (table 6.4). In addition, several factors will work to improve China's debt dynamics in the future. China's large growth potential creates the foundation for further growth of real revenues and favorable debt dynamics. China's government commands a large portion of assets including shares in state-owned enterprises (SOEs) and land, which represent a source of potential revenues going forward. Large national savings coupled with investment-grade sovereign risk ratings imply a relatively low cost of borrowing (Liu, L., and Pradelli 2012).

Concerns, however, remain with local government borrowing. The audit in 2013 found that local government direct debts continued to grow fast, at a yearly rate around 20 percent from 2010 to 2013, and the refinancing ratio exceeded 20 percent in 2 provinces, 31 municipals, 29 counties, and 148 townships. The overdue debt ratio was 1.01 percent on average, but it exceeded 10 percent in some cities and reached 16.36 percent in the worst local government. International experience suggests that subnational debt risk is triggered by the sheer size of the debts but also is more broadly associated with local governments' capacity in managing their debt portfolio and formulating fiscal policies in a sustainable manner.

In China, under the current system, the separation of subnational government debt from its budget undermines the accountability of local governments for debt sustainability, especially when debt is used to finance expenditures mandated by the central government such as the post-2008 stimulus package and affordable housing. The fragmented budgeting and indirect borrowing also prevent local governments from establishing proper debt management and control. To improve their access to credit and lower financing costs, some local governments have taken measures to reinforce the perception of an implicit guarantee on LGFV debt and have tapped into less regulated credit markets, known as "shadow banking." Some local governments resorted to PPPs as a source of capital financing and built up substantial risks emanating from these commitments.

TABLE 6.4 China public debt, June 2013
(RMB billion)

	Direct debt	Contingent debt		Subtotal	as % of GDP
		Guaranteed debt	Other contingent debt		
Central	9813	260	2311	12384	22.7%
Local	10886	2666	4339	17891	32.8%
Total	20699	2926	6650	30275	55.6%

Data source: National Audit Office, 2013.

BOX 6.2 Local governments' debt instruments

Local governments in China have been very innovative in exploring a variety of debt instruments:

- Medium-term loans from the China Development Bank (CDB), which derives some of its funding from the capital market using Policy Financial ("F") Bonds that have a 5- to 10-year maturity. The CDB has provided a significant volume of financing for urban infrastructure. According to an article in May 2013 by the president of the CDB, the bank has already made RMB 6 trillion in loans to finance China's urbanization process.a More than half of those loans—RMB 3.4 trillion—were outstanding at the end of 2012 and represented 71 percent of the bank's total outstanding loans.
- Commercial medium-term bank loans to LGFVs (mostly 3- to 5-year loans) that carry an implicit guarantee from the local government.
- Bonds issued by the Ministry of Finance on behalf of provinces (mostly 3- to 5-year bonds).
- Bonds issued by LGFVs (implicitly guaranteed by the local government). In some cases LGFVs borrow solely for the purpose of de facto relending to the local government. Expansion and diversification of the domestic bond market is already taking place in a tentative manner.
- Bonds issued directly by city governments in a very limited number of cases (mostly 3- to 5-year bonds). Since 2011, four local governments (Guangdong, Shanghai, Shenzhen, and Zhejiang) have been allowed to issue their own bonds and two more provinces (Jiangsu and Shandong) were expected to enter the bond market in 2013. So far, the market entry and volume of bond issuance has been carefully controlled by the Ministry of Finance, and that has increased in 2013 to RMB 70 billion, up from RMB 28.9 billion in 2012.
- Public-private partnerships ranging from concessions to joint ventures and build-own-operate schemes.
- Investments made through shadow banking vehicles such as wealth management products, trust funds, and other collective investment schemes.
- Donor-based on-lending activities that are channeled through government policy banks and government companies.

Despite this array of financing sources, the Chinese financial markets continue to be both bank-dominated (accounting for 56.6 percent of local government debts in June 2013) and restricted in scope, with few long-term financing instruments and a limited number of large institutional investors. The magnitude of capital market financing for urban infrastructure remains small relative to bank financing even as bonds issued by urban development investment corporations have become a growing portion of the bond market.

Source: Painter 2013.

a. As reported in "China Development Bank Says $8.1 Trillion Needed for Urban Shift," Bloomberg News, May 20, 2013.

Meanwhile, creditors, including bank and others, fail to impose hard budget constraints on local governments. There appears to be little market scrutiny of underlying financial conditions of LGFVs or local governments and little information upon which to base such judgment. Most urban infrastructure lending by banks and others is based on the reputation of the LGFV and an implied guarantee that the local government will not let the borrower fail. As a result, there is a lack of transparency and objectivity in the financing process. In the absence of credit ratings for borrowers, it is difficult to see how regulators can reasonably assess the portfolio risk profile of the banks and institutional investors. In such a situation, lenders and investors have no expectation of negative consequences for lending to poor credit risk borrowers and poor credit decisions predominate in an atmosphere of moral hazard.

Overreliance on bank loans as an instrument for local government borrowing has intensified the debt refinancing risk. By the end of June 2013, banks had financed about 56.6 percent of local governments' debt, and bond issuance in the capital markets had financed only 10.3 percent (box

6.2). Because the repayment period for bank loans tends to be shorter (two to five years) than that for bonds, the debt cannot be fully amortized in such short time spans and must be rolled over (refinanced) when it matures. Debt management that relies on continuous refinancing when principal payments come due is dangerous, especially in a market setting. The willingness of banks or other lenders to roll over existing debt at maturity depends on multiple factors, many of which are beyond a local government's ability to control. An inability to roll over debt, in turn, can precipitate a local government budget crisis, or in some cases even a financial crisis such as Brazil experienced in the 1980s. Such liquidity risk is also related to the scarcity of long-term financing instruments and the underdevelopment of the Chinese capital market.

China's authorities recognize the potential risks arising from local government debt if liabilities are left hidden and uncontained. In June 2010, the State Council issued a circular (*Guo Fa* 19) on enhancing the control over LGFVs. A joint task force was established to verify and catalogue the LGFVs and their debts. The Ministry of Finance, the National Development and Reform Commission, the People's Bank of China, and the China Bank Regulation Commission have all issued a series of regulations and guidelines to regulate local government and LGFV borrowing behavior. Many local governments have also launched pilot reforms to improve their debt management framework. Much more remains to be done, however, to improve the financial intermediation process for long-term debt financing and put local government financing on a sustainable foundation.

The fourth concern relates to the impact of the existing financing model on market and private sector developments. The central government has signaled that it wants to promote greater market orientation in infrastructure finance, using market-rate debt financing where appropriate as well as encouraging private investment in infrastructure facilities. Both domestic private and foreign investment would be permitted for nearly all forms of infrastructure, particularly in water supply and wastewater treatment, through sole investment, cooperative enterprises, joint ventures, share purchase, or franchise. In particular, nonpublic capital is encouraged in building, operating, and managing public utilities.[16]

Local governments, however, with easy access to borrowing through LGFVs, are less keen to use PPPs. To improve their access to borrowing, some local governments even combine public investment projects that generate insufficient cash inflows with profit-making activities. Such practices blur the division between the government and the market and create distortions that may do more harm to overall economic efficiency than is gained from the public infrastructure financed. These practices encourage LGFVs and public utility enterprises to manipulate their relationships with government to secure their monopoly power in an otherwise competitive market. They also create distorted incentives for local governments to protect their entities from competition from private firms.

Local governments generally lack the needed capacity to manage PPP contracts. These contracts require identifying the true cost of infrastructure and utilities, but, as discussed, the current reporting of and budgeting for infrastructure finance are deficient and unable to reveal the true cost of infrastructure projects. The cost of traditional publicly financed projects is often underrecorded, which may create an illusion about the efficiency of public utility firms. Managing the bidding process is another challenge. Open bidding could mitigate the information disadvantage of a local government, but it sometimes fails to reveal the true cost of infrastructure projects owing to the moral hazard of private partners; for example, a private partner may offer a low price on expectation that it will be able to renegotiate the tariff or subsidies after winning a PPP contract.

The absence of a clear legal and regulatory framework for PPP management also discourages private investors. There are 54 policy acts related to PPP in China's legal system, each dealing with different aspects of a single project such as finance, foreign investment, tendering, and bidding processes. This multiplicity of laws causes a multitude of regulations and a complex legal

[16] The Administrative Rules for PPP Urban Public Utilities Projects, by the Ministry of Construction, March 19, 2004.

environment for PPP projects even within a single sector.[17] The disconnection between central and local policies further aggravates this fragmented approach,[18] leading not only to different ways of implementing PPPs in different places but also to an array of different ministries and bureaus that may be involved in PPP implementation and ultimately discouraging participation by private companies (Wu 2013).

Financing affordable housing

China's policies have been successful in increasing the per capita housing space even as China's urban population increased to more than 50 percent of the total. Between 1985 and 2007, urban residential space per capita had risen to 28.3 square meters from 7 square meters. The larger size is greater than the averages in Europe and Japan (Man, Zheng, and Ren 2011).

Housing prices have escalated dramatically, however, making it difficult for low- and middle-income households, those moving from rural to urban areas, and young workers to buy a home. Housing prices in China's cities became very high in relationship to incomes. Internationally, a price-income ratio of 5:1 or more is considered unaffordable. While the average price-income average in 600 Chinese cities was 5:1, in major cities it was much higher. In Shanghai, for instance, the ratio was 28.4:1 and in Beijing, over 30.1:1.[19] The lack of affordable housing for low- and middle-income urban households in China, particularly in big cities, poses risks and challenges to a stable and harmonious society and impedes labor mobility. Therefore, the development of affordable housing programs became a central focus on the government reform agenda.

China is in the midst of an ambitious program of affordable housing construction. Under the 12th Five-Year Plan (2011–15), the central government mandated that 36 million units of affordable housing be built, with the objective of reaching 20 percent of the total urban population. It then developed a formula through which each municipality was required to build a certain number of units to standards set by the central government, which provided very little funding for this effort.

China's construction effort contains both rental and owned housing in five broad categories to accommodate the diverse urban population (box 6.3). Affordable rental housing is particularly needed in major cities where owning a house is out of the reach of most families. The definition of what types of housing qualify as affordable is very broad and without clear policy objectives except for growth. The target markets range from very low income workers to young professionals with technology skills to middle-income families. The housing is variously called "low-income" housing, "affordable" or "subsidized" housing, or "social" housing, conflating the difference between social housing and more broadly based government-assisted housing. The categorization of qualifying units is so broad that providing a unit that is 10 percent below market value to a high-skilled technical employee and a low-rent unit to a migrant worker both count as affordable housing.

Housing with price caps is making a resurgence in high-cost cities, such as Beijing, but the practice raises the question of subsidy capture. The concept seems simple: give a discount on land sales to developers in exchange for a price cap on the sales price of the housing units. Unfortunately, international experience has shown that developers can build out the units to a

[17] Take the road sector as an example. A PPP project must follow the Road Law (2004), Tendering and Bidding Law (1999), Land Management Law (2004), Contract Law (1999), and the Regulation on the administration of toll roads (2004) if it is toll road, and the Decision on Reforming Investment Scheme (2004) if it involves domestic private investment.

[18] For example, the central government forbids government guarantees of fixed returns, but in some local areas, government guarantees are used to attract private funding. Private sector tax exemption by local governments also has been forbidden by the central government since the late 1990s; however, tax exemption is still an important promise in local policy (Chen and Zhang 2009).

[19] http://www.numbeo.com.

BOX 6.3 Basic concept and categories of affordable housing in China

Economically affordable housing. Economically affordable housing refers to a special category of housing sold to lower-income families at subsidized prices. Qualified purchasers must meet several requirements, including income level, hukou registration, and certain housing conditions. Units are limited to 60 square meters and are sold to qualified families at below-market price, often 25 percent to 40 percent below the price of comparable ordinary commodity housing. The government generally provides land for affordable housing construction, allowing such units to be sold at a discounted price relative to the market price. Owing to heavy subsidies by the government, homeowners are permitted to sell the unit only under certain conditions: they usually cannot sell for the first five years they own the home, and they may be required to sell the house back to the local housing authority with joint share of the increase in value.

Price-capped commodity housing. Housing prices are so high that even middle-income families could hardly afford to buy their own dwelling. Thus, some cities initiated a housing assistance program targeted at urban middle-income families. In this program, the housing price is higher than that in economic commodity housing but lower than that in ordinary commodity housing. Units are limited to 90 square meters. Similar to economic commodity housing, homeowners have to meet certain conditions before they are allowed to sell their units.

Low-income rental housing. Such housing is owned by the government and leased to very poor urban hukou residents at below-market rates. This low-rent public housing program is part of the official social security program and is primarily financed using the budget of the local government. In recent years, direct financial transfer from the central government has increased. After several years of implementation, the program now covers most of these poor urban residents (with hukou registration), especially families with elderly or disabled members. Some low-income families can rent housing in the market with government subsidies, as part of the low-rental housing program.

Public rental housing. This new form of affordable housing started in 2009 to cater to the demands of households with income levels falling between the required thresholds for economic housing and low-rent housing. Public rental housing mostly serves low- and moderate-income families and has lower-than-market rent for the houses of the same quality. This scheme is the first attempt to use rental housing to solve the housing problem of families. It focuses on relieving the stress of finding housing from local young staff and migrant workers who have relatively low incomes. Unlike low-rent housing, public-rent housing in some cities can be sold to the tenants after they satisfy certain requirements, such as a residency period, income cap, and compensation to the government.

Shanty-town resettlement. The resettlement of shanty town residents constitutes a major component of China's affordable housing construction plan. This form of affordable housing is aimed at improving the well-being of low- and middle-income households living in areas considered shanty towns. Resettlement occurs when the government needs land for a development and plans to tear down the existing housing. Relocated families may be offered affordable housing, price-capped commodity housing, or a cash settlement. In cases where the existing property is of significant value, the current residents are sometimes given more than one housing unit.

Source: World Bank 2013b.

lower-quality standard and, therefore, can capture most of the subsidies, defeating the purpose of the subsidy. A lack of a strong appraisal industry indicates that the land price could be artificially inflated over the true market price before the discount is applied.

The formula for housing construction allocation is driven by the central government, not market conditions. The central government provides the range and level of coverage, the means

of allocation and administration, and access and exit mechanisms, and it also contains stipulations concerning the planning, design, size, quality and safety requirements of low-income housing projects. Market studies are not required, and municipalities are judged on their progress in meeting the quantitative goals, not on the success of the projects. (Gao and Wang 2012)

New housing construction may have a negative impact on labor mobility. Since the municipalities are responsible for the cost of construction, much of the new housing built is on the periphery of the cities where land prices are much lower, but where residents are farther from transportation and jobs. In Mexico City, commuting costs from newly constructed housing on the outskirts of the city have caused an estimated 20 percent of the housing to be abandoned.

Housing policies may also have a negative impact on social cohesion. Those who can afford the housing prices will have housing options in the center cities. Those who do not will find their housing further away. In the United States, the model of tall towers in low-cost and often isolated locations led to such physical and safety problems that many had to be demolished.

The affordable housing construction system is a type of unfunded mandate. While the central government sets the goal for affordable housing construction, the responsibility for financing these projects rests primarily on the municipalities and on the local housing provident funds. According to a JP Morgan study, of the RMB 1.4 trillion needed to meet the policy goals for 2011, the central government provided only RMP 170.5 billion in 2011, including RMB 28 billion carried forward from 2010.

The municipalities' provision of land at discounted prices or of net income from land transfers for the construction of affordable housing projects is both an opportunity and a challenge. On the one hand, current revenues increased. Between 1999 and 2007, the amount of land sold for development grew by 23 percent a year and fees for leasing by municipalities rose by nearly one-third annually. (*China Land and Resources Almanac 2008*) On the other hand, land is a limited resource, so land sales cannot continue indefinitely, creating vulnerabilities for the cities, particularly if the projects ultimately fail or cost more than anticipated. This risk is aggravated in some cities that are not even collecting the 10 percent earmarked from the net profit of land transfer fees for low-rent housing construction, according to the China National Accounting Office.

The use of housing provident funds for project finance has grown rapidly. HPFs—mandatory long-term savings funds established to help fund members finance housing—are permitted to use up to 50 percent of their "surplus funds" for social housing construction. The interest rates on the construction loans are set 10 percent higher than five-year mortgages used for individual home purchases, which is far below the development lending interest rate of commercial banks. The use of these funds has grown from a pilot project in 2009 with 29 HPFs providing project financing, to 93 HPFs that had pledged RMB 41.2 billion for affordable housing development and had used RMB 31.2 billion by the end of 2012. The calculation of the provident fund "surplus" is based on the HPF's current financial status, and is not subject to any type of stress test, creating potential vulnerabilities in the funds and in the real estate markets. The "surplus" is determined by the current surplus, deducting for loan risk reserves and administrative expenses. A project that fails will decrease the liquidity of the fund, which, in turn, will decrease the amount of funds available for mortgage loans. The amortization period for many HPF project loans is greater than 10 years, adding additional liquidity pressure.

Financing the construction of rental housing is more akin to project finance than it is to mortgage lending. A lender must evaluate the business applying for the loan, including its management, its track record, the financial position of the owners or of the corporation, the market, the potential risks, and the competition. Evaluating the market is particularly critical because the lending institution must look at vacancy rates in the target market, local laws and regulations, and the overall economy in the areas served. It must assess potential developments that could affect the market, such as a factory closing, which would have a negative effect on the evaluation, or a new commercial and retail development, which would have a positive effect.

Housing provident funds and governmental entities rarely have the training to perform these evaluations and are therefore dependent on the developer's information.

The current approach to financing affordable housing in China carries great risks, particularly to the cities and to the housing provident funds. In countries with high housing costs, it is nearly impossible for low-rent housing to be sustained without deep demand-side subsidies. Even if land and infrastructure are provided, the cash flows from the rents are highly unlikely to cover all of the costs, particularly in low-cost rentals. Cost savings on the front end can lead to faster deterioration, creating a downward spiral of lower occupancy and higher maintenance costs.

Municipalities are given little incentive to build low-rent housing that can be sustainable over time. They are responsible for all of the costs of building, managing, and maintaining housing. They can charge higher rents for slightly-below-market public rental housing than they can for low-rent housing, creating a much greater possibility for positive cash flow. Conversely, they will have to find additional sources of revenue to cover any losses on low-rent housing projects. Therefore, it is in their economic interests to build fewer low-rent units than public rental units.

Expenses for the operation of publicly supported rental housing are underestimated, as they are in many countries. While analyses have been performed on the cost of constructing subsidized rental housing, managers of rental housing interviewed for an earlier study believed that the rents would be sufficient to cover all expenses. While that might possibly be true for units whose rent is close to market price, it is almost never true for lower-income rental housing. In either case, the only way to determine the sufficiency of rent projections is to have detailed financial statements prepared based on projected income, less an estimate for vacancies, less expenses including all maintenance, operational, and management costs and reserves for replacements of capital items. In Dalian, the rent revenue is expected to cover only loan payments, but not property management and maintenance costs. The gap will have to be filled by HPF annual supplements for low-rent housing.

While China does indeed have standards for new construction, there is no system for monitoring the physical conditions over time or for correcting any deficiencies that exist. Moreover, the pressure to keep costs down during construction can lead to faster deterioration than with market rate housing. Lessons learned in the United States are applicable here. Tall towers in isolated locations with too little capital or staff to manage and maintain them deteriorated into slum housing with unsafe and unhealthy conditions. Eventually, properties in Baltimore, Chicago, Newark, Philadelphia, San Francisco, and other cities were demolished.

Reform Considerations for China

To support the new urbanization model, urban finance needs to be reformed. The centerpiece of the reform will be moving toward a system that more clearly separates the traditional function of government—the provision of equitable and efficient levels of public services and regulation—from the investment and production functions of other sectors. The local government leadership evaluation system would need to be altered to reflect this change in the government role. And China needs to move from benign neglect of local borrowing to a rule-based system that is strictly enforced.

A modernization of the approach to financing will require changes in both financing and regulation. The public finance system will need to support the movement of people and enterprises to the places where they are most productive, not to where they get the best tax or land deal from local government. It will also need to accommodate the integration of migrants and their families into urban areas. Revenues from land conversion are likely to taper off, requiring replacement with new sources of local revenue, whereas properly regulated access to borrowing will be needed to finance infrastructure investment. The financial sector will need to intermediate capital efficiently to meet local governments' needs for infrastructure finance, and at the same time impose financial discipline on local governments and avoid financial sector disruption. The private sector can play a larger role in financing and delivering infrastructure investment and other public services.

Aligning the urban finance system with the changing development objectives involves reforms across a variety of interrelated systems, including the public finance regime, land finance, financial intermediaries, and private sector development. For example, changing expenditure assignments is important but will call for changes in the distribution of intergovernmental transfers because local governments might end up with more or less budget responsibility. In turn, losses from the redistribution of transfers might need to be compensated by increased local taxing powers or the ability to increase user charges. Reform of the land conversion program raises the question of whether local governments should be allowed to borrow directly. Should local government be allowed to borrow, the demand for credit needs must be met by supply, which leads to question whether intermediaries can play such a role. These examples suggest that the right long-run goal is not to address a single issue but to implement a comprehensive reform agenda. Some elements of the reform—such as the reassignment of some expenditure responsibilities—might be accomplished in the short run. Others might be phased in beginning in the provincial cities and moving later to other cities, and yet others may be implemented only over the longer run. In this way, the comprehensive reform package proposed in this report could be introduced gradually and over time.

To manage the process of comprehensive reform, China needs a stronger, more transparent and streamlined public finance management and governance system. To get the best value out of public money, this improved system would need to bring a medium-term perspective to financing, link budgets with development plans, and allow government to strategically allocate resources and improve the efficiency and effectiveness of public expenditures. This transparent system could allow the government to communicate the reform agenda to citizens and gain their support; the government's credibility and trust with citizens could also be improved through linking the budget with performance. The government structure could be streamlined by removing the prefecture level as a tier of regional government.

This section elaborates on the key components of the comprehensive reform package. These components are organized by the sources of funding, namely public finance, land finance, housing provident funds, public-private partnerships, and debt finance. Financial management and governance issues are also discussed. All these components are integrated, so it is important to understand how they fit together, as well as the joint impact they might have on the economy.

Rationalizing public finance

The reform agenda of public finance system should be centered on three major tasks: reassigning the expenditure responsibilities to better manage the externalities in a more urbanized economy; rationalizing revenues to correct the distortion of fiscal incentives and finance expenditure needs related to urbanization; and building a rule-based tax-sharing and transfer system to address the disparity concern.

Reassign the expenditure responsibilities

A first priority for the fiscal system is to achieve greater clarity in the division of functional responsibility among the various levels of government. In China, most of the ambiguity in expenditure assignments under the existing system derives from a "concurrent" responsibility list, that is, functions that are the responsibility of more than one level of government. While concurrency is to some extent inevitable, because some functions do require shared responsibility, the goal of this reform will be to minimize it in service delivery. Reducing overlap in government functions could reduce costs as well as unproductive coordination efforts. More broadly, clarity on expenditure assignment is required for a better design of the intergovernmental fiscal system, to ensure that resources are available at the level of government that has the responsibility for delivering a specific service. There is wisdom in the old adage that "finance follows function." Until expenditure responsibilities are sorted out, it is not possible to put a rational financing plan in place (Bahl and Martinez-Vazquez 2006).

In getting the expenditure assignment right, China may need to weigh the gains from local control against the gains from technical efficiency, and from internalizing external costs and benefits. A task force supported by considerable staff should be charged to analyze all functions of government. Each subfunction of government function might be subjected to the same test: do the gains from decentralization—better servicing of local needs and circumstances—outweigh the advantages from centralization—the ability to capture economies of scale and internalize interjurisdictional externalities? Even with this principle to follow, the work of dividing the competencies between the levels of government will be as much art and politics as science. Factors such as preferences of individuals for services, externalities resulting from local decisions or imposed on local areas, and even economies of scale are not easily measured, if they are measureable at all. The effects on equity must be defined and weighted, administrative questions must be considered, and culture will play a role. And always, there is politics. Based on the analysis, the policy maker should rethink needed changes in the division of expenditure responsibilities between levels of government to come up with the exclusive lists. Finally, the responsibilities for each subfunction of government should be laid out in a new law, perhaps a revised budget law. That law will specify those functions that will be the exclusive responsibility of the central government and those that will be the exclusive responsibility of the local governments.

In China, local governments perform some functions that would be better administered by central government. Three areas are of particular concern. First, governments should continue to divest themselves of responsibilities for private sector activities, such as the management of industrial parks, the development of land for commercial purposes, and the ownership or partial ownership of enterprises that produce purely private goods. Whether local governments should maintain their role in industrial policy through tax and subsidy policies aimed at attracting industry is a more difficult issue. Many industrial countries allow this practice, even though its problems are well known.

If the government decides against allowing local governments to subsidize industry locations, it could shift to a policy of making such competitive subsidies the exclusive responsibility of the central government. That is, every subsidy to attract economic development would require central government approval. Under this regime, local governments would continue to

compete with one another without central approval, but the main instrument of their competition would be the quality of services offered. If subsidies are required, as in the case for technology advancements or pioneer industries, these are more appropriately a responsibility function of the central government. The idea of centralizing the power to grant industrial subsidies in China is raised in Lou (2013). Certainly the administration of such an approval process would be difficult and costly and would invite heavy lobbying efforts. In most countries, the problem would be finding a way to prevent local subsidies, but in China where no local government taxation powers are in place, the policing job could be much less difficult. Irrespective of the policy choice made, the central government should clarify the policy and define what is and what is not allowed by local governments in their conduct of industrial policy. The EU rules on support for industry (see box O.11 in the overview report) could serve as a useful example.

Second, responsibility for the financing and administration of social security functions should be rethought. An especially good case can be made for more centralization on the financing side, and for a clearer sharing arrangement between the center and the provinces on the management and financing sides. Centralizing the administration of pensions would improve the mobility of labor, allow the imposition of national standards, and address important problems related to risk pooling.

Old age pensions are a national function in most industrial countries and, beyond the public pension system, a private function in many countries. China might follow this model. Provincial and local variations in benefits and contribution rates are at odds with uniform standards for all Chinese citizens. The current arrangement of city and county responsibility for pensions has forced pooling to the prefecture and provincial level in many provinces, but even that has not eliminated the financial problems. Inter- and intraprovincial disparities in per capita GDP suggest that uniform national levels could not be maintained with local government funding. These pooling issues and the need for portability suggest that both equity and the removal of impediments to labor mobility would be best served if public pensions were administered by the central government—although, of course, the administration would need to be deconcentrated—that is, central government would need to maintain local offices for administration of benefits.

Health insurance is a less clear-cut issue because local management of the program has benefits, and a case can be made for some local variation in the delivery of the service. But the case for central financing and the imposition of central rules is also a strong one. The central government would like all Chinese citizens to have access to the same health care services, and certainly to the same reimbursement benefits, irrespective of where they live. City and county governments, and even some provinces, do not have the resources to deliver on this promise. In addition, health insurance benefits need to be portable to remove impediments to labor mobility, a goal that is consistent with centralization of the financing and management.

A third problem with expenditure assignment is that local governments have been assigned responsibilities that are characterized by significant interregional spillover effects. These functions and subfunctions are candidates for centralization. Detailed analysis by a government commission is likely to uncover many candidates for central assignment, but judicial services, food safety, river basin management, and environmental protection are examples of such functions.

Rationalize government revenues

Government revenues need to be reassigned, based on the expenditure needs related to urbanization and on reassignment of expenditure responsibilities. On the one hand, the reassignment of expenditure responsibility will hold important implications for the financing side of the reform program. If, for example, the social security functions and certain other functions are shifted to the central government, then it might be necessary to shore up the revenue base of the central government to ensure that these costs could be covered.

Should central government need to mobilize more revenues to finance increased expenditure responsibilities, it has two options. One is to transfer more SOE profits to the budget. The SOEs managed by central government are generally natural monopoly corporations, and they generate more than two-thirds of total profits made by all SOEs. If those SOEs managed by central government were to transfer only half of their profits to support the central government's budget, the revenues generated would be roughly equivalent to 1.5 percent of GDP. The other choice is to increase the central government's retained share of total central tax collections, that is, the value added and corporate income taxes. This policy change would also reduce the incentive for local governments to compete for the value added tax base with industrial subsidies. To manage the potential disruption to local budgets, temporary arrangements such as the Tax Return and Tax Increment Return transfers introduced in 1994, could be considered but would need to be phased out over time.

At the same time, a solid revenue base for local governments is important for reasons of efficiency and accountability. Such a foundation could be established by giving local governments some discretion to levy taxes, on certain bases and within a range of rates, and to claim all revenues raised from the new local taxes. That would bring many benefits to China. Revenue mobilization would be enhanced because local governments have information advantages that give them a comparative advantage in the collection of certain types of taxes, such as property and land taxes. A regional efficiency argument can also be made. Substituting local taxes for some intergovernmental transfers would lead to a higher tax price in the larger urban areas and force labor and capital to take that into account in making location decisions. China is struggling with urban sprawl. A system of property and land taxes could help rationalize land use patterns and provide incentives for more compact investments. Finally, there is an equalization argument, that is, as local governments in higher-income regions substitute their own taxes for intergovernmental transfers, funds will be freed up for distribution to lower-income regions. More broadly, local taxation might be a way to harden the local budget constraint and to strengthen the creditworthiness of subnational governments. With taxing powers, local governments would have the wherewithal to expand delivery of services that are in high demand or that would allow them to better capture their comparative advantage. It would also improve their creditworthiness by showing a stronger ability to service debt or to maintain public facilities. In general, local taxing powers would give local governments an instrument to use in shifting their competitive strategies from the back door to the front.

Useful criteria can be applied to identify good instruments for local revenue mobilization: local taxes should be administered at reasonable cost, yield significant revenue, and not result in exporting the burden of payment to residents of other jurisdictions. A number of local revenue-raising options more or less fit the criteria.

A *property tax on housing* can provide a stable revenue source that is aligned with service delivery quality and would allow local government budgets to benefit from increased land values in their jurisdiction. The property tax can fulfill two other important objectives in China: it can be both a quasi-user charge for urban services and a tax on wealth holdings in real property. Property taxes are never popular with constituents, but that is part of the rationale for those taxes: if local governments want to spend more, the burden is on them to argue their case to the taxpayers. Further, property taxes would encourage property owners to make the best possible use of their property—for instance, by renting out their apartments that are currently empty or developing unused or underused land.

China should aim to make property taxes an important part of local government revenues. Even a relatively low effective tax rate of 0.5 percent on this gross measure of the tax base would yield the equivalent of 1 percent of GDP in revenues. Property taxes will not be able to fully replace current land revenues of 1.5 percent of GDP in the near future. Industrial countries raise more than 2 percent of GDP in property taxes while low- and middle-income countries raise about 0.6 percent of GDP on average (Bahl 2009). To realize the full revenue benefits from the tax, it is important to put up a good administration system with a central decision on

the basic structure of the tax. The administration system should consist of identification of all parcels and their ownership, valuation and revaluation, and collection from individual owners; it also requires extensive recordkeeping and updating. A gradual introduction could start with empty apartments and unused land kept by developers. If so desired, an adjustment period could allow people that hold multiple properties to sell them to avoid future taxes.

Local government *taxes on the ownership and use of motor vehicles* could fit China's strategy for coping with urbanization. The rapid growth in motor vehicles compared with that of the road network has been instrumental in the growing congestion levels, higher pollution from transportation, and longer commutes. Motor vehicle taxation could discourage the use of private cars, at the margin, while generating new revenues to defray some of the costs involved. Chinese cities could continue to use tax and charge policies to increase the price of owning and using a car relative to using a public transport system or choosing a different housing location. Drivers could be charged for the full cost of using private vehicles, including environmental and social costs, through mechanisms such as higher registration fees, higher gasoline taxes, higher tolls and parking fees, and various forms of congestion pricing.

The revenue potential from motor vehicle taxation is considerable, and local governments could use the funds to cover the general costs of urbanization. Beijing, Guangzhou, and Shanghai have introduced vehicle ownership or usage control, or both. Some cities such as Shanghai already auction car license plates, which limits car use to sustainable levels and brings in considerable revenues (RMB 7.1 billion in 2012). Higher vehicle registration fees and excise taxes on fuels also offer considerable revenue potential, and both can be implemented with special arrangements for public transport, if local governments want to limit the impact of fuel taxes on public transport prices.

A local sales tax could be charged in the cities where people live and consume. In principle, urban local governments in China could mobilize considerable resources from local sales taxes that are levied in the location where consumption occurs. If sales taxes on selected items of consumption could be made administratively feasible, they could be revenue productive and would pass some of the tests of a good local tax. That might be possible for specific items of consumption such as high-end jewelry and imported luxury goods. But for most consumer goods, a retail sales tax would encourage tax avoidance by providing an incentive to shift the point of consumption to informal traders that are not easily policed by the tax authorities.

A piggyback surcharge could help avoid the administrative problems of sales taxes, by allowing the local government to select a tax rate to be imposed on a central government tax base. The piggyback approach is used to a considerable extent in industrial countries. The primary source of revenue for Swiss cities is a piggyback personal income tax; the city of Rome levies a piggyback income tax on a base defined by the central government, and Danish local governments tag on to an income tax base set by the central government. Local governments in many U.S. states impose a surrate on the state government retail sales tax base. At least three cities—Bangkok, Moscow, and Seoul—have their own surtax on the VAT (Martinez-Vazquez, Vulovic, and Liu 2011). Piggybacking is already done in China with the urban maintenance and construction tax (UMCT) and the education surcharge on the VAT and personal and corporate incomes taxes. The existing UMCT and education surcharge could be replaced with an "urban service tax," and then the local government could be given the option of increasing the piggyback tax rate above its current level. The individual income tax could be added to the list of the piggyback base, but the existing individual income tax rate would need to be lowered to make a room for local piggybacking. In addition, the individual income tax, currently fragmented by different source of incomes, could be consolidated and simplified to a comprehensive individual income tax, and the location of collection could be changed from where people work to where people live.

Increasing prices of urban services such as mass transit, solid waste collection, water, power, and gas to full-cost-recovery levels would ration the use of resources, enhance service sustainability, and reduce government subsidies that are required to close the financing gap.

Internationally, the use of charges for government services of a largely individual nature (water, electricity) is common, and in high-income countries, those charges often cover full costs—that is, the costs of operating and maintaining the service, and a capital charge to pay for depreciation and profits. Low user charges are not a good solution to address the concern of the entitlement of all citizens to basic service, such as the minimum levels of daily water necessary for good public health; all citizens are entitled to these basic services regardless of their ability to pay. The government could use vouchers or targeted subsidies through lifeline provisions to low-income households to pay for their minimum consumption levels. Targeting consumption subsidies in this manner reduces the municipal cost on public budgets.

China's tax structure could be further improved. One important step would be to replace the business tax on services with a VAT, a step that authorities have already initiated. This move would encourage the growth of a services industry, because VAT on services can be deducted from the user's VAT tax obligations. It would also encourage enterprises to outsource services to more specialized enterprises, because there would no longer be a tax advantage for keeping services in-house. The other important step is to introduce a carbon tax. This tax would not only generate significant amount of revenues, but would also an important step toward developing environmental friendly cities.

Establish rule-based tax sharing and transfer

Even with enhanced local government revenues, a considerable gap between expenditure responsibilities and own revenues will continue to exist at the local level. To support the new model of urbanization and economic development, the intergovernmental transfer system should be recalibrated. To motivate and enable local governments to provide equal public services to all people, urban or rural, migrant or local, a formula distribution based on expenditure needs and fiscal capacity differences would be a better approach than derivation-based revenue sharing. Changing the distribution of tax sharing from a derivation basis to a formula basis would considerably alter the outcomes for individual provinces, however, even if done gradually. Some of the losers under such a reform likely would be the richer provinces, including perhaps the larger metropolitan city-provinces. The lost revenues in some of the higher-income provinces could be replaced by increased local taxes and user charges. Therefore, reforming the intergovernmental transfer system would need to be done in tandem with reforming revenue assignments. That would make possible the replacement of lost transfers in some provinces with higher local tax revenues. To better manage the budgetary and political disruption to local governments, the reform would inevitably need to be implemented gradually, and the architecture of the reform must be worked out based on government objectives, administrative constraints, and politics. For example, local governments could be assigned a "target share" based on objective criteria of expenditure needs and revenue capacity, but they would only receive this incrementally, starting from their current share in the grant pool.

More specifically, the reform of the transfer system should take care of three dimensions: vertical sharing, horizontal sharing, and conditional grants.

The vertical sharing regime could be simplified by setting a uniform sharing rate for all central taxes. And the current collection of unconditional grants could be folded into the general revenue sharing program. By setting a uniform sharing rate against all central taxes, subnational governments would be protected from the revenue impacts of discretionary changes made by the central government. Moreover, the sharing rate in the future might be more easily reset to reflect expenditure assignments and desired incentives. In addition, this reform would enhance local spending autonomy, preserving the information advantages of provincial and local governments. So, vertical sharing would become relatively simple. Of the total amount of revenue raised (on taxes where the central government had responsibility for setting the tax rate), 73 percent would be transferred to the subnational governments on an unconditional basis. That would make the vertical sharing revenue neutral. The central government would

have the discretion to adjust the general sharing rate up or down, depending on factors such as the need to protect the expenditure-revenue balance, the costs of urbanization, compensation for expenditure reassignments, and the like.

The horizontal sharing regime, the distribution of provincial revenue sharing pool, could be based fully on a formula, rather than on the origin of collections as under the current system, or on several formulas and ad hoc distributions as in the case of unconditional grants. Such a horizontal sharing approach would force local governments to compete for tax revenue based on the provision of quality public services, rather than by using subsidies to attract industry and thus build its tax base. This approach would offer a better possibility for equalization and for the reduction of fiscal disparities. And it also would encourage cities to develop based on their own advantages, because the revenues of a city would be neutral to any particular economic structure irrespective of whether it was a port city, an industrial city, or a city with a significant presence of non-taxed public activities.

The formula should reflect the objectives of the government, and will change how the grant pool is distributed among provinces. The formula would be defined by the choice of the variables and how they are weighed. With emphasis on equalization, the provincial population might be weighed heavily in the formula (as is done in Germany). If the goal is to provide more funding where expenditure needs are greatest, the formula elements would concentrate on measures reflecting the cost of providing a minimum service level. China can build on its own practice with formula distribution of the equalization grant but also can learn from international experience. Formula grant systems are used in many developed countries; Australia, for example, manages a sophisticated system. In contrast, some countries, such as the United States, have no system of equalization among the states and instead rely on federal earmarked grants and state government policies to provide equalization. As a result, standards of service delivery can vary considerably from state to state and from local government to local government. Box 6.4 lists the approaches to formula grants applied in other countries. In the case of China, this formula grant should ensure that local government has capacity to deliver the minimum public service package to all serviced population, which would give explicit entitlement to migrants to access the basic public service package wherever they choose to work.

The conditional transfer system should ensure local government capacity to address externalities and to more directly address high-poverty provinces. The current conditional transfer system could be simplified. China could consider consolidating many specific grants into a limited number of sectoral block grants that would need to be linked to central government's broad sectoral objectives and supported by a system of performance indicators and performance review. All conditional grant programs should be subject to a sunset clause and a regular formal review, say every five years. That implies that grant financing would be stable and predictable for five years and that formula revision could take place only as a result of a formal review after five years. To overcome delay in disbursement of funds, recipient governments would receive a regular disbursement, say every month, of a specific amount, say 90 percent of the estimated grant due, with the balance disbursed upon evidence of performance. To overcome any diversion of funds by pass-through intermediary governments, all allocations could be posted on the web before the start of the fiscal year.

Subprovincial finance would need to be reformed to ensure resources get to where they are needed. Adjustments in central-provincial fiscal relations alone are not sufficient to ensure that adequate resources would be available to accommodate the budgetary impacts of urbanization. In fact, intraprovincial inequalities in fiscal resources are likely greater than interprovincial disparities. Subprovincial revenue sharing arrangements vary widely from province to province with few mandatory controls set in place by the central government—a feature that is usually observed in federal countries but not in unitary ones. Imposition of mandates by the central government on the pass-through of central transfers to city and county governments may be prudent to ensure objectives can be achieved.

BOX 6.4 Formula grants

Formula grants refer to methods of distributing revenue entitlements according to an objective set of indicators. This approach has appeal because it can be objective and, depending on how it is constructed, can seem fair, for example, a formula with a province's served population and/or per capita income as a key indicator. It also has the advantage to keep the grant share of each local government relatively stable, as a province's share of national population or relative level of per capita income are unlikely to change quickly. Formula grant transfers also have some undesirable features, however. While the formula itself is objective once it is determined, the process of making the determination is less so—it requires a great deal of judgment and is susceptible to favoritism. Moreover, the choice of variables to be used in the formula may be restricted by the quality of the data available.

Many approaches can be taken to constructing a formula. The great variation in the practice might be summarized under four relatively common grant categories. The first might be called the "standard needs-standard revenue gap." The idea here is to set the amount of grants for each local government according to the gap between the amount of expenditures required to deliver a minimum level of services and the amount of local revenue that could be raised at a "normal" level of effort. Many consider this approach to be the best. It was developed in Australia and is also used in Italy and the Republic of Korea, as well as in China.

The second approach is more ad hoc, in that it develops a formula based on impressionistic reasoning about indicators of fiscal capacity and expenditure needs, and then weights each indicator in the distribution formula. These can be very complicated or very simple. Most commonly, population is used as the basic measure of expenditure needs, although its weight in the formula may differ from country to country (for example, 75 percent in Spain and 10 percent in India). Other indicators of expenditure need are also chosen in different countries, such as the percent who are elderly in Korea, population density in Germany, energy cost in Mongolia, and that share of the population with no access to health care in South Africa.

Third, some provision is made for fiscal capacity, for example, less revenue is transferred to places with greater fiscal capacity and more to places with less capacity (Switzerland, Germany, and India). Alternatively, more revenue may be transferred to places that make a greater tax effort (Spain).

Finally formal set-asides are provided in some cases where the government feels that a factor that cannot be measured is nonetheless important to include; examples are state capitals in Brazil and "backward" states in India.

Source: Bahl and Qiao 2013.

Reform land finance

The Chinese practice of financing urban infrastructure with the proceeds of land leases is both wildly successful and problematic. The basic problem is not with the practice of converting farmland assets into productive urban facilities and higher-quality urban services, but rather with the way in which it is being done. Land finance reform needs to address three key challenges: realigning the subnational governments' incentives regarding land acquisition and development with residents' interest; getting the best economic value from the land assets the subnational governments have already acquired; and mitigating the fiscal risks emanating from land market volatility. [20] This reform would call for China to change the way land development is financed; explore other options for capturing land value and value increase; and establish rigorous fiscal rules for land financing. These would require important changes in the law and the

[20] Broader issues relating to land management—spatial planning, urban development, governance, and resettlement and safeguards—are discussed in Supporting Report 3 on land.

administration, and these changes would need to be worked out and fit together. The following are the most difficult issues:

- *Fairness:* The fairness questions related to expropriation and compensation for farmland and village construction land must be worked out. If compensation for these lands is set at market levels for urban land, then a capital gains tax should be levied and returned to local governments. That would put government in the right place—taxing the profits at a reasonable rate rather than expropriating all of the profits.
- *Urban sprawl:* The problem of dealing with the urban sprawl is related to the practice of selling land leases. At least at the margin, this problem might be addressed with a property tax that would help rationalize the land market by imposing a holding cost on land in the built-up area that is being held off the market, imposing higher motor vehicle and motor fuel taxes that would increase the cost of city sprawling, and eliminating derivation-based revenue sharing, which would reduce the incentive for local government leaders to subsidize industry.
- *Revenue impact*. The net impact on financing of these changes in land leasing is uncertain and depends on the stock of the idle industrial land and other public land. The first change will inevitably lower the net profits of governments from land, while the second change, abolishing subsidies on industrial land, would reduce tax expenditures and therefore improve revenues. In addition, the land saved through more efficient use of industrial land could be reallocated to housing or commercial use, and that is likely to generate a significant amount of revenue. To mitigate any possible revenue shortfall, China could impose betterment taxes on those that see the value of their property rise because of infrastructure development. Box 6.5 lists several practices for capturing land value that have been applied in other countries.

This reform would have important impacts, and the debate surrounding it would be politically charged. Whether its adoption is in the best interests of China depends on how well the reform matches national goals. On the one hand, infrastructure services no longer would be free to users, industries would be deprived of some profits, and city governments might no longer enjoy the monopoly power over land transactions. On the other hand, this reform could reduce the incentives that lead to urban sprawl, improve equity, and optimize the use of existing urban land. A slowdown in land leasing and infrastructure spending could give more space for attention to maintenance and a reallocation of public expenditures to social services. In addition, this reform would encourage more efficient use of industrial land and promote more efficient allocation of industries based on market prices for land. That might narrow regional disparity because the less developed regions with cheaper land have more opportunity to attract industrial investment. Urban-rural income disparity could be narrowed as well. Farmers in city suburbs would gain directly from land conversion, and those living far away from urban areas could also gain if they are allowed to convert their construction land to agriculture land and sell land conversion rights in the market, as is the case in Chengdu.

Under this new regime, government's exposure to property prices would be reduced but would not disappear. The sheer size of land financing for infrastructure points to the importance of setting rules for land financing. Fiscal rules would allow prudent management of land financing while ensuring that it continues to play an important role in financing urbanization. Internationally, there are no standard full-fledged regulatory rules, but an analogy can be drawn with the regulatory rules for debt financing. (Peterson and Kaganova 2010) More specifically, China could consider the following regulatory rules.

First, the priority would be establishment of uniform reporting requirements for subnational land ownership, land sales, contributions of land to public-private ventures, land transactions between different types of subnational institutions, and revenue generated by land sales. These are the essential building blocks needed to translate priority principles into meaningful fiscal

BOX 6.5 Options for policies and tools that capture land value

Value capture allows government to capture at least part of the increase in land value along public transit routes and use these funds to subsidize the system. A prerequisite is that the infrastructure services must generate sufficient value to be captured. China has been successful in capturing increments in land value, but the key challenge is to set a rule to allow all people to share the development outcomes as well as the risks. The rule should be economically justifiable, incentive compatible and acceptable to the public. There are a number of value capture instruments and other financial mechanisms being applied globally (Smolka and Amborski, 2007; Peterson, 2008). The most prevalent and effective of these include:

Property Taxes (PT)**:** Annual impositions on urban land and buildings are well applied as an efficient tool to provide fiscal revenue in many countries such as the US and Canada.

Special assessment districts: A one-time charge or assessment imposed on owners of selected properties to defray the cost of a public improvement or service from which they specifically benefit. New and special levies on properties that will benefit from the provision of new or upgraded public improvement or service (Examples in the United States are 17 percent of the first phase of the Portland Streetcar, 50 percent of the capital costs of South Lake Union streetcar in Seattle, and 28 percent of the cost of the new New York Avenue Metrorail station in Washington, DC).

Tax increment financing: This approach dedicates future tax increments within a certain defined district to finance debt issued to pay for a project, which theoretically will create the conditions for future gains (used primarily in U.S. cities).

Transit oriented development or joint development: Given that transit infrastructure plays a critical role in the end value of development projects, the capture of profits from activities associated with real estate development in and around transit stations may allow a transit agency to deliver an operating ratio in excess of 100 percent (as in the case of Hong Kong MTRC). The approach that MTRC uses is described as the "Rail + Property model." Joint development, similarly, can be described as a real estate development project that involves coordination between multiple parties to develop sites near transit, usually on publically owned land (examples are the Land Transport Authority and SMRT in Singapore, BART in San Francisco Bay Area, and the Transport for London Crossrail project).

Developer charges or development impact fees: A one-time and up-front charge requiring developers to make cash or in-kind contributions to on- and off-site infrastructure in return for permission to develop or build on land. These may be stipulated through subdivision/development agreements via some norm or expectation, or they may be negotiated on an individual basis. The use of charges that defray the cost of expanding and extending public services in a particular area. For example, in Broward County, Florida, the local government implemented a Transit Oriented Concurrency system.

oversight. China has taken the first important step by requiring that land transactions be placed "on budget," so that there is full upward reporting to higher-level authorities. A natural next step would be an inventory of municipally owned land and land owned by different elements and subsidiaries of government, which is basic to asset size and land management options. Similar to loan guarantees, the risks include transfer of land to or from third parties in non-transparent ways that may entangle financial relations between a municipality and its subsidiaries. All information on public land inventories, public land valuations, land sales, and land contributions to public-private joint ventures or subsidiaries should be conducted through standardized instruments, be reflected in the budget or its annexes and financial statements, and be a matter of public record. Regulations typically identify what types of publicly owned property can and cannot be alienated, either by sale or as collateral for loans. The registration of land and property collateral for land-management purposes also involves exactly the same information required for subnational debt regulation.

Second, the "golden rule" of public finance should be applied to subnational land financing: Proceeds of land asset sales must be used only to finance investment. Exceptions could be

allowed for key, one-time institutional reforms. Although urban authorities can acquire new land at the urban fringe, and under certain conditions may acquire land through condemnation or eminent domain, urban land cannot be "produced" indefinitely. Sale or leasing of public land is not a "recurring" source of revenue. Thus, revenues from the sale or other disposition of public land should be treated as one-time revenues, with proceeds used to finance urban investment or finance other one-time expenditures such as major institutional reforms. Such rules also open the opportunity to diversify and augment own-source financing of capital investment.

Recurring revenues from public land development may be appropriately allocated to subnational operating budgets. In cases where public authorities develop commercial or industrial projects on public land, for example, development costs can be recaptured through annual rental charges and used to finance debt service charges through the operating budget. For economic efficiency and fiscal prudence, it is essential in these cases that all parts of a public development project, including land, be valued at market prices, and that the decision whether to publicly develop a site, sell land to the private sector for private development, or hold land in the public domain for future development and future increases in land value be made taking into account realistic market valuations.

Third, loans and bonds backed by land collateral may require special regulation. Urban land markets are volatile and cyclical. Extreme dependence on land finance for capital investment funding will impart this volatility to subnational capital budgets. The fiscal framework should mitigate such risk. Risk mitigation may take the form of ceilings on land-finance dependence (similar to ceilings on local indebtedness) or establishment of permanent infrastructure funds that accumulate proceeds from land sales and spread out expenditures over time, according to an infrastructure investment plan. Such rules could set minimum collateral to loan ratios for land-backed loans and prescribe that land must be valued at current market value for collateral purposes.

Fourth, transfer of surplus land to other government units or enterprises, private developers, or public-private partnerships should be prohibited except on a fully disclosed contract basis. Establishing a land trust (found in some U.S. states) that could receive land sale proceeds, and ensuring that proceeds are used for infrastructure investment as prescribed by law, or as decided by appropriate authority with a metropolitan-wide perspective, is one way to overcome the incentives that bureaucratic owners have to "internalize" land sale gains for the sole benefit of the agency. An alternative to subsidizing land for price-capped housing would be for the developer to pay the municipality full price for the land. The government would then put the amount by which it would have discounted the land into an affordable housing fund. These monies could then be used for down payment assistance to the borrower and, if structured properly, would result in the same sales price. However, it would be more open and transparent. The fund could also be used as a match for the borrower's savings or as monthly payment assistance for either mortgages or rent.

Develop stable and sustainable debt finance

Stable and sustainable debt finance is critical to China's continuing urbanization. A consensus has emerged within China that local governments should be allowed to access financial markets directly. Direct access yields several benefits. Subnational borrowing finances infrastructure more equitably because it matches infrastructure asset life with the maturity of debt instrument so that the beneficiaries of the financed services pay for them. It also exposes local governments to market disciplines and reporting requirements, hence helping strengthen fiscal transparency, sound budget and financial management, and good governance. Furthermore, expanding local government borrowing facilitates the development of competitive financial markets, in particular the deepening of the bond market. And finally, regulated direct access to borrowing rather than unregulated indirect access through LGFVs is likely to entail lower risks for the financial sector.

Before China modifies the Budget Law to allow local governments to have direct and open access to credit, a regulatory framework must be established in line with international good practice. Even in the United States, the legal framework set up by each state regulates the borrowing of the state and its local governments (Canuto and Liu 2013). These regulatory frameworks work together with markets to discipline subnational borrowing and make it sustainable. China's capital markets are still evolving; thus it is all the more important to establish a framework to regulate subnational borrowing while promoting a competitive and diversified subnational credit market.

Rigorous regulatory frameworks for subnational borrowers

As China develops a regulatory framework for subnational borrowers, international experience is relevant. The 1990s saw widespread subnational debt crises or fiscal stress in major developing countries such as Argentina, Brazil, India, Mexico, and the Russian Federation. These crises led to reforms to develop and strengthen regulatory frameworks for local government debt financing in these countries. Some countries such as Peru established a framework in the early 2000s to preempt the fiscal risks of decentralization. Historically, the debt crises in U.S. states in the 1840s led to major constitutional reforms regulating debt in many states. In France, a regulatory framework was put in place in the 1990s after episodes of insolvency in the early 1990s as a result of uncontrolled local government borrowing in the 1980s (Liu, L., and Waibel 2010).

Following international experiences, the basic structure of a regulatory framework for China in the medium term should consider the following elements: identifying which entities are eligible for borrowing, reforming LGFVs, setting fiscal rules and debt limits, and developing approval and monitoring procedures for debt issuance.

Eligibility of borrowing entities. A key question is which level of subnational governments should be allowed to borrow and whether LGFVs should continue to serve as financing platform of subnational governments. To answer this question, it is important to note that debt is intended to finance long-term asset formation and that it must be serviced. A subnational government that has revenue sources and a responsibility to finance infrastructure should be allowed to access financial markets. If and when a subnational government is legally permitted to borrow, the practice for creating LGFVs as pure financing vehicles should cease. However, LGFVs that finance and manage essential infrastructure services such as roads, water supply and solid waste treatment should be permitted to borrow, if these LGFVs have their own sources of revenues generated from infrastructure projects. These LGFVs will follow corporate governance structure and financial reporting requirements.

These two types of borrowing entities—subnational government and LGFVs—are differentiated by the underlying sources of revenues to service the debt. A subnational government as a borrower will have broader revenue sources such as transfers, revenue sharing through VAT and income taxes, and revenue from their own taxation to service the debt. LGFVs in infrastructure generate revenues from user fees such as tolls and water fees that can be used to service the debt.

While fiscally strong local governments can access markets, fiscally weaker local governments, particularly in rural or economically disadvantaged regions, may have difficulty in achieving creditworthiness. For these local governments, the central or provincial government needs to finance the bare minimum of infrastructure investment through grants or direct construction by the higher-level government. To prevent local governments from not seeking to become creditworthy in order to access grant financing, the amount of funding provided should be determined by standardized rules to ensure a set of minimum standards of service delivery.

Local governments with fiscal potential but lagging in achieving creditworthiness should also be eligible only for rule-based small grants for infrastructure until they can demonstrate

creditworthiness. Policy banks should focus on assisting these local governments with technical assistance and training in return for making the first new loan to the local government only after it passes the creditworthiness threshold.

Reforming LGFVs. Even after local governments are allowed to borrow directly, some LGFVs can still play an important role in infrastructure financing and operations. The reforms should differentiate three types of LGFVs. LGFVs that finance and implement public infrastructure projects should continue to exist but be reformed to become transparent and financially stronger. LGFVs that are pure financing vehicles for subnational governments should be dissolved, and their debts brought onto local government balance sheet, once the subnational governments have formal and open access to markets (after the Budget Law is amended). LGFVs that mix public and private commercial activities should divest their commercial activities, in line with the direction of refocusing the government on essential public services. This last is perhaps the most challenging aspect of LGFV reform.

As the three types of LGFVs are being classified and restructured, an important reform is to consolidate and restructure LGFV debt (see section on insolvency framework). After restructuring and consolidation, LGFVs that will continue to finance and manage public investments can be strengthened in three ways.

First, if they are not already, these LGFVs should be corporatized, which would strengthen their corporate governance and financial structure. China should continue reforms on cost recovery and pricing of tariffs, which will be critical to the financial sustainability of infrastructure.

Second, the fiscal relationship between the government budget and LGFV operations should become transparent. LGFVs should follow internationally acceptable accounting and reporting standards, and have their accounts audited and their financial statements disclosed periodically to the local people's congress and the public. Some LGFVs that engage in infrastructure projects may not be financially self-sufficient and may continue to require budgetary support. In these cases, their financial statements should become part of the government budget documents and be reported to the appropriate people's congress and disclosed to the public. LGFVs that rely on budget support should also be part of the capital budgeting process and of the general government borrowing plan, as is done in Maryland in the United States, for example.

Third, financially self-sustaining LGFVs should be allowed to access markets through their own financial strength but they should also follow a rigorous regulatory framework. LGFVs that generate project revenues such as tolls and water fees should be able to use revenue bonds instruments or project financing to access financial markets for infrastructure investments.

Fiscal rules and debt limits for borrowing. Fiscal rules and debt limits for borrowers are intended to manage the risks of systemic defaults before they occur. Many countries have adopted a basic rule, called the "golden rule," which allows government entities to borrow money only for long-term public capital investments (Liu, L., and Waibel 2010). Based on international practice, short-term borrowing for working capital can be permitted. However, provisions should be established to provide a maximum amount of such short-term borrowing and to prevent the rollover of short-term borrowing into operating deficits.

In addition to the golden rule, a further set of fiscal rules and debt limits should be established. A number of issues must be considered in establishing such rules and limits (Liu, L., and Pradelli 2013). First, fiscal rules and debt indicators for subnational governments must take into account the fiscal space available for the total public sector, that is, central and local governments. For any given resources available to repay the total public debt, the borrowing space is ultimately split between the central and local governments. At high debt levels, public indebtedness tends to hamper economic growth by crowding out private investment (because of higher interest rates, debt overhang problems, and the like) and imposing heavy tax burdens that distort incentives to produce and invest. In China, the low level of sovereign debt provides

comfortable space for subnational debt accumulation. However, local government borrowing limits should be established in tandem with public finance reform that aligns the tax revenues with functions and gives local government the taxing power to meet local needs. In addition, potential expenditure pressures that could constrain fiscal space for subnational entities should be carefully monitored.

Second, translating thresholds established by empirical studies into debt limits guiding borrowing policies can be challenging. China differs critically from some other developing countries. While excessive indebtedness of subnational governments has led to restrictive debt limits in other countries, China may not benefit from overly restrictive debt limits that can hamper growth. Faster economic growth, large national savings, and a lower cost of borrowing can lead to positive debt dynamics in China. The main goal in China is to develop sound regulatory frameworks so that subnational governments can mobilize resources from the capital markets to finance large-scale infrastructure investments that support growth and urbanization, while containing overall macroeconomic risks.

Third, it will be important to establish fiscal rules for LGFVs as well, because LGFVs' liabilities ultimately constitute sources of contingent liabilities for central and local governments. In the United States, SPV borrowing is subject to regulation (Liu, L., 2010). For example, a typical rate covenant in the United States for a water-sewer utility is to set rates sufficient to produce net revenues equal to at least 1.25 times total annual debt service. In the United States, SPV debt financed by revenue bonds is subject to the regulatory rules and debt limits set for revenue bonds but is generally outside the debt limits imposed on debt instruments securitized by a government's general taxation power. For this to work, accounting and financial transparency of SPVs is an important prerequisite. Without transparency, the financial problems of an SPV can become contingent liabilities of its owner. Table 6.5 provides a summary of key fiscal rules and debt limits for China to consider.

Guarantees can play a useful role in bridging financing for projects that have public policy justifications, or where markets do not fully recognize the underlying economic values. However, guarantees also create an incentive for risky borrowers to seek government guarantees, and for interrelated public entities to support one another in ways that violate arm's-length standards and obfuscate the financial risks that are being assumed. International experience shows that the risks of guarantees for debt service can be regulated while retaining the usefulness of the guarantees. The generally applied key rules include (Liu, L., 2010):

- Private companies may be prohibited from getting such guarantees.
- Limiting the scope of guarantees for municipal enterprises. In France, for example, annual debt charges paid by the local government on its own loans and on loans it has guaranteed may not exceed 50 percent of its operating revenue; no single borrower may receive in guarantees more than 5 percent of the local government's operating revenue, and guarantees may not exceed 50 percent of the principal of the debt of the entity that is guaranteed. Poland has a stricter rule, which counts guarantees provided to a municipal enterprise by a local government as part of the government debt service, which in total (principal, interest, and guaranteed debt service) cannot exceed 15 percent of its revenues.
- Guarantees and all other direct and indirect debt liabilities should be an explicit part of local government budget and financial statements, fully disclosed to the local people's congress and the public.

Procedures for approving and monitoring subnational debt. The central government, through the Ministry of Finance, should set fiscal rules and debt limits for all levels of subnational government. These rules and limits should be monitored on a regular basis. Local governments should have autonomy to issue debts within the limits, but a debt issuance plan for each level of government should be submitted to the corresponding people's congress for approval along with its annual budget plan. The debt issuance plan should be disclosed to the public. Key

TABLE 6.5 Proposed fiscal rule and debt limit indicators

Indicators	Objective and application	Comments
Total local government debt-to-GDP ratio	To monitor *aggregate* debt of all subnational entities To ensure the division of debt space between the central government and local governments and the limits on the overall public debt	Applying the ratio to *individual* local government misses the heterogeneity—the cost of borrowing depends on each local government's own solvency and risk, and local governments with low risk of insolvency can service a larger stock of debt than local government with high risk of insolvency. The Using the ratio of the *Individual* local government's debt to local GDP, , is not advisable because local GDP and local government revenue capacity might not be correlated.
Debt service-to-own revenue ratio	To apply uniformly to each individual subnational government general budget, to ensure financial capacity to service debt and provide incentives for own revenue collection	The ratio reflects the local government's repayment capacity (denominator) for servicing debt (numerator). Arrears should be included into the ratio. The denominator needs to reflect local government revenue capacity. Important considerations: own revenue versus transfers, regular flow of revenues versus one-off revenues (asset sales, land leasing).
"Golden rule"	To apply to both SPVs and local governments	Imposed on the general budget if local government retains responsibility for certain capital expenditures beyond those transferred to LGFVs. Imposed also on LGFVs. Important to have a sound framework for appraising public investment projects (including cost-benefit analysis) and transparent accrual-based accounting (to avoid creative accounting as well as misclassifications between current and capital spending).
Infrastructure sector-specific debt-to-revenue ratio	To apply to financially viable LGFVs	Preferably revenue is measured net of operating expenditures. This ratio requires operations to be sufficiently profitable in cash terms to repay SPV debt obligations. The industrial sector-specific norms observed in the United States could provide a basic guideline for helping develop China-specific norms.

Source: Liu, L., and Pradelli 2013.

fiscal and debt indicators should be disclosed on a quarterly basis, and these indicators should be standardized across local governments for benchmarking and monitoring. A chief financial officer (CFO) can be established at the subnational government level. Centralizing the accountability for local government finance in one office would clarify authority on financial management matters and would put a halt to the decentralized and uncoordinated issuance of local government debt. Ideally, this officer should come from the department that manages the public purse or its supervisor (mayor).

Each level of government should set up a budget committee consisting of the budget department, the local Development Research Council, the Land Department, and the CFO and charged with making a coordinated decision on the size of government expenditure, revenue and cash flow projections, and deficits and debt financing. The budget committee should be chaired by the provincial governor or mayor, or their designated executive governor or mayor. A debt management committee (chaired by the CFO) and consisting of representatives of key departments such as the treasury, budget, and land departments and the local Development Research Council, should make a coordinated decision on a medium-term debt strategy, by taking into account the revenue streams, cash flow, procurement and expenditure plans of line departments, and the balance sheet of governments (assets and liabilities). Gradually, China

should move toward a robust borrowing framework that connects with the overall framework of fiscal management and transparency.

Developing an insolvency framework

International experience shows that relying only on ex ante fiscal rules and limits, without ex post consequences, gives irresponsible borrowers and lenders an incentive to get around the ex ante rules and execute transactions that will later get bailed out (Liu, L., 2010). China would need to establish a framework for insolvency and debt restructuring, in addition to ex ante borrowing framework discussed above.

International experience shows that a collective framework for debt resolution is at the core of a sound insolvency framework (Liu, L., 2010; Liu, L., and Waibel 2010). The tension between maintaining essential services and creditors' contractual rights implies that the pain of insolvency needs to be shared between creditors and the debtor. The insolvency mechanism needs to balance these competing interests and guide the priority structure for settling competing claims. A collective framework will take on more importance as the subnational bond market develops and grows to include thousands of creditors. A lack of clear rules for insolvency is likely to raise borrowing costs, and may limit market access for creditworthy borrowers. In the United States, Chapter 9 of the Bankruptcy Code imposes strong measures on defaulting municipalities and carries a strong stigma to offset debtor moral hazard.

A sound framework should reduce the moral hazard of subnational defaults, discourage free riders, bind all local governments to pursue sustainable fiscal policies, and extend the short-term horizon of local governments to minimize the impact of unsustainable fiscal policy on future generations (Canuto and Liu 2013). In the absence of a clearly defined framework for insolvency, local governments may adjust debt in negotiations with creditors, repudiate their obligations, or shift the liabilities to higher levels of government. A country's legal, political, and historical context influences the choice and design of an insolvency system. However, a sound insolvency system balances the needs of borrowers (representing citizens) and the needs of creditors (representing savers), establishes a transparent and rule-based debt workout procedure, and minimizes moral hazard. Such a framework in China will serve two purposes. First, it will guide the restructuring of subnational debt. China currently is conducting a comprehensive audit of subnational debt. As the reform of LGFVs and other off-budget vehicles (such as financing vehicles for hospitals and universities) proceeds, the debt of the off-budget vehicles will need to be classified, and some may need to be restructured. Second, an insolvency framework will address future defaults of subnational units so that an insolvent local government can maintain essential services while restructuring its debts, restore its financial health, and reenter the financial market.

China has taken important steps in restructuring subnational debt obligations. One example is the restructuring of rural school debt in transition from debt to grant financing, led by the Finance Ministry; the design for debt restructuring has adhered to the principles of avoiding moral hazard; burden sharing by the central, provincial, and local governments; and a clear framework with explicit criteria and rules (Liu, L., and Qiao 2013). Local governments in China resorted to borrowing to finance school facilities to meet the goal of universal nine-year compulsory education. In 2000, China achieved the goal, a historic accomplishment. However, the rural education debt became a significant fiscal burden on local governments. With the public policy goal in the late 2000s of inclusive economic growth, the debt financing of nine-year compulsory education in the rural areas was replaced by grant financing for all children. The new policy needed to address the legacy debt and its write-offs. With its strong fiscal position, the central government could easily have written off the entire debt. This option was not chosen because it would have encouraged moral hazard.

The debt restructuring program in 2007 shared the fiscal responsibility for debt write-off among three tiers of government. The central government grants used an output-based,

rather than an input-based, formula, which took into account both the required expenditure to achieve basic provision of education and the local government fiscal capacity. This output-based approach was designed to prevent perverse incentives for local governments to increase the size of their debt or to reduce their service of debt in anticipation of more grants or bailouts. A local government that borrowed excessively would not gain extra advantage, and another local government that borrowed less or paid off its debt would not be in an unfavorable position

Developing a subnational credit market

China has large national savings. It also has large infrastructure demand resulting from rapid urbanization and the need to absorb millions of rural residents in urban areas. Financial markets can channel savings into infrastructure investments. Diversified subnational credit markets can provide more investment instruments for institutions (such as insurance companies and mutual funds) and individual investors.

Two models of subnational credit markets. There are two major models of subnational credit markets: bank lending, which financed municipal investment in Western Europe throughout most of the 20th century and is still the primary source of local credit financing there, and subnational bond markets, which China has been developing as an additional source to bank lending. The United States is an example of a country that has a deep and competitive municipal bond market. Annual issuances of local government bonds are about $400 billion with outstanding liabilities at about $3 trillion (or 20 percent of GDP). Individual investors are the largest holders of U.S. subnational bonds, followed by mutual funds, bank trust accounts, banks, insurance companies, and corporations (Liu, L., 2010).

Developing competitive and diversified funding sources for infrastructure financing is important to help lower the financing cost. In establishing a framework for municipal finance borrowing after the fall of apartheid, South Africa clearly understood the benefits of competition in the subnational credit market. Its *Intergovernmental Fiscal Review* report states, "Active capital markets, with a variety of buyers and sellers, and a variety of financial products, can offer more efficiency than direct lending. First, competition for municipal debt instruments tends to keep borrowing costs down and create structural options for every need. Second, an active market implies liquidity for an investor who may wish to sell. Liquidity reduces risk, increases the pool of potential investors, and thus improves efficiency" (South Africa National Treasury 2001, 192).

Several European countries, including the Netherlands and Sweden, and over 50 developing countries set up municipal development banks or municipal development funds as the sole or main channel for providing credit to subnational governments. That approach is not recommended for China. Municipal development banks and funds appear to have the advantage of a focused purpose and scope and an ability to build relationships with their borrowers. In theory, they are able to more closely monitor the borrower and provide technical assistance to weaker borrowers. If not well regulated, however, such close relationships with borrowers can be problematic, and the limited scope of their business increases the risk of failure in the case of widespread default. Most importantly, their subsidized lending is costly to the central government and impedes the development of market-based financing.

The international experience with specialized national and regional development banks and municipal funds is mixed with negative examples and consequences. Brazil privatized almost all state policy banks as part of a debt restructuring agreement between those banks and the federal government in 1997. In the Philippines, government financial institutions have become an impediment to private entry into local government markets. In some Eastern Europe countries, municipal funds have become monopolies.

According to Peterson (2003), financial sector deregulation has eliminated the possibility of having quasi-monopoly municipal banks draw on specially protected government allocations

of low-cost, long-term savings to finance subnational infrastructure. In a competitive world, bonds offer more ways to tap institutional and household long-term savings. Even when the ultimate credit extended to a local government continues to be a loan from a bank or other financial institution, the financial intermediary will increasingly raise its own capital for lending from bond issues.

Developing a subnational bond market. China's infrastructure financing has been dominated by commercial banks and government policy banks (and land financing). This dominance provides too narrow a set of financing instruments for China's continuing urbanization. By broadening the range of instruments and sources to include institutional investors in the domestic bond market, and eventually even private equity, financing can better respond to the pace and scale of infrastructure development that China's rapid urbanization requires.

Engaging the domestic bond market in urban infrastructure financing creates a new class of assets for Chinese investors. Institutional investors have large resources to invest in the domestic debt market. These resources can be put to work financing urban infrastructure. Bonds issued by local governments and LGFVs are well suited to the needs of institutional investors such as pension funds, insurance companies, and mutual funds for wealthy individuals who wish to diversify their investments in long-term assets. Bonds that finance urban infrastructure can provide a secure source of fixed income for institutional investors. They can also be risk rated so that regulatory authorities can assess the impact that they have on the riskiness of the institutional investors' portfolio, and institutional investors can be limited to investments in highly rated assets, as they are in many countries.

There is substantial room to grow and deepen the bond market to achieve a long-term investment target of 150–200 percent of GDP. In 2010, China's domestic bond market was 40 percent of GDP. In Turkey, it is over 90 percent, and in Brazil nearly 200 percent (IFC 2013). Deep, efficient domestic capital markets are a powerful source of long-term financing for infrastructure and other sectors that underpin growth. They create alternative financing tools and greater access to capital. Domestic capital markets also provide resilience against banking system shocks.

China has already started to experiment with creating a municipal bond market (table 6.6). Since 2011, four local governments—the provinces of Guangdong and Zhejiang and the cities of Shanghai and Shenzhen—have been allowed to issue a small amount of municipal bonds directly in the market. In 2013, the provinces of Jiangsu and Shandong were added to the trial program. A much larger volume of financing has also been mobilized for provincial governments through bonds issued by the Ministry of Finance on behalf of the provincial governments.

To better take advantage of the bond market, China will need to extend the yield curve. Three- and five-year bonds, which constitute 98 percent of municipal bonds issued in China since 2011, are too short to spread debt service over the life of the infrastructure. Front-loading the debt service in this way puts unnecessary strain on local government finances and creditworthiness. China should encourage the issuance of municipal bonds with terms of 10, 15, and 20 years with the objective of moving to 25- and 30-year bonds over time. To extend the term of municipal bonds, the market will have to establish a yield curve that prices bonds of equal quality according to their term. This requires benchmark rates for those terms in the sovereign bond market. Central government AAA Treasury bonds have been issued for 10- and 20-year terms, but the volume has been relatively small, so benchmark rates have yet to become firm. The Ministry of Finance could begin issuing 15-year T-bonds and increase the volume of longer-term issues to establish benchmarks in the rates for risk-free long bonds.

The local government bond market could be promoted by clearly defining types of revenues that can securitize the bonds. Two types of revenues facilitate the development of two types of bonds: general obligations bonds and revenue bonds. General obligation bonds (GBs) are secured by a government's general faith and credit, that is, the general taxation revenue of the issuer. This type of bond provides a useful financing instrument for public services, such

TABLE 6.6 Local government bonds by issuers
RMB 100 million

	2009	2010	2011	2012	TOTAL
Ministry of Finance	2000	2,000	1,771	2,211	5,982
Shanghai	0	0	71	89	160
Guangdong	0	0	69	86	155
Shenzhen	0	0	22	27	49
Zhejiang	0	0	67	87	154
TOTAL	2,000	2,000	2,000	2,500	6,500

Source: World Bank.

as local streets, street lights, and traffic signals, which do not generate revenues or sufficient revenues, from user charges. The ratings of general obligation bonds are the same as the institutional rating of the issuer unless specific credit enhancements (for example, a bond guaranty from a policy bank or other source) are added to the bond.

Revenue bonds (RBs) are secured solely by the revenues generated from the project financed by the bonds. There is a direct link between the beneficiaries of the project and their obligations to pay debt services. Investors have no claim on other local government revenue sources for repayment of these bonds. For this reason, RBs are suited only for financing projects that can produce revenue from user charges, such as projects for water supply, toll roads, airports, and public transport. Revenue bonds reinforce self-sustaining finance, because the repayment of principal and interest is made entirely from the revenues generated from the project financed by the bonds. These bonds allow the market to play a central role in enforcing debt limitation, pricing risks, and matching the maturities of liabilities with the economic lives of assets. More importantly, RBs affirm that sustainability is about the ability of the borrower to service the debt. No financing structure has been of greater importance to the growth of the U.S. municipal bond market than RBs, which account for about two-thirds of subnational debt in the United States (Liu, L., and Waibel 2008). In the United States, revenues bonds of SPVs are outside the debt limits set by the states, but revenue bonds follow strict rules and have a low rate of debt default.

Hybrid bonds (HBs) are a third type of municipal bond that combines characteristics of both general obligation and revenue bonds. Like a GB, debt service payments are not linked to revenues produced by the project being financed. Like an RB, the local government does not have to pledge the use of all of its revenue sources to debt service. Hybrid bonds offer investors repayment from one or more specific revenue sources only. Local governments can pledge a highly reliable source of revenue to the HB and arrange for that revenue to be directed into a trust account dedicated solely to repayment of the HB. This allows local governments to finance projects that do not produce revenue with a reliable alternative revenue source, while not encumbering their overall balance sheet. Carefully structured HBs can achieve bond ratings that are better than the issuer's institutional credit rating. Compared to GBs and RBs, HBs have proven to be the preferred type of infrastructure bonds in the emerging debt markets of India, Mexico, South Africa, and elsewhere.

Local governments in general should refrain from speculative debt instruments such as structured products. These instruments should be regulated and in most cases prohibited for used by local governments. The risky debt profiles of some local governments in France stemming from the use of structured products in the 2000s provide a cautionary tale (Canuto and Liu 2013).

Regulating the subnational credit market. Development of a subnational bond market requires a coherent set of securities regulations. In many ways, securities regulations for subnational bonds are similar to those for sovereign and corporate bonds. The institutional infrastructure

for bond issuance and trading, such as regulations on credit rating agencies, broker-dealers, underwriters, and auditors, are also similar. In addition, China also needs to build a reliable government bond market yield curve, standardize the accounting standards of public sectors, impose municipal bond documentation and disclosure requirements, and develop professional services.

Security laws cannot prevent defaults and financial deterioration of local governments. Securities laws also cannot replace rules for prudent fiscal management of local governments and for corporate governance for public entities and special purpose vehicles that are owned by local governments. What they can do is mandate disclosure to investors of all material information that would affect an investor's decision to buy, sell, or hold a security. Securities regulations may also cover the offer and sales of securities and the regulation of issuers, trading systems, and the professionals who work in these areas (box 6.6).

The introduction of an insolvency framework that disciplines both lenders and borrowers, together with a law that makes financing offered to unrated local governments unenforceable,

BOX 6.6 U.S. securities laws applicable to municipal securities

Securities laws

- The Securities Act of 1933 established a regulatory scheme for offerings of corporate securities but exempted offerings of municipal securities. It also included the first antifraud provision, which applies to both corporate and municipal securities.[a]
- The Securities Exchange Act of 1934 established the Securities and Exchange Commission (SEC) to enforce civil antifraud laws and regulate brokers, dealers, and certain other market organizations and professionals. Like the Securities Act of 1933, its antifraud provisions apply to all securities, including municipal securities.
- There are also criminal securities fraud laws, enforced by the U.S. Department of Justice, private securities litigation, and enforcement actions under state securities laws.

Basic Principles

- Disclosure: Organizations that publicly offer securities must tell investors the whole truth about their businesses, financial condition, the securities they are selling, and the risks involved in investing. Investors make their own investment decisions.
- Honest markets: People and firms who sell and trade securities—brokers, dealers, and exchanges—must treat investors fairly and honestly, putting investors' interests first.

Regulation of Municipal Securities Trading

- Brokers and dealers who participate in transactions of municipal securities are required to follow the rules of both the SEC and the Municipal Securities Rulemaking Board (MSRB).
- The MSRB, which was established in 1975, issues regulations for brokers and dealers who engage in municipal securities transactions.
- MSRB rules cover many areas including customer protection, record keeping, clearance and settlement, trade reporting, broker-dealer conduct (including political contributions by broker-dealers and employees who deal with municipal securities), and the submission of information to an electronic system known as EMMA (Electronic Municipal Market Access system) that makes it immediately available to the public on the MSRB's web site (www.emma.msrb.org).
- Disclosed information includes annual audited financial statements from issuers.
- The law emphasizes transparency.

Source: Haines 2009; Canuto and Liu 2013.

a. Municipal securities in the United States include securities issued by states, local governments, and their agencies and instrumentalities, including municipalities, districts (such as school districts), special purpose government entities (such as housing authorities), and a variety of other government entities (such as airport authorities). Municipal securities include all debt instruments issued by states and local governments, including bonds, notes, financing leases, and variable rate obligations.

creates strong incentives for more responsible financing of urban infrastructure. Vigilant regulation of banks and institutional investors creates an important incentive for prudent lending behavior. Putting regulation of all financial institutions on an equal footing will open the door to greater use of long-term financing in the Chinese capital market.

Over the long term, the development of subnational credit markets would also benefit from self-regulation and a "buyer beware" approach. Many U.S. regulations were developed by the market players themselves or through market practice. For example, the Government Finance Officers Association developed many municipal bond disclosure rules and practices that were adopted in the industry. The U.S. market has also benefited from 200 years of operation, during which investors learned the hard way about the consequences of defaults, especially in the absence of guarantees that higher levels of government will bail out defaulting subsidiaries. While allowing subnationals to default may have adverse impacts on bank assets and on investors' appetite, these considerations must be balanced against the negative consequences of moral hazard and bailouts on market development.

The regulatory and institutional frameworks for commercial and policy banks and bond markets need to be harmonized to create a level playing field and avoid regulation arbitrage. The credit rating requirement for bond issuance is a particular concern. Because institutional investors provide their financing through the bond market, the risk rating of their investment portfolios is determined by the ratings of the bonds they buy and is easily overseen by regulators. If bank loans are not subjected to rating, some banks will continue to make risky loans that undercut the entry of more prudent lenders into the market. The borrowers may also opt for easy money that can be gotten through shadow banking, for example.

China might consider imposing a mandatory requirement for local government borrowers to have an institutional credit rating irrespective of the instrument used (bank loan, bond, and wealth management product). That would have many merits in addition to helping level the playing field. Not only would credit ratings encourage local governments and LGFVs to improve their financial management, but they are an excellent way for borrowers to learn about their own financial strengths and weaknesses before seeking financing for their urban infrastructure project. In addition, ratings can help them determine whether to pursue a bank loan, a syndicated loan, or a bond issue. Local governments and LGFVs with strong credit ratings may be in a good position to seek the best terms on loans from competing banks or syndicates. Governments and LGFVs with weaker credit ratings will find that well-structured HBs can achieve much higher credit ratings than their institutional rating and thereby enable them to access financing at lower cost on better terms than would be the case using bank loans. By helping borrowers to better target their lenders and by getting lenders to compete, institutional credit ratings can help reduce the cost of intermediation and thereby the cost of financing urban infrastructure.

Mandatory ratings also improve the financial intermediation process. The most efficient way for lenders (whether commercial banks or institutional investors) to get objective information about borrowers' credit risk is to review their credit rating report. That is as true for lending by policy banks and commercial banks as it is for investors in municipal bonds. Ratings are not intended to substitute for financial due diligence, but they provide an efficient way for lenders and investors to determine if potential borrowers warrant additional credit analysis or should be passed over until they are more highly rated. By sorting out the potential borrowers quickly, credit ratings improve the efficiency of the intermediation process and make credit analysis more focused.

Mandatory ratings also make it easier for the regulators of banks and institutional investors to assess the risk profile of banks' loan portfolios and institutional investors' securities portfolios. In particular, more transparency about the risk of loans to specific local governments and LGFVs improves the calculation of a bank's capital adequacy, and banks will become more sensitive to local government and LGFV credit risk in their lending operations.

Bank lending to local governments should be regulated in a way that reinforces local governments' budget discipline and fiscal transparency. Commercial bank lending is normally bound by general prudential rules, which, if applied to local governments, would restrict the governments' opportunity to borrow from such vehicles. Such rules include exposure limits, which limit a bank's loan exposure to a single client; concentration limits, which limits a bank's exposure to a certain type of client such as all local governments taken together, and insider lending limits, which limits lending to the owners or co-owners of the bank. China might review whether these rules are effectively enforced. In addition to these norms, many countries have innovated other measures to reinforce discipline. For instance, after experiencing widespread subnational defaults, several countries, including Brazil, banned subnational ownership of financial institutions altogether. In Mexico, competitive lender selection and transaction ratings were required for large-scale long-term financing. Although these requirements are not mandatory, banks lending to unrated subnational governments would need to have a high capital adequacy ratio.

Shadow banking would need to be regularized to limit easy money for local governments. All asset management products should be subject to the same fundamental regulatory standards. Regulatory policy for all collective investment products should be coordinated among authorized bank, insurance, and security regulators. A plan for reforming the legal and regulatory framework of shadow banking should include short-term amendments of regulations and long-term amendments of primary legislation. Investments in wealth management products, trust funds, or other collective investment schemes should not be protected by implicit guarantees.

The role of policy banks in the provision of long-term finance should be reoriented. The policy banks should be reformed to address market failures for long-term market based financing through various instruments such as co-investment, guarantees, and credit enhancements. Policy banks could reduce their excessive dependence on government guaranteed bonds and leverage their resources by exploring new ways to finance their new operations on a sustainable basis, such as well constructed securitizations of their loan portfolios, loan syndications, and cofinancing schemes with other state-owned and private financial institutions. In addition, policy banks—in particular, the China Development Bank—could play a catalytic role in supporting the use of long-term capital markets instruments. The bank could issue innovative financial instruments that would support the growth of fixed-income markets; provide bond guarantees (on a fee basis as a credit enhancement) for municipal bonds; and purchase a limited portion of new municipal bond issues, serving as a market-maker by buying or selling bonds as needed by other investors. Promoting market competition and preventing moral hazard in government lending is important. The performance of policy banks should be evaluated regularly on these two grounds.

Clarify the role of housing provident funds

Great care must be taken with the steps China's government is taking in the housing area. International experience shows that a key to the provision of affordable housing is an overall well-functioning housing system, one that is efficient and responsive to the needs of all segments of the population, including the poor who are able to access housing at reasonable prices. Housing needs to be understood as an interlocking ecosystem where consumers of different income segments, the construction industry, financiers, and local and central government bodies interact dynamically. Governments that have successfully made housing affordable are those that have played an enabling role, intervening to overcome market failures while also ensuring that their actions do not distort housing markets. Their actions have systematically and simultaneously addressed the causes of market failures by, first, focusing on demand and supply side constraints and, second, putting in place policies that improve management of the housing sector as a whole. Governments can use various policies that enable them to carefully balance

and coordinate the fluid interaction of those within the ecosystem and thereby support housing affordability. Without such an integrated intervention, a patchwork of "affordable housing" programs will only be dealing with the symptoms of the housing problem rather than its causes.

China's housing policies should encourage transparency and the targeting of its subsidies to match its policy goals. The country has achieved great success in meeting its low-income housing construction targets, yet great vulnerabilities remain in how the policies are being implemented. These include financial risks to the municipalities and the housing provident funds, challenges in housing workers migrating to urban areas, social segregation, and risks to the economy overall.

Local governments should carry out a careful analysis of housing demand (demographic and socioeconomic conditions) and supply (types of housing available for different income groups, at what cost), and then use the findings to determine the housing needs of the locality. This approach will enable local governments to define the nature, scope, and policy interventions required to effectively align housing demand and supply. A "National Housing Observatory" could be established to collect systematic information on housing supply and on demographic and socioeconomic conditions and thus capture trends in housing affordability and finance. Such an institute would facilitate monitoring of the sector's performance by policy makers. A good example of an institute that independently collects and analyzes such information is the Canadian Housing and Mortgage Corporation.

China would benefit from giving municipalities more flexibility in achieving their low-income housing construction goals. Rather than mandating a specific number of a particular type of units, broad goals could be set for each municipality, which could then be required to develop a specific plan on how to achieve these targets. The overall plan would include a market study, a market plan, a financial plan, an analysis of job growth and infrastructure needs, and a long-term management plan including contingencies.

The role of housing provident funds should be clarified in the context of a broader clarification of government's role in housing. These long-term savings funds are established for the purpose of housing the employees who contribute to them, and the cumulative funds in the accounts belong to the employees. Great care must be taken not to conflate the purpose of HPFs with that of serving national or local housing goals such as affordable housing. Moreover, providing mortgage loans and project loans in the same institution without clear lines of delineation is a potential conflict of interest. Using HPFs to pay for operational costs of public rental housing projects should be prohibited unless it is clearly specified in the loan agreement.

Actuarial analyses with stress tests of the HPFs should be performed. Given the high housing prices, the large-scale, long-term HPF investments in projects, and mortgage finance for members, the funds are potentially in a financially precarious position. Understanding the risks under different scenarios would enable them to adjust their policies. It would also enable the Government of China to adjust its own policies if it sees negative trends in the HPFs.

The Regulatory and Supervisory Framework for mortgage lenders and housing financiers should be strengthened, particularly with respect to housing provident funds. The Ministry of Housing and Urban and Rural Development should establish standards of lending and operational procedures closely in line with China Banking Regulatory Commission's model and best international practices. The risk analysis recommended for the HPF portfolios would provide important information for improving regulations.

China should explore means other than HPFs for financing affordable housing program, such as direct subsidies from the government budget, mobilization of assistance from employers to their employees and partnership with the private sector. Additional subsidies will be necessary to ensure sustainability, particularly for low-income renters. Since the central government provides little funding for subsidies, the municipalities will need to generate their own revenue sources. One option is property taxes. That could certainly generate revenue, but Chinese municipalities might consider tax abatements for properties that have received public subsidies, especially low-income rental properties. Rental income from low-rent housing is currently

exempted from business tax, real estate tax, and from the urban land tax. Higher rates could be applied to vacant properties, those properties that have been under construction or unfinished for a predetermined period of time (two to three years) and for other properties owned by the same family.

Demand-side subsidies can be an effective tool both in providing housing and in increasing the housing supply. Developed countries almost universally have moved away from the model where the government finances, builds, manages, and maintains public housing. Rather, the trend has been toward demand-side subsidies, such as down-payment assistance for homeownership and vouchers or conditional cash assistance for rental housing. This type of aid gives the consumer a greater role in the selection of his housing unit. Moreover, the supply of money going to consumers has been shown to increase the supply of affordable housing. Examples of subsidies to households include capital grants towards home purchase (such as assistance for a down payment) or rental vouchers. Successful examples include a rental assistance program to low-income households under the Section 8 Program in the United States, which provides housing vouchers or direct payments to private landlords. Under the program, tenants choose where to live and pay about 30 percent of their gross income for rent, with the remainder of the market rate rent subsidized by the program.

Unleashing the constraint of land supply for housing could improve the supply of low-income housing. Land sales should be conducted through a competitive bidding process without regard to its use for industrial, commercial or residential purposes. The government could allow for rural collective construction land to enter urban land markets, improve the inventory of public land, identify underused parcels that could be put toward affordable housing development, and authorize collectives in urban villages to redevelop their land for housing and allow them to invest in formal rental housing. These steps could help increase the supply of affordable rental units and improve housing conditions for migrants and low-income households while also offering collectives new and significant income sources. Bangkok offers a good example of formalizing informal settlements by allowing communities to upgrade their housing in situ and gaining security of tenure with the support of Community Organizations Development Institute.

Employers could play a role in supporting affordable owned and rented housing for their employees. Because they benefit from workers and professionals coming into urban areas, this can take a number of forms: matching funds for down payments for owned housing that employees can access after a predetermined period of employment or assistance with mortgage payments for an initial period. For rentals, a company could agree to rent a block of apartments from a public entity at market rates and then provide a discounted rent to its employees. It could also provide monthly support for rental housing that declines over time.

Promote public-private partnerships

A public-private partnership, at its core, is a contractual agreement between a public agency and a private sector entity resulting in greater private sector participation in the financing and delivery of infrastructure projects. Using PPPs as a form of delivery of public goods represents a step away from the traditional procurement of infrastructure toward a more sophisticated engagement with the private sector, with the expectation of capturing value for money through efficiency gains and lowering of the life-cycle costs of projects. China should consider developing uniform and credible standards, regulations, and a legal framework to encourage public-private partnerships to engage in urban development, including the construction of urban infrastructure, the delivery of urban services, and the construction and sale or rental of affordable housing.

The potential advantages of moving to PPP arrangements and attracting private investment for cities in China would be substantial. First, PPPs could improve the operational performance of the infrastructure facilities by tapping into the technical expertise in the private sector. The

efficiency gains, with a well-designed PPP contract and full competition, could be captured by the government, thus reducing the fiscal burden of cities, and the need to borrow more or increase taxes.[21] The freed-up fiscal space could then be used for social services. Second, because the private sector would be paid largely from the revenues generated from users of the facility, the infrastructure capacity would be designed to fit the projected demand, rather than the current practice of building infrastructure assets beyond the projected demand requirements. PPPs would thus optimize the scale of infrastructure assets being developed. Having the right scale of infrastructure would contribute to the sustainability of the cities by reducing resource use requirements. Finally, PPPs could facilitate the transformation of the role of government. In the 1980s, in an attempt to reduce public spending and reduce inefficiencies, countries led by the United Kingdom (under Margaret Thatcher) and the United States (under Ronald Reagan) pushed on reform of public enterprises and greater private participation in all economic sectors. The infrastructure industry gradually started to change, marked by a shift from public to private financing and provision of infrastructure and the introduction of the principles of competition and commercialization. The role of the public sector changed from direct and active actor in the provision of public goods and services to one of regulator, facilitator, and user of such goods and services. By the 1990s, PPPs, as currently defined, were introduced and provided with models of private sector involvement more attuned to public services provision.

For the duration of the contract, the concessionaire (or private partner) typically will build (or rehabilitate), manage, maintain, operate, and control the assets in exchange for some combination of user fees and government transfer or payment, which is its compensation for the investment and other costs. The corresponding government commits to make in-kind or financial contributions to the project, whether through subsidies, guarantees, shadow fees, or availability payments. Therefore, to capture value for money through efficiency gains, the Chinese government needs to consider carefully the following issues. First, attracting private investment may require higher user charges to make the investment profitable for private investors. If government is not prepared to accept cost recovery tariffs for the service, it would have to provide for subsidies from the budget. Second, PPPs can create direct or contingent liabilities on the government, which should be carefully managed. If the private operator fails, the government will likely have to take on its obligations to prevent the service from collapsing. Third, providing public services through PPPs adds a layer of complexity in operations and requires considerably more detailed legal agreements and more complex bidding processes than those needed for government-built and operated facilities. All of these issues can be managed, and there is ample international experience in all of these, but government should be aware of these issues as it further develops its PPP framework (box 6.7).

A PPP framework should be tailored to existing laws but may also require changes to laws or policies that are not compatible with PPPs. At the national level, a single PPP law should guide approval processes across sectors and regions.[22] That can both simplify the project approval system and facilitate prudent decision making at the local level. Local governments need to make policies to create the incentive for participation from the private sector, and establish a regulatory system for guiding regulating PPPs. Of great importance in a PPP framework is its provision for resolution of contractual disputes. To attract private investors, PPP contracts may need to include contract-specific dispute resolution mechanisms that may be based on national or international arbitration and other administrative processes before moving the dispute into

[21] It should be noted that the overall financing costs of investment through PPPs might not be lower. In fact, private operators would likely face higher financing costs than government. This disadvantage can be outweighed by efficiency gains in construction and operation.

[22] The newly released rule on government procurement (Rule No. 74 by the Chinese Ministry of Finance, on December 19, 2013) is a good start in this direction.

BOX 6.7 Australia: A leading model in implementing PPPs

Australia is a model example of PPP development from the creation of upstream policy frameworks through downstream implementation. Several reviews of the existing Australian PPP portfolio express confidence in this model of public service delivery and are optimistic on the performance of PPP projects in comparison with traditional procurement. Furthermore, project outcomes from PPP projects in Australia, as measured by cost savings and delivery performance, outstrip their public sector comparators.

Australia has entered into the third decade of PPP contracts and has developed a set of unique skills and strong policy frameworks to meet the challenges of implementing an effective and output-based PPP program. In 2008, the Infrastructure Australia Act came into effect with a new integrated approach to planning, funding, and implementing public infrastructure projects. Some contributing factors to the success of Australia's PPP program include:

- A PPP policy framework underpins the principles of when to use PPP and how to assess projects and appropriate implementation processes
- The PPP policy guidelines set out the guiding principles within which the public sector should operate
- The PPP Unit in Victoria plays a critical role in regulating the PPP process by providing guidance to the government, as well as providing governance structure in its early days when new PPPs take shape.
- The auditor general's review of the procurement process of the PPP contracts led to subsequent improvements in PPP procurement practices, such as the bid submission process, competitiveness during the bidding period, and optimization of risk allocations.

the courts. Other legal safeguards also need to be present in the form of effective application of the rule of law and effective regulatory oversight.

Local governments need to introduce a competitive mechanism along with innovative modes of operation to promote openness, transparency, and efficiency for PPPs. To open up competition, public agencies should be restructured with transparent financial reporting on their costs, subsidies received from the budget, and the quantity and quality of delivered services. Open bidding should be set as a norm to create more opportunities for the entry of private players.

To fully capture the benefits of these partnerships, China might shift the focus of PPP contracts from capital financing toward service provision. Service focus could be achieved by bundling investment for asset creation with operation and maintenance requirements over a long period of time (such as 20 years). PPPs for most types of urban infrastructure and service and affordable housing delivery will depend on local government payments over the lifetime of the PPP contract. In these cases, local governments should be allowed to make multiyear financial commitments. Future financial contributions to PPPs need to be kept to a fiscally sustainable level, and the best way to do that is to ensure they are kept within the expected, future level of recurrent revenue. These observations reinforce the case for fiscal reform. If, for example, the system of fiscal decentralization provided local governments with a stronger revenue base than they currently have, they would be in a better position to engage private partners through PPPs.

Expanding PPPs in the future will inevitably increase governments' contingent liabilities, and a careful risk assessment and proper risk-sharing system is needed. PPP contract arrangements need to clarify the risk-sharing arrangements. Governments should bear only those risks that they can best manage, which generally are those that they can control or at least influence. The rules governing PPPs should ensure that the officials and ministers in charge have incentives, information, and the capability to take account of the costs and risks of contingent liabilities. More specifically, PPPs should be approved by the cabinet, the Ministry of Finance, or some other body with an interest in future spending. The Ministry of Finance or the finance departments of local governments, or both, should review proposed PPPs. Cost-benefit analysis should

be used to select projects, and value-for-money analysis should be used to choose between PPPs and traditional public procurement. The costs and risks of contingent liabilities should be quantified, and budgetary systems should be modified to capture the costs of contingent liabilities. A guarantee fund should be used to encourage recognition of the cost of guarantees when they are given or to help with payments when guarantees are called. Governments should charge fees for guarantees. PPP contracts should be published, along with other information on the costs and risks of the financial obligations they impose on the government. Modern accrual accounting standards should be adopted for financial reporting, to reduce the temptation to use PPPs to disguise fiscal obligations. (World Bank Institute and PPIAF 2012).

China could improve the institutional capacity of governments to lead and promote PPP at local level by creating a special PPP unit. Experience from more than 20 developed and developing countries shows that such a unit is more likely to have the necessary expertise to oversee projects with standardized processes and achieve scale economies in management, ultimately maximizing public benefits. For China, such special PPP units might be established at the provincial level, given the scale and regional variation of development. Potential conflicts among their promotional, advisory, and evaluation roles could be avoided by having the fiscal risk assessment carried out by an impartial entity; as noted, the finance departments might be given the task of deciding whether to use public procurement or PPPs on a comprehensive value-for-money assessment.

Improve financial management and governance

These reforms in urban finance—public finance, land finance, debt finance, and partnerships with the private sector—will empower city governments with more control over taxing, revenues, and borrowing, and more autonomy in locating resources to finance expenditures on local needs. City governments would then have a better chance of capturing the opportunities and managing the risks brought about by city development. At the same time, however, the power of city governments has to be balanced with strong governance to maintain a proper balance between efficiency and equity; only with this balance between authority and accountability will China's urbanization be efficient, inclusive, and sustainable. Top priority should go to building capacities for financial management, by bringing a medium-term perspective to public finance management and by promoting accountability through transparency and a streamlined hierarchy government structure.

Strengthen public finance management through a medium-term perspective

The government's forthcoming urbanization plan will have far-reaching fiscal implications across numerous sectors on revenue, expenditure, and debt over the medium term. Many fiscal policies undertaken today may have broad intertemporal effects. Examples include the effects of current public investment on future operation and maintenance spending, the impact of current land development spending on future land leasing revenue, and the effects of current spending on education and health on future productivity. Similarly, a medium- and long-term horizon is required to assess the financial sustainability of current debt policies and the effect on liquidity risks of the financing terms applicable to LGFV liabilities. Formulating and implementing such a plan in a fiscally sound manner would be difficult without using a medium-term budget perspective. Moreover, government anticipates a slowing of growth even as it works to address the significant imbalances between the needs of local governments and their fiscal capacity, while maintaining a healthy debt-to-GDP ratio; that combination makes the need for medium-term fiscal planning all the more important.

Conceptually, medium-term expenditure frameworks (MTEFs) promise numerous benefits: strengthening the links between planning and budgeting, including by sharpening the strategic allocation of resources over the medium term; strengthening the ability of fiscal policy to

address structural challenges, such as demographic change and business cycles; strengthening the efficiency and effectiveness of spending, including through programming multiyear projects and their recurrent cost implications; and providing greater reliability to subnational governments dependent on transfers from the central government. Among these, a core advantage of MTEFs is the bringing together of planning and budgeting, which is especially important in countries with five-year plans but annual budgets. A recent, comprehensive analysis by the World Bank shows that MTEFs are indeed associated with many of the hypothesized benefits (World Bank 2013a).

The term "medium-term expenditure framework" covers a range of approaches, from more basic to more sophisticated. The first stage can be considered a medium-term fiscal framework, which is essentially the determination of the total amount of resources available (macroeconomic-fiscal framework) during the medium term and their allocation across broad spending categories (sectors or agencies). The fiscal framework is thus based on a "top-down" approach. The second stage, the medium-term budget framework, incorporates multiyear budget requests prepared by spending agencies, which must be reconciled with the sectoral ceilings and the overall resource envelope. The budget framework thus brings in the "bottom-up" dimension. The third and most sophisticated stage is the medium-term performance framework, which moves the budget's focus from inputs to outputs and outcomes, thus encouraging the allocation of funds based on results. By 2008, 132 countries had adopted MTEFs. To be sure, MTEFs are not panaceas, and their success depends on initial conditions including the institutional context, appropriate design, and sound implementation. The key challenge for China is the robustness of annual budgeting, including budget credibility, measured by the divergence between budget documents and actual spending; and approval of the budget after the start of the fiscal year; budget comprehensiveness that is, whether there are extrabudgetary funds and the use of multiple budgets (such as a public finance budget, a state funds budget, and so on); complexity, or the number of budgetary entities; and budget reporting, in terms of analyzing the on-going execution of the budget and the impact of spending in light of the five-year plans and their targets (Deng and Peng 2011).

A medium-term expenditure framework with Chinese characteristics is likely to provide benefits that a limited and simple annual budgeting approach cannot offer. To successfully adopt a medium-term budget perspective, China might consider three steps:

Harmonizing the MTEF with on-going and planned public financial management (PFM) reforms. With the aim of making the annual budget sufficiently robust to enable construction of a multiannual budget process, China might consider using the MTEF reform to drive the next phase of overall PFM reform. That is, to implement an MTEF, some existing challenges in PFM would need to be addressed simultaneously. Using the MTEF as the driver, or key reform concept, would enable the Ministry of Finance to identify and sequence the priorities for reform over time, ensuring design of a comprehensive and prioritized reform plan.

Identifying challenges that the MTEF should focus on addressing. The specific challenges that China might want to address in introducing an MTEF will play an important role in how it is designed. For example, if China wants to shift from a "bottom-up" orientation to a more "top-down" budget allocation process, the MTEF can play a key role by focusing on sound aggregate and departmental expenditure ceilings and limiting policy decisions outside of the annual budget process. Or if China wishes to focus on more robust efficiency and effectiveness in spending, the MTEF would play a key role in bringing together the recurrent and capital budgets. It would be important for the government to articulate a rationale for the MTEF to help motivate and design it.

Appropriately designing an MTEF that could fit China's existing public financial management system. Implementing a full medium-term budget outlook would, of course, take a number of

years and would need to be phased in. But immediate steps could be taken to gradually develop a multiannual perspective in budgeting. Toward that end, careful consideration should be given to the immediate steps needed to strengthen key supporting fiscal capabilities and pilot building blocks of a medium-term budget outlook.

Given the existing challenges in China, it would seem to make the most sense to start with the fiscal framework. In doing so, attention should be given to building several core capacities: macroeconomic forecasting; revenue forecasting; the capacity for using a medium-term fiscal framework model; the development of multiyear ceilings; and the piloting an improved methodology for program costing.

In addition, a number of design, institutional, and technical issues would need to be considered: coverage (categories and levels of government spending, such as recurrent and capital, to be included); level of detail (disaggregation of spending by economic type and agency); time period covered and frequency of updating; dealing with uncertainty (setting up a contingency reserve fund, for example); and institutional roles and responsibilities for implementation. Additional analytical and technical inputs might be needed to prepare an adequate design proposal and an MTEF implementation roadmap. It might also be useful to develop a pilot MTEF model at a subnational government level (where there is limited reliance on transfers, for example) and also pilot a medium-term budget framework in selected sectoral budget agencies.

Enhance transparency

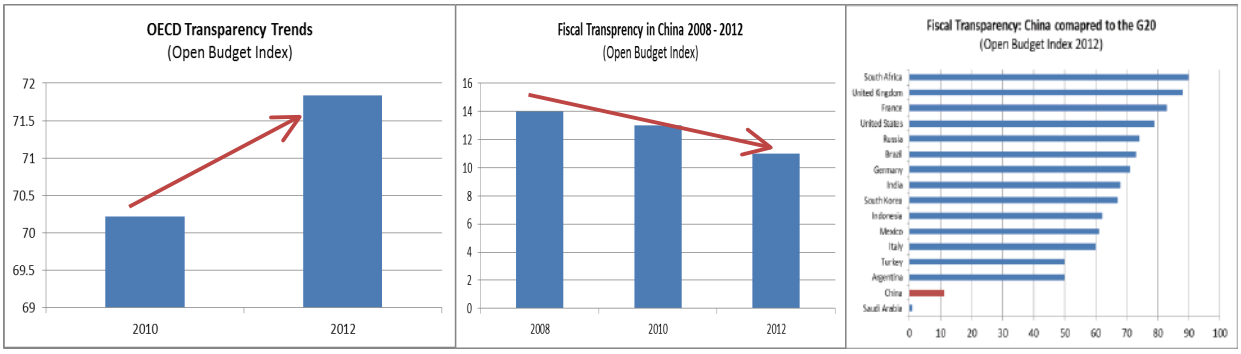
China experienced relatively rapid expansion in public service provision coupled with deepening decentralization to provincial and subprovincial governments over the past 10 years. With continued but slower growth expected in the coming years, along with an aging population and rapid urbanization, the demand for equal access to better public services will continue to increase. These developments are likely to place a strain on services and outcomes for citizens. Transparent performance management will track results during this time of transition and establish a basis for government and citizen engagement to increase access to and the quality of services.

Transparency is increasingly at the heart of accountable, representative, and well-performing government. As Premier Li Keqiang recently said, "It is imperative to build an innovative and clean government under the rule of law. Clean governance is the cornerstone for the credibility of a government, and is expected by the people. Open and transparent use of power is the key to building a clean government."[23] Indeed, international literature provides robust evidence that openness and transparency assist in strengthening accountability and building citizen trust and engagement. Transparency could bring numerous benefits to the country: transparency is often associated with better socioeconomic and human development indicators, higher competitiveness, and reduced corruption. More transparent countries tend to have better credit ratings, better fiscal discipline, and less corruption. In addition, reforms that enhance openness and accountability can lead to increased responsiveness from service providers and less corruption and can empower the poor (Kaufmann and Bellver 2005; Hameed 2005). Moreover, greater transparency in procurement (through public access to information on government contracts, and fair opportunities for contractors and suppliers) can also have a significant impact on the efficiency of public expenditure and the attainment of value for money.

China has taken steps toward greater transparency in public spending in recent years. The new leadership has promised to make more rapid progress in this regard, and some specific types of expenditure, over which the public had voiced concerns, have been addressed recently. However, the level of fiscal transparency is still low compared to member countries of the Organization for Economic Co-operation and Development (OECD) and the Group of 20

[23] "Li Defines Criteria for Fighting Corruption," *China Daily*, March 27, 2013, p. 1.

FIGURE 6.8 Budget transparency trends in the OECD and China, 2008–12



Source: Open Budget Survey 2012.

(G-20)—and may be declining. China still has one of the least transparent fiscal and budget processes in the world (figure 6.8).

The most recent estimates show that China's fiscal transparency score has been declining over the past five years. China does relatively well on publishing in-year, year-end budget and audit reports; however, after more than a decade of budget reform and increasing transparency at the central level, a large gap remains at the subnational level, especially given the size of extrabudgetary funds. These areas are in need of reform. Relatively easy gains could be made by also publishing the executive's budget proposal as well as the enacted budget, both of which are currently produced but used for internal purposes only. The in-year and end-year budget reports could also be strengthened by increasing the comprehensiveness of information provided, including explanatory notes on the differences between the budget and actual spending and greater disclosure of assets and liabilities.

The level of fiscal transparency varies across jurisdictions, and on average China lags behind most others in government transparency. Information about actual expenditures, off-budget transactions, and actual government performance, is patchy and limited in most jurisdictions. Some pockets of innovation are emerging in some jurisdictions, such as the district of Minhang in Shanghai, which is piloting performance-linked budgeting and is pursuing transparency through the Internet (box 6.8).

Lack of transparency is particularly costly for China. On the one hand, it limits the central government's capacity for monitoring budget implementation and results at the subprovincial level. Hence, the accountability chain from central government to citizens is weakened when local governments are unable to provide timely information about the coverage and quality of services delivered. On the other hand, the quality of administrative data provided by local governments to higher levels is also limited. In some cases, subnational governments find it difficult

BOX 6.8 Performance-informed budgeting in Minhang district (Shanghai)

Minhang is piloting a performance-oriented budget reform that covers key social spending programs, for which objectives and performance indicators and targets are incorporated into the annual budget documentation and submitted to the district people's congress for review. Evaluations of these programs, some by third parties, are also undertaken, provided to the people's congress, and posted on the web. Reviewing and strengthening the pilot, and then rolling it out to other subnational governments, could help improve transparency.

Source: http://www.shmh.gov.cn/.

to generate sufficiently high-quality performance data to meet the needs of the national government; in other cases subnational governments have been known to manipulate data to attain certain ends, such as qualifying for more transfers. This problem has led the national government to provide more and more transfers in the form of narrowly earmarked programs that require compliance with national government objectives but that limit discretion of subnational governments to adjust programs and allocate resources to meet local needs. This negative cycle of decreasing trust, increasing control, and increasing strategic local government behavior may be contributing to reduced spending efficiency and greater administrative and transaction costs.

Making more of the subnational government data public and opening it to the scrutiny of citizens would increase the credibility of the data and make it more useful. Indeed, the central government could enlist the help of citizens in holding local governments more accountable. At its foundation, this step would represent a change in political and bureaucratic culture, moving away from practices of confidentiality toward more open communication, not only with the public but within governments themselves in the discharge of their duties.

A modern approach to government transparency is fast becoming the norm as governments establish initiatives and agencies charged with making information available to management and to the public. China could draw from international good practices.

Collecting and publishing fiscal, assets and liabilities information. Transparency includes having an independent audit of national and subnational financial accounts, making periodic public disclosures of key fiscal data, exposing hidden liabilities, and moving off-budget liabilities on budget. China will need a comprehensive budget reporting that covers four government budgets and other public activities carried out by public utilities or SPVs but mainly funded by governments. The classification of budgetary expenditures should distinguish between recurrent and capital expenditures. The debt reporting should cover government direct borrowing, guarantees, and contingent liabilities. The financing of deficits of large public sector undertakings, which implicitly are government liabilities, should be reported as an annex to the main financial statement. Changing the accounting method from cash-based to accrual accounting for all level of the governments could eliminate an important source of hidden liabilities: arrears.

Linking with performance information. China could compile and publish a citizens' budget. These have been increasingly used as a way to make information about fiscal and service delivery outcomes accessible to the public. A citizens' budget for China, which would present basic revenue, expenditure, and fiscal data in an accessible format, could be a useful way to communicate about these issues directly with the public.

Transparency—that the public availability of fiscal and performance information—is needed to make performance budgeting works. It can help increase public trust in government as part of an open budgeting and performance management framework. Performance budgeting focuses on the results that are being delivered for the resources provided, rather than just on how much money is being spent or transferred to subnational governments. It is an approach that is increasingly being adopted around the world. Over two-thirds of OECD countries now include non-financial performance information in their budget documents.

To a large extent, China is already performance driven. The national performance framework is transitioning from being output focused and is increasingly linked to forward-looking policy targets. China's 12th Five-Year Plan sets out clear performance targets that cut across the priority areas of government. Similarly, regional and special plans set out targets for key initiatives, while provincial plans set out policies and targets at the subnational level. The Ministry of Finance is in a unique position to lead a government wide initiative to link fiscal and performance transparency. Performance-linked budgeting can be a useful approach for pursuing this goal.

Publishing performance data in national and subnational budgets is an initiative that would anchor China's performance-driven plans in open government, and that would encourage

greater focus, efficiency, and effectiveness in expenditure. To achieve these goals, the main task is to systematically distill and publish a salient set of performance benchmarks tied to budgets and outcomes as experienced by local citizens across the whole of government.

To be effective, performance information needs to be meaningful to both service providers and citizens. This balance is often a challenging one to strike, because it is based on an iterative and coordinated process between levels of government and service providers. Often, government information is too broad or vague in meaning to have any substantial public impact. Indeed, there are calls for subnational governments to release more meaningful data to citizens.

Two examples for providing performance information to the public come from the United Kingdom and Canada. The United Kingdom's official open data portal (http://data.gov.uk) is the home of its transparency efforts. The website contains a substantial and growing amount of information, including central and local government spending data, government contracts, and titles and pay rates for senior civil servants. This initiative has been transformative and has quickly helped the government demonstrate its commitment to transparency and open data.

The Canadian province of British Columbia launched an open data portal (http://data.gov.bc.ca) offering access to more than 2,500 local government datasets to the public. The initiative showed that a high demand for financial data, and remarkably, there was also demand from civil servants themselves who benefited from better access to data for management.

E-government. Innovations in the use of technology, an area of strength for China, can make it easier to adopt a big-push approach to transparency, particularly as the use of Internet and e-government facilities has been growing in recent years. Such innovations have underpinned a modern approach to transparency in many countries. Transparency is most effective when the government enables citizen participation. The Korean government, for example, has set up a web-based participatory budgeting system. Besides providing public access to real-time fiscal data, D-Brain (http://digitalbrain.go.kr) enables citizen participation throughout the budget process with Internet surveys, cyber forums, and a budget waste report center for citizen reporting of misappropriation or misbehavior. The Minhang District of Shanghai's experiment with performance-based budgeting is another example of innovative use of information technology (see box 6.8)

Completing province-managing-county reform

The hierarchical governance structure is of critical importance in dealing with the effects of past rapid urbanization, improving access to rural services, and facilitating a more orderly next wave of urbanization. China is a unitary state with one government administratively organized into a hierarchical five-tier governance structure with the central government at the apex followed by provinces, prefectures, counties, and towns and townships. China has the highest number of tiers among large countries (table 6.7). It is worth reexamining how many tiers are needed.

Enhanced focus on expanding access to rural services led the Chinese authorities to take a second look at this hierarchical governance structure. In 2002, the national government adopted a policy of developing a harmonious society with special emphasis on rural development and expanding access to rural services. In the context of this policy, it was recognized that the existing local government structure especially prefecture-county relationships were not conducive to giving rural residents equal access to services. Prefecture governments were perceived to have an urban bias in their incentives and accountabilities and a relative neglect of the concerns of rural residents or even for the food security of the nation. This prompted the central government to encourage reforms of province-managing-county and county-managing-township finances in 2002 on a pilot basis. Subsequently, these reforms were recommended for nationwide adoption jointly by the China Communist Party (CPC) Central Committee and the State Council in 2009 (*Zong Fa,* 2009, no. 1) and were highlighted as an important priority in

TABLE 6.7 Local government fiscal tiers by region and income

	# tiers		average population		average area	
	mean	s.d.	mean	s.d.	mean	s.d.
Total	2.03	0.80	101.1	175.5	2.1	7.0
By region:						
Southern Asia	2.43	0.98	79.8	75.5	0.3	0.6
Europe and Central Asia	2.00	0.74	29.5	56.3	0.3	0.4
Middle East and North Africa	2.00	0.86	111.8	116.4	5.1	15.7
Sub-Saharan Africa	2.02	0.76	171.6	178.6	4.1	8.0
Latin America and Caribbean	1.74	0.63	63.2	51.9	1.1	1.7
East Asia and Pacific	2.50	1.00	171.4	379.8	1.2	2.5
North America	2.00	0.00	11.6	6.8	1.3	1.7
By income:						
high income	1.69	0.67	72.5	119.4	1.1	2.7
middle upper income	1.76	0.72	67.3	78.8	4.1	13.3
middle lower income	2.35	0.76	93.9	246.4	1.1	2.3
low income	2.26	0.82	162.3	178.0	2.6	5.5

Source: Ivanyna and Shah 2014.

the 12th Five-Year Plan. In 2012, the Ministry of Finance advised all provinces to implement these reforms with suitable adaptation to local context.

Several provinces including Hubei have now almost a decade of experience with these reforms. The reforms delayered local fiscal governance by allowing direct flow of funds from the province to counties and in the process bypassing the prefecture governments. A careful review of progress with these reforms suggests that they have had a positive impact (Zhao, Ma, and Li 2013).

The case for abolishing prefecture as an intermediate tier between province and county can be made on conventional constitutional and economic grounds. First, abolition in itself could be considered a welcome move because China has four tiers of local governance, twice as many as the average in the rest of the world and the highest number among large countries. Second, China's constitution does not acknowledge prefecture governments as oversight tiers for county governments. Third, the greater the number of tiers, the more costly local governance is and the greater the perils of coordination failures. Further there is likely to be greater potential for confusion about division of powers and, as a result, duplication as well as neglect in delivery of public services. A lack of clarity in responsibilities is further likely to manifest itself in a lack of government accountability to local residents.

Although monitoring and oversight by the higher level could be adversely affected with delayering, that is not likely to be of much concern in this information age with instantaneous communications. The information age diminishes the economic relevance of an intermediate tier in countries with advanced communication and transportation networks and makes larger population sizes in a compact area more economical for local service delivery. Agglomeration economies associated with compactness of the area (population density) further weakens the relevance of an intermediate tier for service delivery. In addition, the regional functions could be performed by inter local partnerships or agreements and the oversight function of the prefectures could be made the responsibility of the provinces. One also needs to examine local governments, especially intermediate tiers, for jurisdictional design. Any jurisdiction not aligned with the economic service area should have its boundaries redrawn.

The province-managing-county reforms moved decision making closer to the people by shifting the power locus from prefectures to counties. The empowerment of counties has led to greater clarity in division of powers and has thereby limited potential for blame shifting for

service delivery failures. Local residents now have a much better perspective about who does what and therefore have a greater clarity about who should be held to account. These management reforms have also resulted in greater focus on rural areas and improved access for rural services. Several factors have contributed to this positive result. First, rural counties were given greater funding consistent with enhanced responsibilities. Second, potential for divergence of funds intended for rural areas to urban areas as happened under the prefecture-managing-county regime have been eliminated. Third, land grabs by prefectures of productive agricultural land from rural counties have been restrained, which should have a positive impact on food security for the nation.

The reforms also offer potential for a positive impact on investment climate and urbanization. The location advantages for rural migrants of county-level cities offer great potential for orderly urbanization. Because of their geographic closeness to rural areas, county cities are better placed to absorb rural migrants. These cities have the potential to offer more affordable housing, education, and health care services, and they also typically have less rigid policies in granting residence permits to rural migrant labor compared with metropolitan or prefectural cities. County cities view the influx of rural migrant labor as a positive "demographic dividend" by increasing the size of the productive labor force and a larger population to reap economies of scale and scope for city services. The abundant supply of labor and lower wages in turn may improve the competitiveness of counties against prefectural cities in attracting potential investors. In addition, the reforms in the long run are also expected to contribute to more orderly development of urban centers, by constraining the expansion of boundaries of prefectural cities.

Moving forward, prefectures as a regional tier providing administrative oversight of counties could be a good candidate for abolition. With the abolition of prefecture government as a regional tier, regional functions could be performed by interlocal partnerships or agreements, and the oversight function of the prefectures could be move upward to the province. This will enhance provincial oversight and coordination responsibilities which could be exercised by absorbing redundant prefecture technical staff into provincial cadres.

The Reform Agenda and Expected Payoffs

The proposal here is for a comprehensive structural reform rather than a piecemeal fix of the system. Because the Chinese approach to urbanization finance makes it difficult to separate public finance reform, land finance, debt finance, and housing finance, it may be reasonable to consider how the various elements of the reform fit together and the joint impact they might have on the economy. The elements of the reform can be introduced gradually and over time, but developing and making clear the long-run plan to modernize the entire urbanization finance system should be done at the outset. One such comprehensive reform program, discussed above, contains the following elements:

- Shift responsibility for financing social insurance programs, including legacy costs, to the central government level.
- Authorize subnational governments to adopt specified taxes and to set rates within limits. The tax sources to be used are property taxation, motor vehicle taxes, and the urban construction and management tax/education surcharge tax.
- Revamp the revenue sharing system to one that features a single sharing rate for the vertical pool, a formula-based system for distributing the transfers, and a simplified earmarked grant system.
- Clarify the role of HPFs in the affordable housing program, and explore alternative means to finance the program including direct subsidies from the government budget, contributions from employers, and partnership with the private sector
- Regulate the land lease system and change its structure toward higher rates of compensation for farmers, auctions versus. placements of lease sales, restriction to public purpose activities, and implementation of property taxation to encourage a more efficient use of land.
- Promote private-public partnerships in broad urban development
- Reform LGFVs, and allow local governments and SPVs to borrow within a rigorous regulatory framework.
- Diversify stable long-term financing for local government and SPVs and align the incentives for them and their lenders.
- Bring medium-term perspective and transparency into public expenditure management, and streamline the government hierarchy structure by removing the prefecture as a regional government.

This proposed reform package will significantly change the Chinese economic system in many ways. Table 6.8 summarizes key elements of the comprehensive reform package. Among these, the most important payoff will be a stronger market institution. The reforms would allow the market to play a larger role in resource allocation and let the government focus on its core role of delivery of public services, planning, coordination, and regulation. Moving from a derivation-based revenue sharing to a formula system would reduce the incentives for local governments to compete for a tax base. The amount of intergovernmental transfers received would now depend on expenditure needs, such as population size or the concentration of low-income families or the state of urban infrastructure or urbanization, rather than on the amount of new VAT or company income tax generated. The choice between investments in education and investments in industrial development would now be on a more level playing field. That should result in more rational decisions about strategies and subsidies for attracting industry. Moving industrial subsidies to the central government would further limit the role of local governments. Moving the LGFVs into the formal local government structure, or to commercial entities, and more generally laying a play field for the private sector would make space for the market to play a role.

TABLE 6.8 Comprehensive reform program

Subject	Reform	Comments
Expenditure assignment	Transfer responsibility for social security to the central level	Full assumption of responsibility and the cost of leveling up benefit differences among provinces, and funding the system including legacy costs would probably bring additional expenditures.
	Transfer unfunded liabilities in the pension and health areas to the central level	Central expenditures would increase, but amounts are unknown
	Transfer selected subnational functions to the central level	Central expenditures would increase, but amounts are unknown
Revenue assignment	Eliminate the 25 percent VAT share to subnational governments	This step would shift revenues from the subnational governments to the central government.
	Adopt local government taxes	Options include property taxes, surcharges on central taxes, motor vehicle taxes, and retail taxes on selected products.
Intergovernmental transfers	Restate the vertical share for intergovernmental transfers in terms of all tax collections. Replace derivation sharing with formula sharing	This reform would shift the distribution of transfers away from the higher-income provinces.
	Consolidate conditional and unconditional grants into a single program	This reform would reduce compliance costs but remove targeting of specific areas for spending. Allocation could be shifted to a formula and possibly merged with general revenue sharing above.
Tariff Policies	Set tariffs to recover the full costs of infrastructure service provision, including the costs of capital, for: · Solid waste collection and disposal · Water supply and distribution · Natural gas distribution · Wastewater treatment plants · Roads and bridges constructed as toll facilities Set tariffs to cover the full costs of operation and maintenance and to make partial contributions to the cost of capital for wastewater collection systems.	A regulatory authority will review tariffs to ensure that they meet the prescribed standards
Debt	Give local governments the power to directly borrow long-term for capital investments once they are credit rated.	Allowing local governments to access debt market would impose fiscal discipline. LGFVs would no longer be the only way for

(table continues next page)

TABLE 6.8 Comprehensive reform program (continued)

		local governments to access financing.
	Make credit rating mandatory before any local government can borrow from any source for any purpose.	Ratings promote financial transparency, encourage lenders and investors to price credit on a risk basis, and enable authorities to monitor local government finances based on objective information.
	Develop the municipal bond market to provide long-term financing for urban infrastructure.	This step increases the sources of financing for local governments and SPVs; engages investors that are seeking long-term securities; and strengthens China's financial sector.
	Resolve existing local government bad debts, sharing negative consequences among borrowers and lenders, and simultaneously establish a credible local government insolvency framework	This reform eliminates the need for future central government bailouts of local governments, makes the default risk credible to lenders and investors, and thereby reduces moral hazard in local government financing.
Land finance	Pay a higher rate of compensation to farmers but tax the difference between the buying price and the agriculture price.	This reform would slow the increase in land lease sales, reduce public investment in infrastructure, and make debt more affordable.
	Revenue generated from long-term leasing of municipally owned land will be earmarked for capital expenditures only. Land leasing revenues will be dedicated to specific capital projects, when these projects raise land values. All land leasing will take place at market values, subject to competitive bidding.	
Budgeting	Adopt a new budget format that separates current from capital spending and revenues. Adopt accrual-based government accounting rules. Require that all revenues, expenditures, assets and liabilities be fully reported. Phase in medium-term budgeting.	The reform would permit development of a capital budget, and could lead to transparency, enhanced efficiency and better measures of creditworthiness.

Central-local government relations will be rationalized. The reform package proposed here would shift some expenditure responsibilities from local governments to the central level. The central government has long been called upon to take over financing responsibility for social insurance (pension and health), which would lead to cost increases for the central government. Other expenditure programs are candidates for shifting to the central government, which would add to the improvement in vertical balance. These include functions where there are significant spatial externalities (environmental protection and natural resource management) and where

regional and national coordination is necessary (urban transportation). Expenditure reassignments would be accompanied by revenue reassignments. The central government revenue share would be increased. All tax revenues where the central government sets the tax rate would form the new revenue sharing pool, and a single sharing rate would be applied. The new general rate would reflect the new central government responsibilities. The distribution of revenue sharing among provinces would be done by a formula and by earmarked grants. If serviced population is factored heavily in the formula, metropolitan cities are likely to lose revenues. They then could recapture revenue losses with new local taxes that would be assigned. These would include a revamped set of property taxes, surcharges on central taxes, and motor vehicle taxes.

The financing system will be more conducive to the development of an efficient, inclusive and sustainable urbanization.

In addition to efficiency brought by greater role of market in resource allocation, greater efficiency will be achieved from three other changes proposed here. First, local taxing powers would allow (force) those urban governments that provide better services to charge a higher tax rate to their residents, which would bring about a number of changes in choices made. In cities that provided better (higher cost) services, residents would be asked to pay the higher marginal cost, which would be factored into the location decisions of both companies and migrants and, at least at the margin, contribute to a more efficient mix and layout of cities of various size. This change, together with greater transparency, will stimulate resident groups and business groups to pressure local governments for more cost effective service delivery.

Second, a proper rejiggering of expenditure assignments would lead to a better accounting of the external costs and benefits in spending decisions. In cases where the reforms led to more centralization, externalities would be internalized and more efficient levels of service would follow. Examples are natural resource management, environmental protection, food safety, and regional transportation.

Third, the increased level of compensation to farmers (and reduced profits to local governments and developers) could reduce land transfer revenues and slow down the rate of increase in peri-urban infrastructure investment. Some excess capacity could be used up, and budget allocations could be focused more on social services and on infrastructure maintenance. Urban fringe development might also be slowed by taxes on property and motor vehicles. That could limit urban sprawl and at the margin lead to more compact development that would better capture agglomeration economies. Whether any of these changes in relative prices will matter, however, depends on the price elasticity of demand for suburban land.

This reform package would also have positive impacts on equity. The shift to a formula-based system of intergovernmental transfers would, at least, hold out the possibility of more equalization among provinces by comparison with the current derivation-based system. The transfer formula could be structured to take expenditure needs more directly into account and no longer would reward those provinces with a stronger tax base. The degree of equalization that resulted would depend on the formula chosen.

A second area where equity gains would be made is with the shifting of responsibility for the financing of social insurance programs to the central government. Lower-income local governments would no longer be required to cope with fiscal capacity constraints and a heavy concentration of resident low-income workers. Social security would be a national program where benefits and contributions would no longer depend on place of residence. That would also generate efficiency gains by removing an important barrier to labor mobility.

Third, equity might be served by revisiting the expropriation and compensation policies now followed in converting farmland into urban land uses. That could happen in one of several ways. Farmers could be given stronger property rights over farmland or homesteads, or both, or the central government could mandate a compensation rate that more closely approximates market value and impose a capital gains tax on the profit.

Overall stability could be improved. A property tax levied at a reasonable level, and with the right structure, could help curb speculation in the housing market. Heavier taxes on motor

vehicle registration and motor fuels would be consistent with lower-carbon urbanization. Bringing a medium-term perspective into budgeting would enable the government to manage the fiscal implications of urbanization more effectively and mitigate the shocks accordingly.

Local government budget discipline is promoted. Forcing local governments to raise some of their own revenue and borrow on budget would move local officials a step closer to accountability and fiscal discipline. Adequate budget provisioning is required for contingent liabilities resulting from local government guarantees on debt undertaken by SPVs delivering local services and on the commitments made by PPPs. Adherence to budget discipline is monitored through annual institutional credit ratings for all local governments and SPVs that want access to financing from any source. Any failure to maintain budget discipline is revealed through downgraded credit ratings that are public information, easily monitored by central government authorities and financial institutions.

Financing for local governments is put on a stable foundation. The reform program broadens the sources of long-term financing available to local governments while addressing the problem of moral hazard that undermines the stability of China's financial sector. Scaling up the use of municipal bonds issued by local government from its experimental phase creates a mechanism for institutional investors to play a much larger role in financing urban infrastructure. Shifting some of this financing burden from policy banks and commercial banks to China's developing debt market enables banks to diversify and strengthen their loan portfolios with more lending to small and medium-size businesses. It also strengthens and deepens the debt market, thereby contributing to a more flexible and responsive financial sector for China.

Gradually resolving the existing bad debts of LGFVs in a manner that shares responsibility among the central government, local governments, and banks is combined with establishing a formal and pragmatic local government insolvency framework. These reforms put financial institutions on notice that an assumption that local government SPV debt is implicitly guaranteed is unwarranted. That forces moral hazard out of the financing process and creates strong incentives for lenders and borrowers to pursue objectively creditworthy financing for urban infrastructure.

Annex 6A: A technical note on the urbanization finance model

The World Bank developed a model to estimate the total costs of urban infrastructure, social services, and affordable housing, covering both the capital expenditure (CAPEX) and the current expenditures such as the operation and maintenance expenditure (OMEX) in a wide range of key sectors. Urban infrastructure sectors include roads, subways, drainage, sewage, landscaping, garbage, water, and heating; while social service sectors include social housing, education, and health. Arguably, by considering all these sectors, the model provides a fairly comprehensive account of the major amenities urbanites would expect from a livable city in China or elsewhere.

Acknowledging the prominence of the public sector in undertaking and financing expenditure programs related to urban infrastructure and social services, it is quite pertinent to assess the fiscal affordability of the urbanization process. To do so, the model considers the total expenditures to be borne by the public sector (including those related to urbanization as well as many other spending responsibilities) against the resource envelope it commands. The model is then structured in two modules. First, the urbanization cost module quantifies the required expenditures stemming from the urbanization process, projecting these expenditures sector by sector over the period 2013–30 to capture long-term economic and demographic trends. Second, the fiscal space module estimates the total expenditures to be financed by the central and local governments, together with their prospective resource envelope comprising fiscal revenues and borrowings. Financing policies play a key role in linking the two modules because they ultimately determine the share of required urbanization-related expenditures (identified in the investment needs module) that the public sector would finance as part of its total expenditures (ascertained in the fiscal space module).

The World Bank model's projections are predicated on stylized scenarios built upon reasonable assumptions concerning the future pattern of economic growth and urbanization (such as growth of real GDP and incomes, expansion of urban population, built-up area, and density) and the institutions and policies shaping public-finance outcomes (such as financing policies, taxes, spending programs). The Development Research Center (DRC) macro model provides many of the long-term economic and demographic projections that are used as exogenous inputs in the World Bank model, thus ensuring consistency between results obtained from both models. In the World Bank model, the baseline scenario reflects the continuation of the current pattern of urbanization and the perpetuation of existing institutions and policies without drastic reforms. It is characterized by a growing urban population and significant city sprawl. The reform scenario captures the high-quality urbanization pattern that structural reforms might bring about, together with changes in tax, land, and debt-financing policies. Reforms thus lead to even faster growth of the urban population and city densification.

The urbanization cost module

Salient economic and demographic fundamentals of the urbanization process affect the expenditures required to build urban infrastructure and deliver social services. Three fundamentals are considered in determining the expenditure needs: urban population, the built-up area, and density. These variables are projected for three categories of urban area (namely, city, county, and town) and for both the baseline scenario and the reform scenario. The urban population results from the total population projected by the National Population and Family Planning Commission, and the urbanization rate estimated in the DRC macro model for the baseline and reform scenarios. The distribution of urban population among the categories of city, county, and town follows the trends observed in recent years, where the relative importance of cities

is increasing slightly at the expense of towns. The urban built-up area is projected linearly in the baseline scenario, starting with the 2011 figures for the three categories and subsequently adding a category-specific fixed amount each year. The fixed annual increase in built-up area equals the average expansion observed in 2001–11.[24] In the reform scenario, the urban built-up area is kept constant at the 2012 figure for each category, thus reflecting policy reforms that discourage urban sprawl. Finally, the urban density is defined as the ratio of urban population to built-up area and is projected accordingly.[25]

Urban infrastructure sectors

The urbanization process characterized by the fundamentals described above requires investment in physical capital, most notably for urban infrastructure sectors. Thus, the model postulates that the growth of urban population and density determines the required growth of physical capital stock in these sectors (with the exception of subways). Formally, the required physical capital stock $K_{i,j,t}$ in category i (that is, city, county, or town), urban infrastructure sector j, and year t, is given by $ln\frac{K_{i,j,t}}{K_{i,j,t-1}} = \varepsilon\frac{UP}{i,j} * ln\frac{UP_{i,t}}{UP_{i,t-1}} + \varepsilon\frac{UD}{i,j} * ln\frac{UD_{i,t}}{UD_{i,t-1}}$, where $UP_{i,t}$ is urban population, $UD_{i,t}$ is urban density, and the elasticities ε_{UP} and ε_{UD} are estimated econometrically. For each category and sector, the initial physical capital stock $K_{i,j,2011}$ is taken from 2011 data.[26]

The basic growth specification outlined above projects $K_{i,j,t}$ for roads, drainage, landscaping, and heating. For sewage treatment, garbage treatment, and water, a sector-specific policy target is added to the fundamentals-driven growth: namely, 100 percent of discharged sewage and collected garbage must be treated by 2030, and the water coverage rate must also be 100 percent by 2030. The target accelerates the projected $K_{i,j,t}$ by adding a third term to the basic growth specification: $\varepsilon_{i,j}^{Rate} * ln\frac{Rate_{i,j,t}}{Rate_{i,j,t-1}}$, where $Rate_{i,j,t}$ is the sectoral rate (that is, sewage treatment, garbage treatment, or water penetration), which increases linearly until reaching 100 percent by 2030, and the elasticity ε_{Rate}, which is estimated econometrically.[27]

In contrast to the other sectors, subways are driven solely by a policy target implicit in the development plans of 34 Chinese cities: the subway lines must reach 14,187 kilometers by 2040, starting from 1,672 kilometers in 2011. Therefore, an average of 432 kilometers of subway lines must be built every year until 2040 to meet the target. Thus, the model assumes the required physical capital stock $K_{i,j,t}$ in this sector increases in proportion to the average expansion of subway lines.

The physical investment requirement in a given urban infrastructure sector is, by definition, the required growth of physical capital stock plus the depreciation of the existing stock. For simplicity, the depreciation is assumed to be a constant proportion of the existing physical capital stock, which is uniform across sectors and varies only across categories: 5 percent if the capital is built in a city, 6.7 percent if built in a county, and 10 percent if built in a town.

[24] Calculated using data from the *China Statistics Yearbook of Urban and Rural Construction* and the *China Statistics Yearbook of City Construction*.

[25] Density is often defined using the urban area, which is larger than the urban built-up area. But the model focuses on the urban built-up area because it is more relevant to project investment needs.

[26] Data from the *China Statistics Yearbook of Urban and Rural Construction* and the *China Statistics Yearbook of City Construction*. Linear regression models for each urban category and infrastructure sector are estimated using cross-section data, including 656 cities and aggregates of county and town for 30 provinces. Physical capital stock in 2011 is regressed on urban population, density, and other explanatory variables. Variables are in log, and the estimated coefficients are the elasticities reported in the main text.

[27] Physical capital stock in sewage and garbage sectors is assumed to be proportional to the quantities treated because data refer to sectoral outputs and not to the real assets involved in producing those outputs.

The physical investment requirement $IR_{i,j,t}$ is then given by $K_{i,j,t} - (1 - \delta_i)K_{i,j,t-1}$, where δ_i is the category-specific depreciation rate.

A monetary cost is incurred if and when the accumulation of physical capital takes place. The cost reflects all the expenses incurred in purchasing real assets outright or in building them, and so depends on market prices of real assets, goods, and services, as well as on the overall efficiency of the investment process. A cost per unit of physical capital invested is postulated in the model as a summary indicator of all costs related to real investment. For each category and sector, the initial unit cost $P^K_{i,j,2011}$ is calibrated using historical data up to 2011 on the investment expenditures at current prices and the concomitant gross accumulation of physical capital. Next, to project the unit cost $P^K_{i,j,t}$, the model assumes a time-invariant sector-specific inflation rate π^K_j, which captures the expected trends in market prices and investment efficiency. For the baseline and reform scenarios, the sector-specific unit-cost inflation is 6 percent annually. This figure is below the historical average estimated for most urban infrastructure sectors and thus reflects investment efficiency gains vis-à-vis past performance (for example, the estimated unit-cost inflation in roads and landscaping was 13 percent a year in 2001–10). On the other hand, because the cost structure in these sectors is tilted toward inputs (like labor) whose relative prices would increase along with the rebalancing of China' growth pattern, the projected 6 percent unit-cost inflation exceeds the projected 3.5 percent GDP deflator inflation.

The required capital expenditure (CAPEX) in a given urban infrastructure sector is, by definition, the physical investment requirement (the quantity of real assets to be invested) times the unit cost (the expenses incurred per unit of real assets to be invested). At current prices, CAPEXs are projected as $IR_{i,j,t} * P^K_{i,j,t}$, whereas CAPEXs at constant prices use $P^K_{i,j,2011}$ to value the physical investment requirement. The CAPEXs are monetary magnitudes and can be aggregated across categories and sectors. Thus, total CAPEX at current prices in year t is $\Sigma_{i,j} IR_{i,j,t} * P^K_{i,j,t}$.

The required operation and maintenance expenditure (OMEX) in a given urban infrastructure sector is assumed to be proportional to the replacement value of the physical capital stock. For all categories and sectors, the proportion is 2 percent, and the unit cost proxies the replacement value. The OMEXs at current prices are projected as $\theta * P^K_{i,j,t} * K_{i,j,t}$, where θ is the proportional factor (2 percent). OMEXs at constant prices use $P^K_{i,j,2011}$ to value the physical capital stock. The total OMEX at current prices in year t is $\Sigma_{i,j}\, \theta * P^K_{i,j,t} * K_{i,j,t}$.

Education

Providing education in urban areas requires building schools and hiring teachers. A remarkable policy goal is that mandatory education in urban schools be provided to students whose households hold urban residence, as well as to students currently attending rural schools whose parents are living and working in cities (the migrant population without hukou). Thus, the model postulates that the required urban-education coverage of students to be served is driven by two factors. The first is the number of students living in cities and attending five types of urban schools: primary school, middle-junior school, high school, high vocational school, and other schools. Starting from the 2011 figures corresponding to the first four urban-school types, the number of these students is assumed to increase over time following the growth of the urban population underlying the baseline and reform scenarios.[28] The second factor is the gradual absorption of the migrant workers' children currently receiving mandatory education in rural areas that would move to cities and enroll in urban schools. Nearly 19 million students in rural primary schools and 6.5 million students in rural middle-junior school are estimated to join

[28] Data from the *China Statistics Yearbook of Education Finance*. There is no reliable information on the number of students attending schools in the residual "others" type, so it is assumed that such a number (whatever it may be) remains constant over time.

their parents living in cities.[29] Thus, the model assumes that these students will gradually enroll in urban schools, with the transition completed by 2015. For each of the four urban-school types indicated above, indexed by s, the total number of urban students $ST_{s,t}$ resulting from both factors is the required urban-education coverage.

Monetary costs incurred in providing primary, middle-junior, high, and high vocational education in urban areas include labor, OMEX, and CAPEX. The model formulates a cost per unit of student served for labor and OMEX, and a cost per marginal student served for CAPEX. The unit costs summarize expenses to deliver education services, which depend on market prices of real assets, goods, and services, as well as on the overall efficiency of the service delivery process. This approach assumes that each urban student has a fixed endowment of physical capital, so that the (observed) number of urban students $ST_{s,t}$ is one-to-one proportional to the (unobserved) stock of physical capital in urban schools. For each urban-school type s, the initial unit costs of labor $P^L_{s,2011}$ and OMEX $P^O_{s,2011}$ are calibrated using 2011 data on these expenditures. The initial CAPEX unit cost $P^K_{s,2011}$ is estimated using historical data up to 2011 on the investment expenditures at current prices and the increase in the number of students attending urban schools of type s. To project costs into the future, it is assumed that the labor unit cost $P^L_{s,t}$ increases over time in line with the growth of per-capita nominal income of urban households, which averages 9.3 percent a year in 2013–30, according to the DRC macro model. The OMEX unit cost $P^O_{s,t}$ grows at 3.5 percent a year, in line with the GDP deflator inflation. The CAPEX unit cost $P^K_{s,t}$ increases 6 percent a year, in line with the unit-cost inflation in urban infrastructure sectors. Putting together the required coverage and unit costs at current prices projected for the four types of urban schools, the provision of education in year t requires a total labor expenditure of $\Sigma_s ST_{s,t} * P^L_{s,t}$, OMEX of $\Sigma_s ST_{s,t} * P^O_{s,t}$, and CAPEX of $\Sigma_s[ST_{s,t} - (1 - \delta_s)ST_{s,t-1}] * P^K_{s,t}$. Total expenditures at constant prices use the 2011 initial unit costs.

Costs incurred in other types of schools cannot be addressed by identifying required coverage and unit costs separately because of lack of reliable information on the number of students currently enrolled. Thus, to project the required total labor expenditure, OMEX, and CAPEX, it is assumed that the expenditures observed in 2011 would grow at annual rates identical to those postulated for the unit costs of the four main types of urban schools. Note that the model does not deduct the savings in the rural education system arising from the migration of students.

Public health

Delivering health services in urban areas requires building hospitals and hiring medical staff. The model focuses only on capital expenditure, however, because government subsidizes the recurrent cost to both rural and urban residents on a capitation basis, thus the net increment of recurrent cost is expected to be negligible. Since there is no homogeneous physical capital good for providing health services but rather a heterogeneous collection of goods (including facilities and medical equipment), the model relies on the number of beds in urban hospitals as a proxy for the requirements of physical capital (or, more broadly, hospital capacity). This approach implicitly assumes that each bed is associated with a fixed endowment of physical capital, so that the (observed) number of urban hospital beds B_t is one-to-one proportional to

[29] Estimates result from comparing the actual number of students attending primary and junior-middle schools in rural areas against the hypothetical number of students that would attend rural schools if the total student population were distributed among rural and urban schools in proportion to the urbanization rate (mimicking the distribution of the total Chinese population between rural and urban areas). Whereas the urbanization rate was 51 percent in 2011, nearly 70 percent of total primary-school students and 63 percent of total junior-middle-school attended schools in rural areas. Such an asymmetry reveals a backlog of rural students for the urban schools to absorb. Data on the actual number of students are from the *China Statistics Yearbook of Education Finance*.

the (unobserved) physical capital stock. The required urban-health coverage is then expressed in terms of beds to be endowed with supportive physical-capital goods.

Urban hospital beds and related CAPEX are driven by an assumed policy target concerning the capacity of health facilities to serve urbanites: to make available 6.4 beds per 1,000 urbanites by 2030, which is the average figure observed in high-income OECD countries, starting from the current availability of 3.6 beds per 1,000 urbanites. Thus, the urban population growth and a gradual increase in the beds ratio toward the 2030 target jointly determine the required urban-health coverage measured by B_t.

The model postulates a cost per marginal bed to be endowed, which reflects investments to be made in the health sector and depends on market prices of real assets, goods, and services, as well as on the overall efficiency of the investment process. The initial CAPEX unit cost P^K_{2011} is calibrated using 2011 data on the investment expenditures at current prices and the increase in the number of beds in urban hospitals. The estimated value is RMB 80,453 for a bed. The CAPEX unit cost P^K_t is assumed to grow at 6 percent a year, as in the urban infrastructure sectors. Providing health services in year t then requires CAPEX of $[B_t - (1 - \delta_h)B_{t-1}] * P^K_t$. CAPEX at constant prices use the 2011 initial unit cost.

Social housing

Social housing implies construction, operation, and maintenance of buildings. Current policy aims at building 36 million units in the period 2011–15, and raising social-housing coverage to 20 percent of urban households by 2020. In the model, it is postulated that a typical social-housing unit has 60 square meters of floor space, and a typical urban household living there has three people. The required physical capital stock $K_{sh,t}$ in the social housing sector is then defined in terms of the floor space to be built. It is driven by the current policy until 2015 and afterward by the urban population growth and coverage target.

Building social housing takes time and some major monetary costs are incurred before the physical capital built becomes available. In this regard, the model postulates that the physical investment requirement $IR_{sh,t}$ in year t (the quantity of real assets to be invested) equals the average increase in the physical capital stock available in the next two years, $0.5 * (K_{sh,t+2} - K_{sh,t})$.[30] A cost per unit of physical capital invested (which will be available over the next two years) is used to summarize all costs related to real investment in the sector. The initial unit cost $P^K_{sh,2011}$ is RMB 2,373 for a square meter of space floor.[31] The unit cost $P^K_{sh,t}$ is assumed to grow in line with GDP deflator inflation. Finally, the required capital expenditure (CAPEX) at current prices is projected as $IR_{sh,t} * P^K_{sh,t}$, whereas the required CAPEX at constant prices uses $P^K_{sh,2011}$ instead.

The required operation and maintenance expenditure (OMEX) in social housing is assumed to be proportional to the market value of the physical capital stock. The OMEX proportion θ is 2 percent. The market value $P^{KM}_{sh,t}$ is proxied with the average selling price of residential buildings, which was RMB 4,993 for a square meter of space floor in 2011 and which is assumed to grow following unit-cost inflation. OMEX at current prices is projected as $\theta * P^{KM}_{sh,t} * K_{sh,t}$ and OMEX at constant prices use $P^{KM}_{sh,2011}$.

Fiscal space module

Expenditure requirements identified in the urbanization cost module are to be undertaken and financed by the private and public sector, often using borrowing to initially put assets in place and setting tariffs, user charges, and budget resources (subsidies and transfers) to repay debts and operate and maintain these assets. Financing policy options will then determine how much

[30] For simplicity, no depreciation is assumed.
[31] Data from DRC.

of the urbanization costs will be borne by the central and local governments. These costs will compete with other spending responsibilities, thus posing policy trade-offs and the need to prioritize expenditure programs. In the model, the expenditure share in each urban infrastructure and social service sector is calibrated by looking at the historical ratio between public and total spending.[32] Estimated shares are used in both baseline and reform scenarios, thus implicitly assuming that the current financing policies will be upheld going forward.

As for all the other primary expenditures (those not related to urbanization, excluding interest), it is assumed that the corresponding spending programs will be adapted to China's new growth pattern and thus will expand in line with either the nominal GDP or the nominal per capita income of urban households. Interest payments depend on the borrowing policies pursued, which are discussed below.

The resource envelope available to fund all expenditures, referred to as the fiscal space, consists of government revenues and borrowings. While revenues result from the interaction of economic performance and fiscal policies, borrowings (both on- and off-budget) depend on the objectives of debt financing policies as well as on market opportunities.

Government revenues include taxes, nontax receipts, and net land-leasing receipts (after deducting the cost of land acquisition and relocation compensation), which are recorded in the Public Finance Budget and the Government Funds. The macroeconomic projections of the DRC macro model provide reasonable proxies for the relevant tax bases of the major tax and nontax revenues. Assuming the tax rates remain unchanged, the revenue projections are consistent with their underlying economic determinants, so that, for example, income taxes grow in line with nominal GDP and consumption tax trails aggregate consumption expenditure. Land financing policies drive the net land leasing receipts. In the baseline scenario, the gross receipts result from leasing 4.4 million *mu* of state-owned land a year, at a market price of RMB 660,000 a mu in 2012, which subsequently increases 3 percent a year, in line with GDP deflator inflation. Three-quarters of the gross receipts are assumed to cover the costs of land acquisition and relocation compensation. In the reform scenario, instead, land leases are dropped in 2015 and replaced with a property tax that likely generates revenues equivalent to 1.6 percent of GDP a year.

Borrowings include all direct government debts and the indirect debts of local governments contracted through their financial vehicles. Debt-financing policies determine the net borrowings (after deducting principal amortizations) by setting a target level of public debt relative to GDP. In the baseline scenario, it is assumed that net borrowings seek to maintain the public debt-to-GDP ratio at 53 percent, which was the level observed in 2012. In the reform scenario, policies aim to slow the rapid pace of indebtedness incurred by local governments since 2008, when the global crisis erupted. Thus, the target is to attain a debt-to-GDP ratio of 40 percent by 2030. The model assumes that the annual interest rate on outstanding debts is 3.5 percent for the central government and 7 percent for the local governments.

[32] Such figures often result from aggregate-level data and should be seen cautiously as working approximations because the limited availability of data precludes any accurate estimation of expenditure shares.

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Supporting Report 7

Green Urbanization

Introduction

China's growth model has brought tremendous economic and social rewards over the past three decades but also has come at the enormous cost of resource depletion and local and global pollution. Most resource use and pollution occurs in cities or is caused by demand from cities, which also bear some of the greatest impacts. Continuing on this path is not economically efficient because pollution imposes rising direct and indirect economic costs, even if those costs (to health or the environment) are usually not reflected in markets or in measures of national income. Such development is also not socially inclusive because—while pollution and resource scarcity affect all citizens—the poor are usually most heavily affected and least able to cope. As it seeks to attain high-income status, meet aspirations for a higher quality of life, and ensure that resources are available for future generations, China needs to transition to a growth path driven by more efficient and cleaner production and consumption. For that to become a reality, environmental sustainability must become an explicit policy goal on an equal footing with economic efficiency and social inclusion.

Raising the profile—and the effectiveness—of environmentally sustainable policies in the ongoing urbanization process requires that China's green governance matches its green ambitions (Annex 7A). China has introduced a comprehensive set of environmental laws and regulations, but these have not brought the expected improvements in environmental quality. To achieve better outcomes, China needs to overcome what has been called the "paradox of advanced legislation but weak enforcement." So far, environmental policy making has often favored narrow technical and engineering solutions over institutional development and economic approaches. Strengthening the incentives and accountability framework for environmental management requires addressing many interrelated challenges, including:

- First, by international standards and given the size of the problem, China's national-level environmental management capacity is relatively small and should be increased, while many local environmental protection bureaus need more resources and authority to enforce compliance.
- Second, incentives to implement environmental policies and complete complementary sector reforms have been weak. Changing the cadre evaluation system would encourage local leaders to pursue sustainability goals more forcefully, and extending their tenure, which has dropped over the past decade, would promote longer-term thinking.
- Third, more channels are needed for public participation, which in practically all industrial countries is a key element for catalyzing demand for better environmental protection and a higher quality of life. Three main channels could be further opened to complement government efforts: consultation on policy design and projects, with a greater role for environmental nongovernmental organizations (NGOs); facilitating stronger actions against polluters by adequately resourcing the formal complaint systems at local levels and by broadening access to the emerging environmental court system; and more public disclosure including use of public environmental performance ratings and strengthening of the Open Environmental Information initiative, a program of the Ministry of Environment (MEP).
- Fourth, there is a need to sharpen the mix of policy instruments. The most effective instrument to induce resource efficiency and lower pollution is pricing. China has removed many environmentally harmful subsidies and other distortions, but tariffs for energy, water, and other resources do not always fully reflect both the cost of providing them and the external costs that resource production and use impose on health, ecosystems, and the climate. Solid waste tariffs reflect only 10 percent of the cost of services, for instance, and should be adjusted. Road and congestion pricing, even higher parking rates, would more accurately reflect the full cost of using private vehicles. Pricing distortions in the electricity market could be addressed to create a more even playing field for renewable energy, including a well-coordinated and clear carbon-pricing policy. Pricing, however, needs to be complemented with strong regulations, setting ambitious targets for pollution controls and limits on

resource use, but allowing for more flexible and market-based approaches to meeting them, such as trading. Finally, better collection and wide disclosure of credible data, greater consideration of market signals, and more efficient management of trade-offs between sustainability and other development goals will improve the quality and enhance the implementation of environmental regulations. For example, affordability concerns should be addressed more through targeted subsidies rather than preferential residential energy tariffs.

There are numerous causes of environmental problems in China's cities, and improving urban sustainability requires a multisector approach. Structural shifts in the economy toward cleaner sectors will help, but only over the longer term. Urban infrastructure and energy sector policies that align environmental with economic and social objectives therefore need to complement more effective green governance. Greening sector policies will require some action at the national level where broad legal and regulatory decisions guide local decisions. At local levels, more comprehensive overall planning supports more specific sector reforms. For instance, integrated urban land use, transport and energy planning, by reshaping urban form, help avoid urban sprawl, which is raising the cost of public service provision and locking in wasteful energy consumption in many Chinese cities. And in larger urban clusters, air quality management must operate at a regional scale to account for all relevant pollution sources in the airshed and identify cost-effective regional abatement plans.

Beyond these cross-cutting issues, sustainable urbanization requires improvements in each sector. The reforms range from the mundane—such as better landfill management—to the monumental: an energy shift away from coal toward natural gas and a rising share of renewables. The priorities discussed in this report are specific to each sector, but the basic principle across all sectors is to limit environmentally harmful resource use as much as possible and then clean up what cannot be avoided. Resource use efficiency is thus the first priority, all the more so because it also yields important co-benefits by raising productivity and promoting economic growth. Energy intensity reductions during the 11th Five-Year Plan averted the use of 630 million tons of coal equivalent, or 1.46 billion tons of carbon dioxide (CO_2) emissions. Pollution control is closely linked with social development objectives. Achieving China's new air quality standards in all cities would add millions of healthy life years for China's urban residents. Some of the most important sectoral actions are:

- Encourage a greater shift from private to public urban transport by using price instruments and investments in better service, and reduce pollution by promoting cleaner vehicle technology, especially a shift to ultra-low-sulfur diesel and gasoline, and enforcing fuel quality standards.
- To improve incentives and cost effectiveness in meeting the energy intensity reduction targets of industrial enterprises, rebalance regulatory and target-based approaches by introducing market-based policy tools such as tradable energy savings certificates. Further development of technical and financial services for energy efficiency, including deeper penetration of energy savings performance contracting, will also be helpful.
- Lead by example by implementing aggressive efficiency programs for public buildings; establish targets for progressively tightening the energy efficiency code; and broaden the use of benchmarking for existing buildings. Promote green buildings by linking incentives with clearer labeling schemes while strengthening capacities across the supply chain. Phase out harmful construction materials to reduce indoor air pollution in buildings.
- Secure cleaner urban energy sources by minimizing direct use of coal in cities through expanded access to piped natural gas—giving priority to households, commercial uses, and district heating—by removing pricing distortions, establishing a well-coordinated carbon pricing policy and restarting sector reforms that would establish a more even playing field for clean energy sources to contribute to urban energy supply. Continue to tighten power and heating emissions regulations.

- Ensure an efficient, safe, and secure water supply by reforming water rights systems, by using smart technologies to measure consumption, and by improving regional water resource and pollution discharge governance at the river basin and local levels. Expand use of payments for ecological services to address nonpoint source pollution challenges, and modernize urban water utility management.
- Improve cost recovery in the solid waste sector to promote waste reduction, recycling, and safe disposal, including, in the medium term, life-cycle product stewardship programs. Improve planning of waste disposal with better environmental impact assessments; improve waste disposal operations through reduced air and water pollution from incinerators and landfills and through proper closure, rehabilitation, and safe reclamation of old landfills.

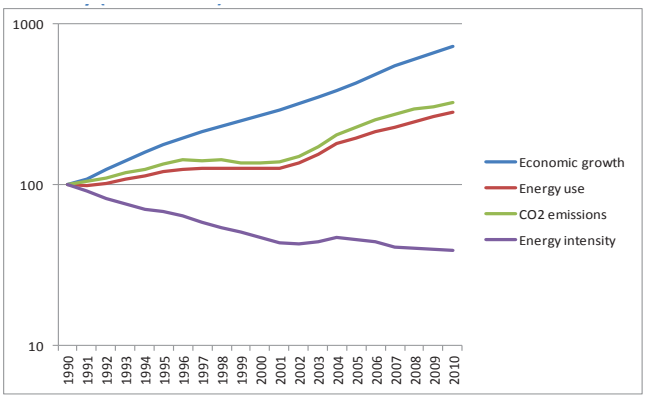
The task is urgent as the costs of growth mount and as citizens' demands and expectations increasingly include a clean environment. The task is also challenging. No country in the world can claim to have achieved truly green growth, and those that are greenest took decades to get there. But the challenge also provides an opportunity. Stronger environmental actions will further encourage the shift toward cleaner economic activities—towards growth that is built not on energy- and pollution-intensive low-margin production, but on services and higher-value-added manufacturing as countries such as Germany or Japan have done. Greener growth is a viable goal for China, as also argued by the Development Research Center of the State Council and the World Bank in *China 2030* (World Bank–DRC 2013). Progress on reducing pollution will not be fast, and China's current and future urban citizens will need some patience before their cities resemble their peers elsewhere that started this transition much earlier. But China has proven that it can implement major transformations more quickly than other countries, as the unprecedented scale and pace of its economic development shows. By continuing the tradition of adapting lessons from elsewhere to local needs and developing their own innovative solutions, China's cities will become not just great places to make a living, but also great places to live.

The challenge of sustainable urban growth

In 1997, a World Bank report titled "Clear Water, Blue Skies" reviewed China's environmental challenges. Fifteen years later, its findings and recommendations sound strangely familiar. Looking at the 15 years before 1997, when China's urban population grew from 191 million to 352 million people, the report documented high air and water pollution levels with large impacts on public health but also pointed to the many policy efforts under way to rein in pollution and the many successful initiatives for stabilizing or even reducing environmental problems such as urban air pollution. The report's hopeful conclusion was that "new policies and careful investments made today [in 1997] mean that China's children and grandchildren would also enjoy clear water and blue skies [by 2020]" (World Bank 1997, 3). This prospect still seems distant as China's economic growth since the late 1990s exceeded not only the most optimistic expectations but also the capacity of environmental institutions to keep pollution and resource depletion in check. Some key challenges are:

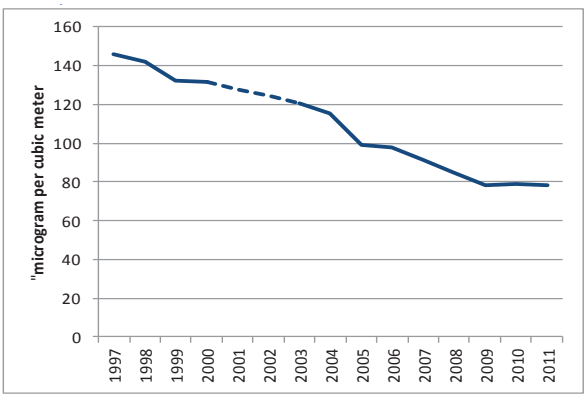
- The main source of air pollution in China comes from its dependence on coal for energy, and total energy use increased six times to fuel an economy that increased 18 times and meet the needs of a growing industrial sector and an urban population that more than doubled since 1978, when China began its economic reforms (Wang and others 2012). This growth in energy demand exceeded all expectations. By 2005, China had already almost reached energy consumption levels projected for 2020 in a joint DRC–Energy Research Institute (ERI) study published in 1999 (Berrah and others 2007). The share of coal in primary energy consumption has dropped from 78 percent in 1995 but remained at around 70 in 2011 (NBS 2012c). Emissions grew in parallel, although concerted efforts have been made to control particulate matter (PM) and sulfur oxides (SO_x), and NO_x emission standards for

FIGURE 7.1 Fast economic growth outpaced improvements in efficiency (61% 1990–2010) 1990 = 100



Source: IEA, World Energy Statistics and Balances (database). doi:10.1787/data-00510-en

FIGURE 7.2 Air pollution declined over time and has recently been stable, PM_{10} concentrations



Source: Renmin University 3E Database based on China Environmental Yearbooks.
Note: Data for 2000 and 2001 not comparable due to change in monitoring systems.

power plants were strengthened in 2012. Greenhouse gas emissions also grew. According to the International Energy Agency, China now accounts for about a quarter of global CO_2 emissions from burning fossil fuel (IEA 2013a). Shanghai, Beijing and Tianjin have estimated per capita emissions comparable to large European and even some North American cities (Sugar, Kennedy, and Leman 2012).

- While air pollution has grabbed recent international headlines, China's cities also face serious challenges in the quality and quantity of water. Nationwide, urban water supply falls short of demand by 6 billion cubic meters a year. The Ministry of Land Reclamation and Water Resources reports that 430 of 657 cities face water shortages; 110 of these had "severe" shortages (OECD 2009). The MEP reported 57 percent of the groundwater in 198 cities in 2012 was rated "bad" or "extremely bad," while more than 30 percent of the country's major rivers were found to be "polluted" or "seriously polluted," making their waters unfit for drinking or direct human contact (MEP 2013).[1]
- Municipal and industrial solid waste generation increased from about 1.2 billion to 2.6 billion tons between 2003 and 2010 and is expected to double by 2030—challenging the waste management systems in many cities. Urban residents represent 53 percent of the population, but generate 80 percent of the total waste amount.

As alarming as these trends are, there are some positive notes as well. The increase in energy consumption could have been much higher if it had paralleled economic growth, which averaged about 10 percent between 1990 and 2010. But China's economy also became more efficient in using energy during this period, as energy intensity fell by an average of 4.7 percent a year (figure 7.1). This is an impressive achievement even though a full decoupling—with the economy continuing to grow while energy use and carbon emissions are held constant or decline—has not been attainable with such high economic growth rates. Second, the trend over the past years has been a reduction of average annual concentrations of PM_{10} (fine particulates with a diameter of 10 micrometers or less) despite the large increase in energy consumption (figure 7.2). Abatement policies have had an effect, although particulate matter concentrations in large cities remain unacceptably high. A third reason to be optimistic is that some experts expect a further slowing

[1]"Polluted" or "seriously polluted" water is Grade IV or below, according to China's Environmental Water Quality Standard (GB3838-2002).

of energy consumption and resource use thanks to the restructuring of the economy. While still more is needed, a large share of the infrastructure to accommodate expected urban growth has been built, and more efficient technology is becoming more widely available—and is often produced—in China. These broader trends could provide a welcome tailwind for ambitious public policies aimed at greater resource efficiency and pollution abatement.

The rising cost of environmental degradation

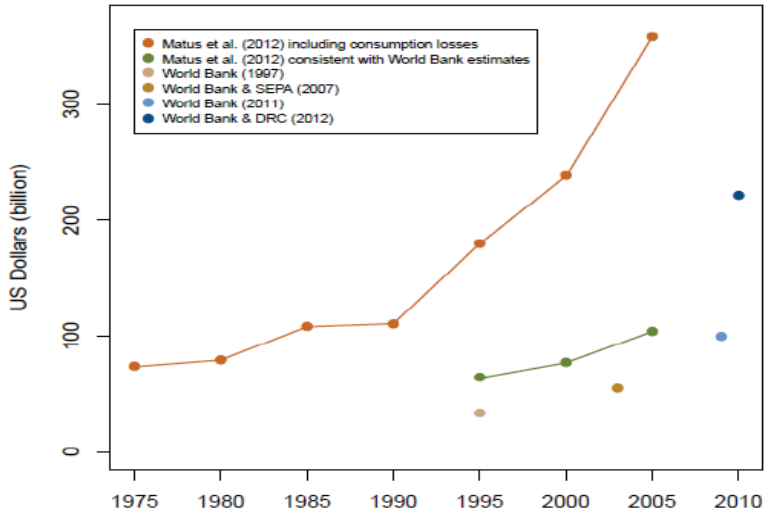
These successes are no cause for complacency because environmental degradation continues to compromise social and economic development objectives. Understanding of the severe health impacts of air pollution is growing, especially the effects on small children and infants, including higher rates of infant mortality, birth defects, and impaired cognitive functions (Currie and Vogl 2012; Currie and Neidell 2005; Padula and others 2013). Estimates of mortality from air pollution in China are staggeringly high. Despite falling average annual PM_{10} concentrations, impacts have been increasing, in large part because more people now live in cities. Two hundred million more urban residents were exposed to high air pollution levels in 2010 compared with the beginning of the decade. Estimated annual premature mortality from air pollution in Chinese cities increased from 418,000 to 514,000 between 2001 and 2010 despite a 25 percent reduction in average PM_{10} (Cheng and others 2013). The recent Global Burden of Disease update issued by the World Health Organization (WHO) presents an even higher estimate of 1.2 million premature deaths in China in 2010 (HEI 2013).[2] The impacts of water pollution are less well researched. Water pollution contributes to China's rising cancer rates. Digestive cancers, for instance, increase by almost 10 percent with a one-grade deterioration of water quality (on a six-grade scale) (Ebenstein 2012).

These high mortality levels and other health damages have high economic costs. Because of differences in methodologies, estimates of health damages from air pollution, for instance, vary considerably, from close to $100 billion to more than $300 billion a year (figure 7.3). New research also finds impacts on productivity with workers in highly polluted areas absent more frequently. A study in California even showed that pollution from urban areas has a significant impact on the productivity of farm workers in nearby rural areas (Graff Zivin and Neidell 2012). Stricter standards that lowered the average ozone level by 10 parts per billion were found to increase farm worker productivity by 5.5 percent, which could translate into $700 billion in benefits from higher productivity. Impacts could be even higher in China because of higher pollution levels. As a rising exporter of high-value farm products, both Chinese producers and their customers also have an interest in agriculture that is unaffected by pollution. Additionally, there is anecdotal evidence—supported by academic studies in other countries—that low environmental quality affects migration decisions and thus the competitiveness of polluted cities that may be less able to attract highly skilled workers and professionals. As incomes rise, quality of life issues become more important, and people's calls for a cleaner environment in China are growing louder. Premier Li Keqiang called for a more transparent government and increased public supervision to improve environmental compliance and warned that economic growth at the expense of the environment "won't satisfy the people" (Kostka 2013). Better environmental quality will undoubtedly serve China's people well.

Practically all industrialized countries went through a phase of excessive pollution. Cities that have high environmental quality today suffered similar degradation decades ago (box 7.1). London's "great smog" event in 1952 may have killed more than 10,000 people over four

[2] One reason for these higher estimates is that they include both rural and urban areas, making use of satellite data available for the entire country. Another is that they use a new dose-response function more appropriate for China's very high pollution concentrations and a lower minimum threshold between air pollution exposure and health effects.

FIGURE 7.3 Estimates of the value of mortality and morbidity from air pollution



Sources: Matus and others 2012; World Bank 1997, 2011; World Bank and DRC 2012; World Bank and SEPA 2007.

December days. Smog levels in Los Angeles are down 70 percent from the 1970s, and high ozone advisory days have dropped from 184 to close to zero. Tokyo's campaign for cleaner air centered on the visibility of Mount Fuji. The mountain that can be seen on more than 130 days today could be seen on only 20 days a year in the 1960s. But there are some important distinctions in China's experience.

Given the size of China's population and economy, its structure, and the speed of its development, the country's environmental problems are larger than those experienced by other countries. But being a late developer also has advantages. China can benefit from the experiences of others and technology developed elsewhere and turn pollution curves around faster than was possible for earlier developers. Much of the research on air pollution sources, impacts, and abatement options was developed in North America and Europe over many decades and can be deployed more quickly and cheaply in China. Some of the benefits of technology and management are already apparent, and China has also produced indigenous solutions that can be shared with countries facing similar challenges today.

More so than in many countries, green urbanization in China is in everyone's interest. What happens in a Chinese city does not stay within administrative, regional, or even national borders. China is now the world's largest emitter of CO_2, and air pollution from China frequently affects neighboring Japan and the Republic of Korea and can be carried in the jet stream for thousands of miles. North America and Europe still exceed China's cumulative historical greenhouse gas emissions, but, according to IEA data, China's per capita CO_2 emissions from fuel combustion of 5.4 tons in 2010 are still rising and are likely to reach the EU average by the middle of this decade (IEA 2013a, c).

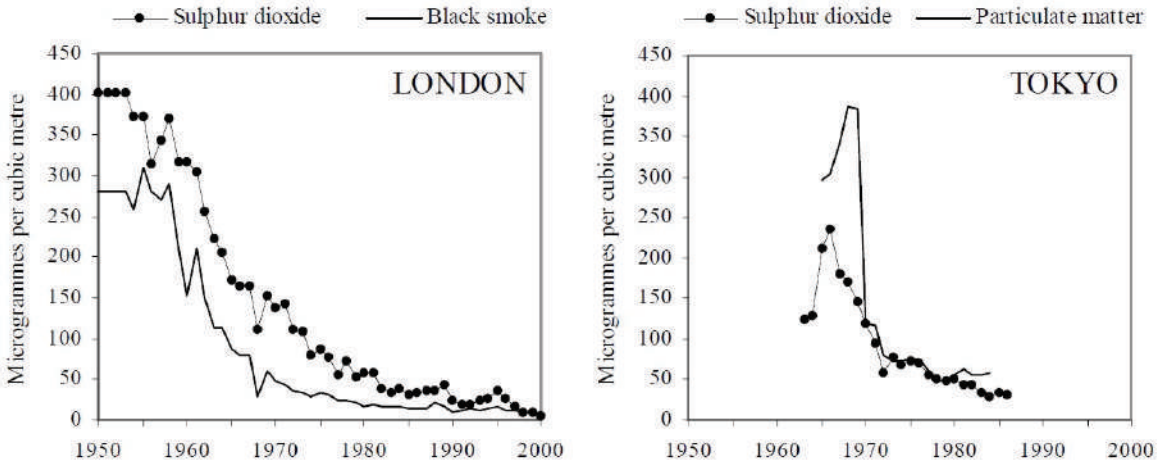
Finally, in contrast to experience elsewhere, a large share of China's pollution came initially from the expansion of dirty industries that were being phased out in developed countries. One estimate suggests that exports account for about one-third of China's energy use, and likely a similar share of air pollution (Weber and others 2008). China's export of CO_2 emissions embedded in manufactured products has risen sharply in the 2000s (figure 7.4). This happened even as its manufacturing sector became cleaner simply because exports increased so much. On balance, these trends were probably beneficial to China and to its trade partners. Europe and North America were able to green their production and access low-cost goods, but at the cost

BOX 7.1 Reducing severe air pollution in London and in Tokyo

In December 1952, London experienced an unusual cold spell prompting greater than normal coal burning for heating. Although air pollution had been a problem for many years, from December 5 to December 9, London was covered by a thick blanket of what became known as the Great Smog of '52. This event coincided with 4,500 more deaths than would normally have been expected. Later research estimated that almost three times as many fatalities could be attributed to persistently high air pollution during that winter.

The dangers of low air quality were known to Londoners as early as 1661, when John Evelyn presented evidence to King Charles II that smoke pollution increases mortality. But it was not until the London smog incident that major pollution control legislation was passed in the form of the Clean Air Act of 1956, which was subsequently expanded. Most importantly, the law regulated the use of domestic fires and encouraged the replacement of coal with natural gas or electricity for heating. Air pollution began a steady decline, even though London experienced another major smog event in December 1991 that caused about 160 deaths and could likely have been prevented by more ambitious air pollution policies. It took until the mid-1990s until the United Kingdom adopted specific air quality standards in response to EU requirements (figure B7.1.1).

FIGURE B7.1.1 Air pollution concentrations in London and Tokyo, 1950–2000

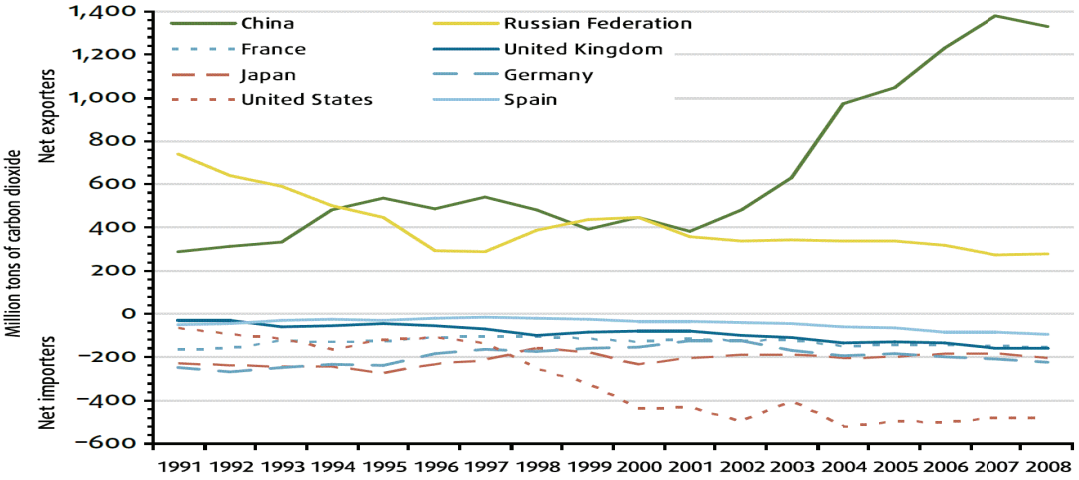


Source: Hutchinson and others 2004.

In Tokyo, every day since January of 1963, observers at the Seikei Meteorological Observatory have recorded whether they can see Japan's highest mountain, Mt. Fuji, 83 kilometers away. The 1960s were a period of fast industrial growth in Japan that came with an equally rapid increase of soot, dust, and sulfur oxides (SOx) in the air. While the government was initially slow to respond to severe air pollution, citizen groups soon demanded stronger action. Seeing Mt. Fuji again, which in 1965 was possible on only 20 days, became a rallying cry for Tokyo residents. Public pressure was further fueled by a series of environmental crises including the 1970 "Yokkaichi Asthma" incident—an outbreak of severe chronic pulmonary disease, emphysema, and asthma among residents near a large petrochemical complex in Mie Prefecture south of Kyoto. The government was finally compelled to issue a slew of environmental rules in a special legislative session that became known as the "Pollution Diet." The new rules required factories to report their activities, strictly regulated industrial emissions, and, as transport emissions replaced those from manufacturing as the most important problem, imposed tight pollution regulations on vehicles. Air pollution dropped rapidly between the mid-1960s and 1970s. In 2011, observers at Seikei Observatory saw Mt. Fuji on a record number of 131 days.

Box sources: Ren 2000; Bell, Davis, and Fletcher 2004; Hutchinson and others 2004; Okubo 2013.

FIGURE 7.4 Global net transfers of CO_2 emissions embedded in traded goods, 1991–2008



Source: Peters and others 2011.

of sometimes painful economic restructuring at home as dirty industries closed down. China's industrialization helped lift hundreds of millions out of poverty, but at the cost of heavy pollution in its cities where the lower environmental standards at the time were among its comparative advantages. By shifting toward a growth model based more on services and consumption, China will be able to pollute less on behalf of other countries. On the other hand, global patterns appear to be replicated within China as coastal provinces have now become major importers of embedded CO_2 from interior areas (Feng and others 2013).

The past 15 years have yielded much better information about the sources and consequences of environmental problems in China. There have been promising developments but excessive environmental burdens remain a major challenge. Much of what was written in the 1997 World Bank report could be written today. Will a report written 15 years from today be able to present a more positive appraisal? Much will depend on whether Chinese leaders can strengthen green governance to increase everyone's incentives for more ambitious greening, and whether provincial and local decision makers can implement sustainable sector policies that align greening with social and economic objectives.

Green governance must match China's green ambitions

China has one of the most comprehensive sets of environmental laws and regulations in the world. Since 1970, it has "enacted eight pollution control laws, 15 natural resources laws, over 50 environmental protection administrative regulations, over 200 departmental regulations and other regulatory documents, more than 1300 national environmental standards, more than 1600 local environmental regulations, and has approved and signed 51 multilateral international environmental treaties" (Zhang and Bao 2012, 1). Yet, this growing body of laws and rules has not ensured environmental compliance by private and state-owned firms. Major pollution incidents are frequent, and persistent pollution continues to foul the air, land and water in Chinese cities. How can China overcome this "paradox of advanced legislation and weak enforcement"?

Investments in specific sectors, discussed in later sections, will increase resource use efficiency and reduce pollution. But the technical know-how or even the financial resources for these investments are not the primary problem holding back green progress. The fundamental problem is inadequate green governance—the institutions, incentives, and instruments that enable effective environmental management. There are four main ways in which China can make environmental management more effective:

- *Increase resources*: By international standards and given the size of the problem, China's environmental management capacity is relatively small—especially at the national level—and environmental agencies often lack sufficient authority to enforce compliance.
- *Strengthen incentives*: The current evaluation system for local officials, who are the primary authority for implementing environmental policies, puts insufficient weight on improvements in the quality of life of residents.
- *Open more channels for public participation*: Citizens' opportunities for contributing to the enforcement of green regulations, including through the legal system, are still inadequate—in part because of limited access to information on the performance of environmental management authorities and the polluting activities of firms.
- *Employ sharper instruments*: Reflecting a strong emphasis on technical expertise in government, regulations and target-based approaches dominate, while economic and market-based instruments that can sometimes be more efficient remain underused.

Although governance is difficult to measure and formal evaluations are scarce, China has made progress in all of these areas. The government has announced increases in funding for pollution control. With rising incomes, local policies are shifting from a sole emphasis on growth to more balanced objectives. Individual citizens and organized groups are more and more active in environmental advocacy work, and initial steps have been taken toward full public disclosure of environmental information. And, finally, price instruments and market-based mechanisms such as pilot carbon markets, play an increasing role in promoting resources conservation and pollution control. Yet, as this chapter shows, in all of these areas more progress is possible.

Greater resources for effective environmental management

Achieving China's green goals requires stronger institutions responsible for designing and enforcing environmental rules. Government spending on environmental protection has been around 1 percent of gross domestic product (GDP) (World Bank–DRC 2013). That is similar to average GDP shares for public spending on the environment in countries belonging to the Organisation for Economic Co-operation and Development (OECD), although EU levels are at about 1.9 percent when including expenditures by government-controlled environmental

agencies such as water treatment plants.[3] China's current expenditures represent an increase from the past, and, in response to recent pollution problems, the government announced additional resources. Required initial spending to adequately address China's environmental problems is estimated at 0.5 percent of GDP above current levels (World Bank–DRC 2013). Conservative estimates put annual damages from environmental degradation at 3.5 percent of GDP in 2010, according to the Chinese Academy of Environmental Planning.[4]

The lack of sufficient resources is reflected in lower staffing levels at China's national environmental institutions. The Ministry of Environmental Protection has about 400 staff in Beijing, about 2,000 in affiliated institutions (*shiye danwei*) and 500 in five regional offices.[5] Compare that to the more than 17,000 who work at the U.S. Environmental Protection Agency, two-thirds of whom are based in regional offices. MEP, serving a population that is four times larger and arguably facing more severe challenges, has fewer resources available for centralized environmental management functions such as national collection and dissemination of data, research, policy and regulatory development, and supervision of large polluters than its North American or European counterparts.

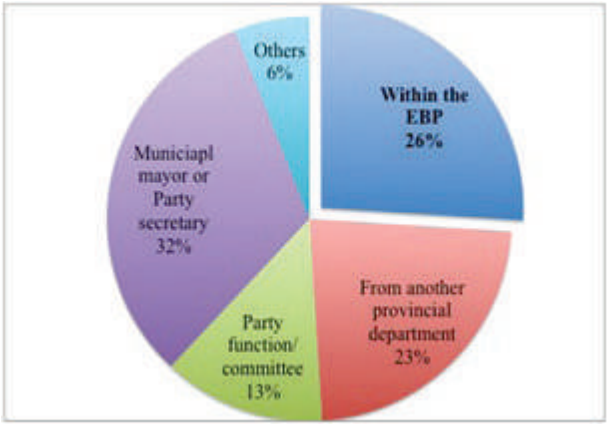
Provincial and local environmental management is the responsibility of the Environmental Protection Bureaus (EPBs), whose staff numbers increased from 105,900 in 1998 to 166,800 in 2005 (Li and Higgins 2013, 412) and about 192,000 today.[6] While notionally partly accountable to MEP, EPBs mainly report to local governments and are dependent on them for funding and promotions. Local EPB budgets vary by region. In poorer parts of the country, budgets tend to be small, leading to staff shortages, lack of inspection and testing equipment, and inadequate skill development. Some EPBs located in regions experiencing rapid economic growth have not received funding increases that match their expanded obligations.

For instance, Kunshan City in Suzhou municipality in Jiangsu had a level of economic development in 2011 that was much higher than that of several of the poorer provinces in China, yet Kunshan's administrative status remained that of a county (Chien 2013; Kostka 2013). This "big foot in a small shoe" (*dajiao chuan xiaoxie*) problem has sometimes adversely affected the work of the EPB. EPBs in these fast-growing urban areas complained that allocated resources and their rank did not match the higher workload. Some local governments and EPB leaders have tried to overcome inadequate budgets for environmental or restructuring projects by using debt financing or land sales, as has been the case in Datong City in Shanxi (Eaton and Kostka 2013). Inadequate funding means that local-level staff and managers often lack sufficient qualifications and training opportunities to cope with rising challenges. Furthermore, because of the current government officials' selection and appointment practice, only a quarter of EPB directors came from within the EPB system (figure 7.5)

EPBs also often depend on fines collected from polluters for funding. In one EPB in Central China, only 24 of 157 employees were covered by central government funding; the remaining 133 were supported by pollution fees.[7] Among six surveyed counties in Henan Province in 2009, 79 percent of staff were paid from fines paid by local firms. When the EPB staff's "daily bread comes from pollution fees," as one county EPB director put it, they have no incentive to increase fines to a level that would exceed damages or compliance costs and cause firms to stop polluting. It is not clear whether these reports are isolated cases or form a widespread

[3] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Environmental_protection_expenditure.
[4] http://www.nytimes.com/2013/03/30/world/asia/cost-of-environmental-degradation-in-china-is-growing.html; http://www.cleanbiz.asia/news/chinas-revived-green-gdp-program-still-faces-challenges.
[5] Information provided by MEP. See also Kaiser and Liu 2009.
[6] Information provided by MEP. This total includes 46,000 provincial, municipal, and county EPB staff plus 146,000 staff in affiliated institutes at each administrative level.
[7] Xiao Xiang Morning Post (潇湘晨报), "Media Investigation Finds Polluting Industries are Income Source for Local EPBs" (媒体调查基层环保局：污染企业成为其收入来源), Xinhua News online, April 16, 2013, http://news.xinhuanet.com/yuqing/2013-04/16/c_124587694.htm (Chinese).

FIGURE 7.5 Only a quarter of provincial EPB directors came from within the organization



Source: Kostka 2013.

pattern,[8] but they do imply that the steady flow of fines may lead to overstaffing of some local bureaus without increasing their effectiveness. In addition, pollution fines and collection rates are generally low, and penalties do not generally increase for repeated violations (Economy 2010). That is in contrast to the U.S. Clean Water Act, for example, under which e daily penalties can be imposed on noncompliant polluters.

Besides lack of funding, environmental management agencies in China also do not have sufficient authority to enforce regulations. Provincial EPBs have the authority to impose "regional investment restrictions" by holding up environmental approvals of new projects. But because EPBs report to provincial and local governments, local officials can override environmental concerns when they conflict with other objectives. Because EPBs rank relatively low in the administrative hierarchy, leaders of state-owned enterprises (SOEs) that operate nationally or internationally often outrank those who supervise their environmental compliance—a constraint often referred to as the "central SOE problem." Especially where an SOE or even a private firm dominates a local economy, local leaders have few means and little incentive to enforce regulations. In fact, where one or a few large firms dominate a municipality, there tends to be less disclosure of environmental information, especially if the dominant firms are in heavily polluting industries (Lorentzen, Landry, and Yasuda 2014). Enforcement authority varies among other agencies responsible for attaining environmental objectives.[9] For example, the National Development and Reform Commission (NDRC), which is responsible for energy efficiency, has relatively strong influence through investments and financing. Local water and resource bureaus, which monitor surface water quality, on the other hand, have fewer enforcement tools. One such municipal bureau in Hunan Province was not only unable to penalize firms that violated water consumption regulations, it could not even obtain value-added figures for local firms from the statistical bureau to estimate their water consumption (Kostka 2014). Recently there have been some hopeful signs that strong leadership at EPBs are able to address some of these problems even if the low fines remain an ineffective deterrent (box 7.2).

[8] The management of pollution fees has been revised over the past few years so that salaries are paid out of a "basic fund" that is separate from a "project fund." Pollution fees are sent to the local finance bureau. EPBs can then apply to get back part of that money to finance particular environmental projects but not salaries. But, as indicated in the Xinhua article, this practice may not be followed by all EPBs.

[9] This includes agencies such as the economic commission, and the land resources, transportation and construction bureaus, which through their decisions and actions have a large influence on environmental quality.

BOX 7.2 Addressing the "Central SOE problem"

In June 2013, the local environmental protection bureau (EPB) of Anqing Municipality in Anhui charged the central state-owned enterprise (SOE) Sinopec Anqing with a RMB 90,000 fine for polluting the air. The fine was triggered by a production accident that occurred in May 2013 caused black smoke to leak from Sinopec's production facilities. The fine was one of the first of its kind, because local EPBs usually have no authority to charge pollution fees to central SOEs. Often managers of local branches of central SOEs also hold concurrent posts within the locality; the general manager of Sinopec Anqing, for instance, is concurrently also a member of the Anqing Municipal Standing Committee, a powerful position in the locality. The Anqing case could be a signal to other local EPBs to be bolder in addressing the "yangqi (central state-owned enterprise) problem." However, the RMB 90,000 fine is relatively low for a central SOE and does not fully reflect the considerable local ecological and health damage resulting from Sinopec's pollution.

Two factors help to explain why the municipal EPB in Anqing dared to fine the central SOE:

- Public monitoring was an important stimulus: following the accident in May 2013, many citizens in Anqing complained about the pollution and posted pictures to the Internet.
- Strong EPB leadership: In early 2013, Anqing Municipality assigned a high-ranked local leader—a former vice mayor—to lead the municipal EPB. The new leader frequently visited the provincial EPB bureau and MEP to gain upper-level government support. The local EPB head's high ranking together with the support from national level made charging the new fee possible.

Source: Kostka 2013.

Strengthening the capacity of institutions for environmental management should also include improvements in the collection and wide dissemination of relevant data. Much progress has recently been made in collecting air quality data, including the recent establishment and real time release of monitoring data for $PM_{2.5}$ (very fine particulates with a diameter of 2.5 micrometers or less) in 74 cities. MEP plans to expand this system to more than 300 prefecture-level cities. But monitoring networks for many environmental indicators are still sparse. Provincial EPBs, but no local EPBs, are able to assess the 106 indicators defined in the new water quality standards (Qu, W. D. and others 2012). Reporting protocols for environmental performance data are not very rigorous, allowing local institutions too much flexibility in what and how they report (box 7.3).

In response to recent environmental crises China's government has announced new financial resources for mitigating pollution problems. Some of those resources could be allocated to strengthen the policy development and enforcement capacity of MEP and its affiliated institutes. At the local level, additional resources in capacity and technology for monitoring will also be needed. Additional administrative changes could disconnect the funding for local EPBs from the collection of pollution fees, but without removing the incentive to go after polluters. Fines and pollution fees can be an important source of funding for environmental management, but, as in most countries, revenue should flow into general budgets from which EPBs would then be financed. A more difficult problem will be to make local EPBs more independent, especially in enforcement action, without reducing the responsibility of local governments for environmental outcomes. That may require stronger oversight and performance monitoring from provincial and national authorities, combined with better incentives for local officials and greater scope for public participation.

Stronger incentives for local governments

The disconnect between the national government's environmental goals and local implementation is also a reflection of insufficient incentives for local governments to improve environmental

BOX 7.3 The three *baos* of data reporting

Shortage of advanced monitoring equipment at the local level hinders the verification of environmental outcomes. The verification of environmental targets differs depending on available technologies and forms of monitoring systems. For chemical oxygen demand (COD), a measure of water quality, and SO2 targets, monitors are installed in larger companies. This monitoring equipment is often not very technically advanced, unreliable, and limited in number (Kostka 2014). For energy intensity targets, no purpose-built monitoring equipment is in place, and reports rely on self-reported figures from enterprises. Self-reported online data are sent to the local statistical bureau, which then collates sheets of data. Only data from very large enterprises are shared directly with the provincial and national statistical bureaus. A government official explains:

> *Enterprises report their energy consumption through an online reporting system. Self-reporting by enterprises is problematic, because there are three kinds of bao [reporting]. There is luanbao, which refers to messy data that [lack] logic. Often accountants enter the data into the online sheets but they lack training on energy bookkeeping, so they often make mistakes. There is manbao, which refers to companies underreporting production figures because they fear that this information is shared with the local taxation bureau. Because companies are afraid that they would have to pay more taxes, they do not report real production numbers. Finally, there is tuobao, where companies simply delay reports.*

Because the self-reported data from enterprises collected by the statistical bureau are so poor, one official admitted that he collects his own data from the town level, including data for both large and smaller enterprises. According to him, his independently collected data are more accurate, but for official purposes he still has to use the data from the statistical bureau.

Source: Kostka 2013.

outcomes and for firms to reduce resource consumption and avoid pollution. Local government officials who do not see sufficient benefits or penalties for environmental performance will focus on other priorities. National directives and local priorities continue to encourage a dominant concern for economic growth targets over social and environmental objectives. As one local leader said: "It is like a constrained maximization problem (*youyue shue de jidahua*): We try to maximize GDP and fiscal income, but we meet only the bare minimum of environmental standards. This is of course not always efficient for the environment" (Kostka 2013).

Such attitudes are reinforced by promotion criteria that put relatively little weight on environmental quality achievements. This system is formalized in the government's performance assessment system, which gives different weights to targets in the cadre evaluation forms (*kaohebiao*). Economic targets tend to overshadow social and environmental targets. In one Shanxi county 2011 evaluation form, government officials could reach up to 28 points for meeting economic targets, 19 points for improving people's lives, 11 points for social development, 14 points for resources and environment, and 13 points for social safety (Eaton and Kostka, 2013). Environmental goals thus accounted for, at most, 16 percent of the total performance score. Consequently, one EPB official said: "Environmental and energy targets are binding targets but they are not our ultimate targets. No leader will be promoted because of their better achievements in environmental protection and energy savings. GDP growth is still the target that we work hardest to achieve" (Kostka 2013). A recent statistical analysis confirms that environmental improvements are uncorrelated with probability of promotion, while spending on transport, for instance, promotes GDP growth and thus career advancement (Wu and others 2013). Given the long list of central government directives, local leaders therefore act rationally by investing their time and resources in other objectives that are more likely to advance their career. This pattern will not change unless promotion criteria are revised and penalties for nonachievement increased.

BOX 7.4 Co-opting local businesses into green growth in Xiaoyi

Xiaoyi County in northern Shanxi effectively managed to co-opt local businesses into sharing the burdens of green growth and economic restructuring. Xiaoyi is a resource-based economy with an undiversified, coal-dependent industrial structure in the midst of transformation. Leaders in Xiaoyi's leadership group have cooperated closely with local businesses to share the burden of reducing Xiaoyi's coal dependence. Strikingly, local coal enterprises, many of which are privately owned, have actually been given soft targets in local plans for investment in economic transformation projects: "Coal production enterprises should each launch non-coal projects of between one and two billion RMB; each coking enterprise should launch projects of one billion RMB or more in non-coal or downstream processing projects." (Xiaoyi Government Work Report 2011, 20). In addition, Xiaoyi leaders have effectively bundled coal restructuring with the goal of developing noncoal industries by providing incentives for former coal bosses whose enterprises were eliminated as part of a 2006 industry clean-up to start greener businesses. For instance, with government backing, a former mine owner whose enterprise was shuttered brought a Walmart outlet to Xiaoyi and also has a new business marketing agricultural products.

Xiaoyi's greening growth strategy has built up gradually with guidance from a strong and locally rooted leadership group. Recent party secretaries in Xiaoyi have served for an average of 8.3 years and mayors an average 6.2 years, much longer than the average tenure of local leaders of three to four years. A unique characteristic of Xiaoyi is that leaders from elsewhere put down roots in Xiaoyi: "Most of the Party secretaries, mayors and CCP Organization Department heads are from outside. But they all settle down here." The attractiveness of Xiaoyi as a place to live (good primary and secondary schools, high environmental quality, and a developed entertainment industry) does seem to have contributed to its success. Living environment is often cited as an important factor in luring investors, but the example of Xiaoyi shows that it also may be important in attracting and retaining able government leaders.

This continuity helped Xiaoyi's leadership group make very effective use of the relationships it has built over time with local industry. Leadership continuity likely contributed to the leaders' success in securing investment because investors could be confident that plans would not shift radically with personnel changes in the leadership group.

Source: Eaton and Kostka (2014).

The relatively short tenure of local cadres also reduces their incentive to invest in environmental projects whose benefits may only be apparent after some years. Nominally 5 years, the average tenure of local mayors and party secretaries has dropped from 4.2 years in the 1993–2001 period to 3.3 years during 2002–11 (Kostka and Yu 2013). Provincial DRC heads stay an average of 3.6 years and provincial EPB directors 4 years. While there are some advantages of periodic turnover to bring in fresh ideas, short tenure times encourage a focus on projects with short-term results that increase promotion odds rather than on more complex restructuring or pollution mitigation efforts whose benefits are in the future and that may be stopped by one's successor. Extended tenures would encourage long-term thinking and more emphasis on quality of life issues in evaluation systems. Xiaoyi in the coal country of northern Shanxi province turned itself into an attractive place to live under the leadership of a locally rooted group of policy makers who built constructive relationships with residents and local industry (box 7.4).

Further reducing the effectiveness of environmental policy implementation is that local decision makers frequently concentrate on the appearance of environmental gains rather than on cost-effective greening. In selecting environmental investments, many local leaders thus favor "political accomplishment projects" (*zhengji gongcheng*) over more efficient solutions. In Shandong Province, one county plans to build water treatment plants in each town to show progress in implementing the 12th Five-Year Plan, rather than upgrade a centralized larger plant more cheaply (Kostka 2013).

There are some signs that these problems are being addressed. Promotion criteria have begun to change, and Zheng and others (2013) find that this is having an impact on local policy makers' environmental achievements, especially in cities where mayors have better education levels. China's government can accelerate this process by further reforming the reward and incentive system for local officials. Together with increasing public involvement (discussed in the next section), stronger incentives will put pressure from two directions on local officials to improve environmental performance.

More channels for public participation

In practically all industrial countries, environmental management has become stricter over time largely as a response to vocal public demand for better protection from pollution and for a higher quality of life. China is no exception. As incomes and access to information increase, public pressure on polluters directly and on governments charged with environmental management will continue to grow. Public participation—whether by individuals, by grass-roots initiatives, or by well-organized NGOs—plays a vital and constructive role that complements official efforts but does not replace it. The public's concern often focuses on visible problems such as air pollution, while less visible or long-term problems such as sporadic toxic releases or soil contamination can be just as bad or even more dangerous. Most people also react most to problems in their own backyard (although NGOs tend to have a broader perspective). So the problems identified by well-educated people, who are often more vocal and well connected, might receive a disproportionate amount of attention. Public participation is therefore no substitute for the government's investment in environmental monitoring and enforcement.

Yet, public participation will be an important factor in the success of China's efforts to improve the environment. Citizens can currently have influence through three main channels: the consultation process that is part of the environmental impact assessment of large public and private projects, various public complaint mechanisms, and the legal system. For these channels to be effective and efficient, citizens must have access to credible and up-to-date information about pollution and emissions from companies. Progress on public disclosure of such information has been made in some parts of China, but information release is still too much up to the discretion of firms and local officials.

As in other countries, NGOs play an important role in facilitating public participation in China (Kostka 2013). There are an estimated 1,000 registered environmental NGOs (or ENGOs) and an equal number of unregistered ones. Those that have been most influential have often been closely associated with governmental organizations (government organized NGOs or GONGOs). They can more easily bridge the gap between civil society and the state but have sometimes been criticized for not being as forceful in pursuing environmental objectives as more independent ENGOs, who still often run into the limits of what the government considers an acceptable role for NGOs (Hildebrandt 2011; Wu 2013). ENGOs could become more effective in helping achieve China's green goals if they had more opportunities to participate in policy design and formulation and not just implementation. ENGOs are far more influential in China's large international cities, especially Beijing, Shanghai, and Guangzhou. Officials in other parts of China too often see them as adversaries rather than as stakeholders, which limits their role, for instance, in environmental education, advocacy, and monitoring of environmental compliance. ENGOs can also play an important role in promoting sustainable lifestyles—an essential task for China to build up awareness and support for green actions and to build a market to demand greener products.

Environmental impact assessments

The earliest mechanism for the public to provide input to environmental decision making was through participation in environmental impact assessments (EIA), which were first introduced

in China in 1973 (Zhang and others 2012). The guiding concept for EIAs is the "three simultaneities": any major project should anticipate adverse impacts on the environment by designing, constructing and operating protective measures during the project cycle. By the 1990s, EIAs for international cooperation projects started to include public consultation. In 2003, the Environmental Impact Assessment Law specifically stated that if a project involves the environmental interests of the general public, inputs from stakeholders, experts, and the general public need to be collected. EIAs have become one of the main instruments for environmental protection. They have been effective in significantly modifying or preventing some projects that could have caused large environmental damages, including the Panyu Waste Incineration Project or the Shanghai-Hangzhou Maglev train line (Zhao 2010).

But there are weaknesses both in the EIA implementations generally and in their participatory components. EIA compliance is mandatory only for a relatively small number of projects and often weakly enforced. Large companies sometimes fail to perform EIAs, instead paying relatively modest fines. In soliciting inputs from the public, EIAs often pick an unrepresentative sample of respondents and allow public comments for only a short period early in the process when the full implications of the project are not yet clear. There is often too little opportunity for face-to-face consultation. Recently, the central government has endorsed a strengthening of public participation in EIAs. What would help most would be a shift in the mindset of local officials about the value of the public's feedback, more rigorous methodologies for questionnaire design and feedback collection, and clearer operational rules for public participation throughout the project cycle (Li, Ng, and Skitmore 2012).

Formal complaint systems. As early as the 1990s. some city governments had established formal channels through which residents could complain about environmental violations. Many provinces and cities have established 24-hour hotlines that allow citizens to register environmental complaints. Citizens also can complain directly to local EPBs, which received over 700,000 complaints in 2010. With rising access to social media—42 percent of Chinese are now connected to the Internet—some local governments have begun using such channels that allow for broader information distribution and feedback collection. The Chengdu EPB, for instance, assigned staff to set up a microblog for citizen outreach and information dissemination. By documenting and publicizing local environmental problems, citizen groups can be effective partners of the government in pursuit of shared environmental goals. As the example in a previous section showed, in May 2013, public monitoring helped encourage Anqing Municipality in Anhui Province to impose a fine on the production facility of a large SOE after a pollution incident. Formal complaint systems thus complement the efforts of local agencies, which usually do not have the resources to monitor compliance of numerous potential polluters.

The question is how efficient and effective complaints are. There are many examples of polluters being caught who would not have been detected by the EPB. But the costs of a complaint system can be high, because many complaints are about minor nuisances. Improving formal monitoring aided by more complete pollution registries could prevent many complaints in the first place. Despite the large number of complaints, relatively few trigger enforcement actions. Between 2006 and 2010, MEP received 300,000 environmental complaints.[10] These led to a re-examination of 2,614 administrative decisions. Only 980 of these were administrative court cases, and only 30 resulted in criminal cases, suggesting that few environmental conflicts are resolved through the legal system. Greater public participation in detecting and publicizing environmental wrongdoing—whether through formal channels or informally—will be an effective means to support the government's environmental goals only if there is an outlet for such protests. Otherwise they can lead to social instability. One such outlet is the legal system

[10] http://www.chinadialogue.net/article/show/single/en/5438-Officials-struggling-to-respond-to-China-s-year-of-environment-protests- and http://blogs.cfr.org/asia/2013/05/20/chinas-environmental-politics-a-game-of-crisis-management/.

where citizens, community groups or local governments could initiate cases of gross violation of environmental laws.

Legal system. Most national and local environmental agencies around the world have limited enforcement capacity. Ministries of Environment typically have much smaller budgets than other departments. Enforcement of environmental rules in Europe or North America—but also in Brazil, India, or Thailand, for instance—therefore relies substantially on the court system. A famous example is the role of courts in enforcing air quality standards in Delhi in 2001 (Bell and others 2004). Successful lawsuits by individuals affected by pollution in China have resulted in compensation payments in some instances. In one prominent ongoing case, a chemical plant in Yunnan released 5,000 tons of chromium dregs into the Nanpan River in 2011. A group of NGOs filed a public interest lawsuit on behalf of thousands of affected farmers that could become a landmark case if it is recognized by the Supreme People's Court as a precedent. Overall, however, pursuing polluters through the legal system is still difficult, and many cases never reach trial stage (Stern 2011).

China has for some time been experimenting with specialized environmental courts. By mid-2012, almost 100 such courts and tribunals had been established in 16 provinces of China (Zhang and Bao 2012). Such courts could provide an effective way of assisting more direct government efforts in enforcing environmental laws if a number of problems with existing environmental courts are resolved. The main issue is that there are high barriers to bringing cases to court. Less than 1 percent of environmental disputes reach the court system (Stern 2011), in part because only few organizations can file public interest environmental law suits. Revisions to China's environmental law proposed in July 2013 would further restrict the right to file such suits to only one MEP-affiliated organization—the All-China Environment Federation.[11]

Barriers also exist where judges close to local governments prevent individuals or groups of affected citizens trying to bring cases to court from going forward (Zhang and Bao 2012). The resulting small number of environmental cases has been used as a reason to close environmental courts. A more certain legal basis for these courts and greater independent procedures would help overcome these problems. The legal system can be a slow and expensive way to resolve environmental disputes. More comprehensive enforcement of environmental laws and mediation or conflict resolution by public or nonstate organizations should play an important role and usually be the first best option. But, as experience in other countries has shown (for example, Lin and others 2009), for complex cases or where officials are unable or unwilling to pursue polluters, stronger environmental courts will be an important means to hold polluters to account.

Public disclosure

Public pressure on polluters can be an effective way to encourage greater environmental compliance. But citizens often do not realize that a facility is polluting air, water, or soils until harmful effects are obvious. Disclosure of polluting behavior by firms gives people the information they need to assess whether they are affected. China has experimented with public disclosure of pollution performance ratings since the 1990s (Wang, Wheeler, and Jin 2010). Piloted in Zhenjian (Jiangsu Province, box 7.5) and Hohhot (Inner Mongolia) by MEP's predecessor organization, SEPA, together with the World Bank, such initiatives have now been implemented in the Yangtze River delta (Jiangsu, Shanghai, Zhejiang), Hunan, Hebei, Anhui, Guangdong, Shanxi, Shenyang of Liaoning, Shenzhen, Chongqing, Ningxia, and soon Hubei. These systems summarize and publicize firms' environmental compliance information into a

[11] "China's Proposed Revisions to Environmental Protection Law Draw Mixed Reviews," Bloomberg/BNA, July 17, 2013, http://www.bna.com/chinas-proposed-revisions-n17179875568/.

BOX 7.5 Environmental performance ratings in Jiangsu Province

Despite long-standing efforts to control pollution with traditional regulatory instruments, China continues to have severe pollution problems. Environmental performance rating and public disclosure (PRPD) has emerged as a complement for traditional pollution regulation. It helps overcome institutional weaknesses that hinder conventional monitoring and enforcement of environmental laws, regulations, and standards, and lowers regulatory costs. In the past decade, Jiangsu and several other areas in China have practiced the PRPD approach and have found it an effective pollution control instrument.

Jiangsu started its PRPD program with support from the World Bank in 2001, after a pilot test in Zhenjiang Municipality. The program rates firms' environmental performance from best to worst in five colors—green for superior performance; blue for full compliance; yellow for meeting major compliance standards but violating some minor requirements; red for violating important standards; and black for more extreme noncompliance. The primary benchmarks for ratings are China's emission and discharge standards that specify effluent concentration limits. The rating system also incorporates other performance indicators, including hazardous waste disposal practices, solid waste recycling, pollution accidents, public complaints, internal management requirements, China cleaner production certificates, ISO 14000 certificates, administrative penalties, and other citations for illegal activity. For each indicator, the system specifies a clear, unambiguous, and publicly available link to ratings.

Evidence for the PRPD program in Jiangsu Province indicates both increasing participation by firms and improvement in their compliance rates. The number of rated firms increased more than twentyfold in 10 years, from 1,059 in 2001 to 20,261 in 2010. The percentage of firms with positive ratings increased to 96 percent in 2010. Research has found that PRPD program in Jiangsu has significantly reduced pollution from rated firms, with particularly strong impacts on firms with poor ratings. PRPD has significantly increased market and stakeholder pressure on managers to improve their firms' environmental performance. Firms with better ratings perceive positive impacts on market competitiveness, overall market value, and relationships with different stakeholders, while the firms with bad ratings are more likely to perceive deterioration.

Recently, Jiangsu Province has linked the environmental performance ratings to eligibility of bank loans, the market list inspections requirement, and the environmental responsibility insurance premium, among other things. All firms' environmental performance information has been posted on the province's intranet, which is accessible to all local environmental officers. It is expected that stronger incentives will be generated for firms to further reduce pollution with the PRPD program in Jiangsu Province in the future.

Source: Jin, Wang, and Wheeler 2010.

color-coded ranking from excellent to severe underperformance, essentially shaming persistent polluters and rewarding clean production.

Social pressure can be effective and many companies will voluntarily seek improvements. But such systems will work only in cities with an environmentally proactive government, which are usually already better performing places with higher incomes. Although decentralized, this approach again requires the voluntary support of a central (provincial or municipal) authority (Economy 2010). The system also still will need to be backed up by comprehensive monitoring and strong enforcement, which has been uneven in China—better in coastal areas and in areas with a more diverse economy (and therefore less susceptible to capture by dominant firms), where enforcement capacity is greater, and where there are a larger number of complaints, which highlights the role of public participation (van Rooij and Lo 2010).

As part of China's Open Government Information initiative in 2008, MEP introduced an Open Environmental Information (OEI) regulation. It requires disclosure of environmental information including the allocation of emissions quotas, pollution fees collected, outcomes of investigations, and lists of violators of environmental rules. These measures are an important

step in moving from voluntary public disclosure schemes toward more formalized attempts to introduce greater transparency in environmental performance. The regulation still has some shortcomings. First, in contrast to most other such regulations, China's OEI makes the government, rather than industry, responsible for disclosure. The toxic release inventory in the United States and the European Pollutant Emission Register in contrast make it mandatory for companies to report emissions above a threshold. Furthermore, there are seven types of exceptions that Chinese environment management officials can invoke to refuse release of information, such as state or commercial secrets or information that could endanger public security or social stability. These exceptions make it too easy to suppress information about pollution that is of public interest.

Second, as a general set of regulations aimed at improving governance, OEI does not convey a right to disclosure. Given China's decentralized environmental administration, that means that the most polluted municipalities have the weakest disclosure (Tan 2012). There is even some evidence of backsliding. The Institute of Public Policy and Environmental Affairs, which annually ranks 113 cities by their environmental transparency, found that about 40 cities had lower disclosure performance in 2012 than a year earlier.[12] And third, implementation of OEI is quite expensive for environmental authorities and will require further large investments in technology. MEP, for instance, receives "a flood of requests," as one official put it, and does not have the staff and resources to respond to all.

The government still acts as a gatekeeper for environmental compliance information. Some municipalities have made significant efforts to open up environmental information. Jiangsu Province has become a national model for public disclosure.[13] Hunan Province's publicizing of persistent polluters shamed one company into immediately investing in cleaning up production. And Zhejiang Province is the first in China to require firms to publicly release their pollution data. The current system gives a lot of leeway to individual provinces, which encourages experimentation. Over time, this should lead to mandatory policies that require municipalities in all parts of China to collect and disclose high-quality pollution monitoring data and information about government enforcement. This kind of disclosure will be an important step toward a system where local authorities—with the help of the public—monitor the compliance of firms and prosecute violators, and where provincial governments and MEP, in turn, monitor the environmental management performance of municipalities.

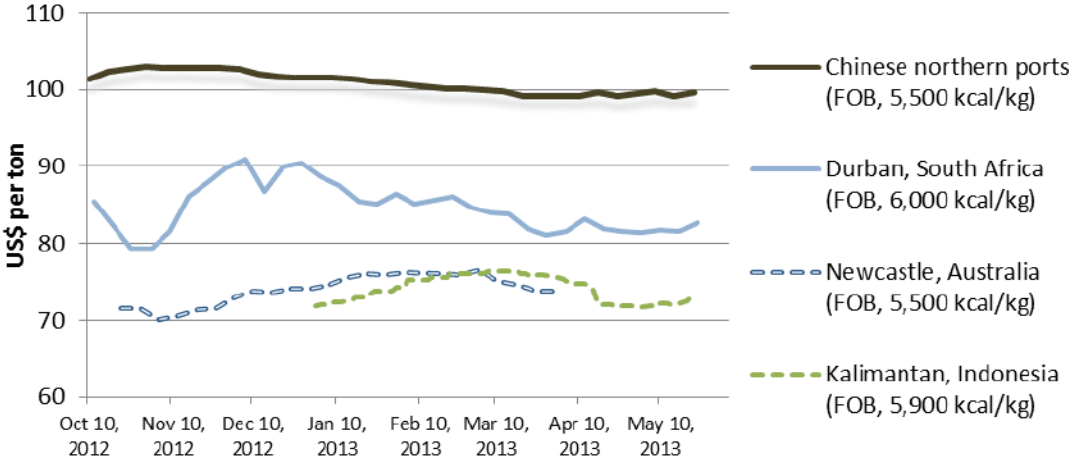
Sharper policy instruments

As in other areas of policy making, governments have three types of instruments available to promote environmental objectives. They can use price instruments such as taxes, fees, or subsidies. They can pass regulations such as technology or emission standards. And they can spend resources on things like research, information programs, or transfers to compensate those affected by other policies. All three types of instruments are necessary, although the efficiency with which they achieve their policy goal can vary. Price instruments, if they are designed to ensure economically efficient resource use, tend to be the most efficient. But they are often not enough to trigger the desired response such as a certain level of energy savings. So additional

[12] "The 10 most secretive cities were Zaozhuang in Shandong , Datong and Yangquan in Shanxi, Xiangyang in Hubei, Karamay in Xinjiang, Changchun and Jilin city in Jilin, Zhangjiajie in Hunan , Jinzhou in Liaoning and Ordos in Inner Mongolia. Forty cities scaled back their information disclosure last year, with Wuhu in Anhui, Foshan and Shantou in Guangdong, Baoding in Hebei, Taizhou in Zhejiang, Changzhou in Jiangsu , Anshan and Dalian in Liaoning, Weifang in Shandong and Yinchuan in Ningxia the most regressive." Stephen Chen, "Most Chinese Cities Hiding Vital Pollution Data from Public," *South China Morning Post,* March 29, 2013, http://www.scmp.com/news/china/article/1202211/most-chinese-cities-hiding-vital-pollution-data-public.

[13] Barbara Finamore, "A Step Forward for Environmental Transparency in China," SWiTCHBOARD, Natural Resources Defense Council Staff Blog, 29 March 2013, http://switchboard.nrdc.org/blogs/bfinamore/a_step_forward_for_environment.html.

FIGURE 7.6 Border spot prices for thermal coal traded in China and other countries, 2012–13



Source: China Coal Industry Association data.
Note: Free-on-board (FOB) prices, expressed in US dollars at monthly market exchange rates.

instruments may be required to address separate market, information, or behavioral failures. Governments should be careful when adding additional instruments, however. Too often, overlapping instruments cancel out each other, create new market distortions, or create confusing and inefficient signals to firms and households. A simple principle is that each problem or market failure should be addressed by a separate instrument. In practice, policies do interact and need to be taken into account when introducing new instruments. The following sections briefly discuss the three main types of instruments—prices, regulations, and investments and transfers.

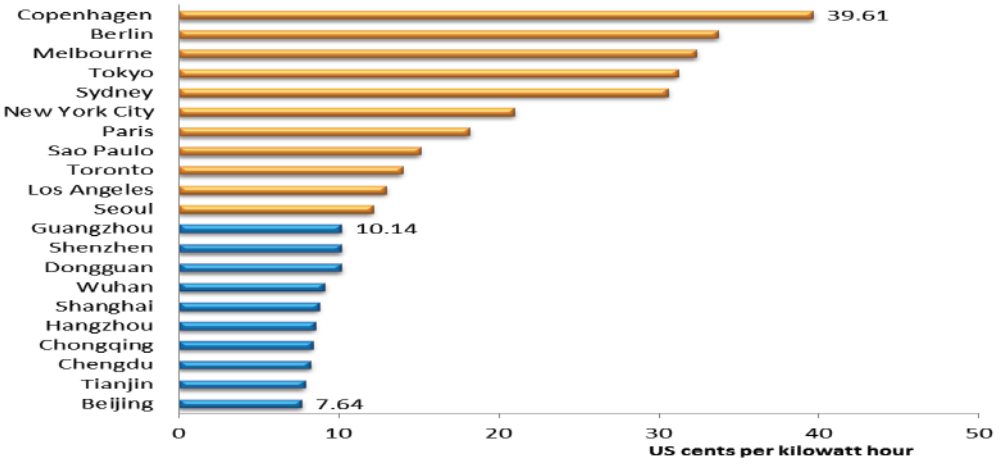
Prices

Besides reforming institutions for environmental management in China, the most effective way to induce greater resource efficiency and lower pollution is through prices. China has removed the most egregious distortions and subsidies in the energy sector—the source of most air pollution and greenhouse gas emissions. Prices for coal, electricity, some petroleum products, and natural gas generally reflect financial costs over the long run, and some are at or even above international market levels.

Coal prices. Coal prices paid by industrial consumers have been relatively high compared with prices in other countries. Over the past year, the benchmark spot price for thermal coal traded at China's northern ports has remained well above that of similar-grade coal produced in South Africa, Indonesia, and Australia (figure 7.6). Domestically produced hard coking coal has generally been up to 20 percent more expensive than in the United States between 2009 and 2012, in part because of high transport and handling fees that can make up to 70 percent of the industrial consumer price in coastal areas. Environmental taxes and fees have also increased. Publicly traded coal mining companies in China paid around RMB 140 ($22) in taxes per ton of coal produced in 2012 (RMB 110 or $17 per ton excluding income taxes).[14] A 2013 review by China's Central University of Finance and Economics found 25 different environmental

[14] The average spot price at China's northern seaports in 2012 was around RMB 650. Estimates of tax burden based on a look at the financial reporting of 12 large publicly listed firms (China Energy Network, 20 June 2013, http://www.cmen.cc/2013/coal_0620/49560.html.

FIGURE 7.7 Residential electricity prices of 10 cities in China compared with other major cities, 2011–12



Source: China Electricity Council data; E-Control and VaasaETT (2012), "Household Energy Price Index for Europe" media releases, http://www.energypriceindex.com (accessed June 2013); US EIA, Form EIA-826 detailed data, http://www.eia.gov/electricity/data/eia826/ (accessed June 2013); Tokyo Electric Power Company (2012), "Press Release (May 11, 2012) Regarding Electricity Rate Increase", http://www.tepco.co.jp/en/press/corp-com/release/2012/1204304_1870.html (accessed June 2013); Kepco, electricity rates calculator, http://cyber.kepco.co.kr/kepco/EN/F/B/ENFBPP002.do?menuCd=EN060202 (accessed June 2013); Ausgrid, 2012, "Residential Electricity Prices and Energy Bills 2011/2012—Sydney vs Melbourne," http://www.ausgrid.com.au/Common/About-us/Newsroom/ (accessed June 2013).
Note: Prices for China's cities are for 2011; data for other cities are for 2012.

resource taxes and fees among the 109 taxes and fees currently levied on coal producers.[15] Prices will rise further as tonnage-based resource taxes are converted to value-based resource taxes.

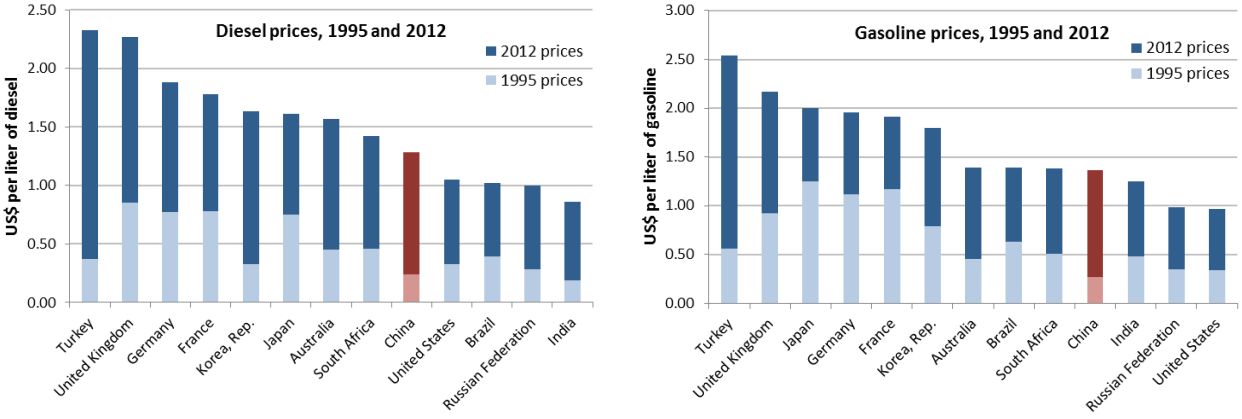
Electricity prices. Electricity prices in China overall are now generally comparable to long-run marginal supply costs (before accounting for environmental damage and other nonmonetized costs) (Moskovitz and others 2007; Zhang 2012). Industrial users pay around RMB 0.70 ($0.10) per kilowatt hour on average. By comparison, the average rate for industrial users in the OECD countries in 2010 was $0.11 per kilowatt hour (IEA 2013b). Taken on a purchasing power parity basis, China's effective average rate for industrial users is about $0.17, which would place it in the middle of the pack among the OECD countries. Urban residential prices vary between $0.08 and $0.10, lower than in many industrial country cities (figure 7.7).

Oil and gas prices. NDRC, which regulates petroleum prices, has used international oil prices as the benchmark for domestic prices since 2009, although with a break on cost increases. If benchmark prices exceeded $130 a barrel, then "on principle of maintaining economic stability," diesel and gasoline prices are not raised or are raised only by a small margin (Xinhua 2009). Taxes now make up more than 35 percent of retail gasoline and diesel prices in China, [16] compared with 13 percent in the United States and 47 percent in the European Union. Gasoline and diesel prices are higher today than in Russia or the United States, although still much lower

[15] National Energy Administration, "Establishing a Modern Tax System for Coal" (建立现代煤炭税费制度), reposted from Economic Daily (经济日报), March 21, 2013, http://www.nea.gov.cn/2013-03/21/c_132251142.htm; Xinhua, "Reducing Burden on Coal Industry by Clearing Up Fees and Reforming Taxes" (煤炭行业减负 重在"清费""正税"), reposted from Economic Daily (经济日报), March 21, 2013, http://news.xinhuanet.com/energy/2013-03/21/c_124485886.htm .

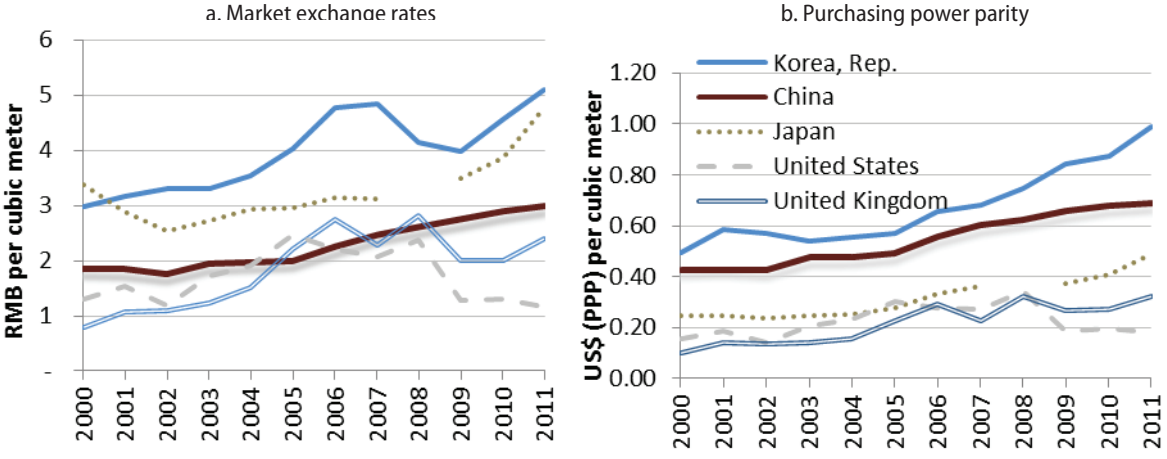
[16] Xie Jiu, "Difficulties and the Way Forward in a World of RMB 8.00 Gasoline" (油价"8元时代"的困局与出路). Life Week (三联生活), March 28, 2012, http://www.lifeweek.com.cn/2012/0328/36802.shtml (accessed December 2013).

FIGURE 7.8 China's transport fuel prices are still relatively low but have increased significantly



Source: GIZ (2013).

FIGURE 7.9 Natural gas prices paid by industrial end-users in Chinese cities compared to prices in other countries, 2000–2011



Source: NBS 2005d–2012d; U.S. EIA, US Price of Natural Gas Delivered to Residential Customers, http://www.eia.gov/dnav/ng/hist/n3010us3m.htm (accessed December 2013); Korea Energy Economics Institute, Energy Info.Korea 2012, http://www.keei.re.kr/main.nsf/index_en.html (accessed December 2012); UK DECC, Table 5.7.1 Industrial gas prices in the EU and the G7 countries, https://www.gov.uk/government/statistical-data-sets/international-industrial-energy-prices (accessed December 2013).
Note: Chinese data represent prices paid by sample of industries in 36 large cities; data for Korea, Japan, the United States, and the United Kingdom are national averages of urban consumers; data include all taxes, surcharges, and other fees.

than in Europe (figure 7.8). New rules introduced by the NDRC in March 2013 have allowed petroleum prices to be adjusted more frequently to follow movements in benchmark prices more closely (NDRC 2013).

Natural gas prices are also closely regulated by pricing authorities. Prices for industrial users in major Chinese cities are relatively high, especially at purchasing power parity prices (figure 7.9). Prices for fertilizer producers and urban residents are typically set 30–35 percent lower than those for industry.

Although energy prices generally reflect production and supply costs and are close to or sometimes even exceed global price levels, some government policies cause some prices to deviate from market costs and encourage inefficient energy consumption. The most important

of these is the continued favorable pricing policies, sometimes cross subsidies, for residential energy prices through higher tariffs for industrial users. One study estimates that in 2007, overall electricity subsidies were RMB 76.4 billion ($10.1 billion, 2007 prices) (Lin and Jiang 2011). While the residential sector received an estimated RMB 202.6 billion in net subsidies, the industrial and commercial sectors combined overpaid (had a negative net subsidy) by an estimated RMB 126.2 billion. In industrial countries residential tariffs are usually higher, reflecting higher distribution costs. Cross-subsidies have social objectives. They follow the principle of "equal burden sharing," where price setting considers affordability and social concerns in addition to supply costs. But they come at the cost of lower economic efficiency. Furthermore, they tend to be regressive because wealthier households, who consume disproportionately more energy, receive the largest share of the benefit.

Other distortions include pricing practices that prevent electricity producers and some other energy suppliers from passing input costs above a certain level on to consumers. The difference between market-based import prices for natural gas and regulated domestic prices have generated large losses for importers. In 2011, for example, PetroChina lost RMB 21.4 billion on sales of pipeline gas imported from Turkmenistan because of price regulation. Such losses have dampened incentives to boost supplies of this relatively cleaner fuel. As pricing reform continues, better information about the size, fiscal costs, and distributional impacts of distortions in resource prices would provide greater momentum for reform and a better basis for deciding which policies, on balance, are justified when economic, social, and environmental considerations are taken into account. Such a review could take the form of an inventory or audit of environmentally harmful policies similar to those performed by some European environmental agencies (UBA 2011, for example).

Getting to cost recovery levels is only the first step. China's coal, electricity, and gasoline pricing policies have also begun to account for damages caused by resource production and consumption—local pollution that harms people's health and greenhouse gas pollution that fuels global warming. Adding such "external" or "social" costs is usually the most efficient way to change the behavior of people and firms. Determining the appropriate pollution charges can be difficult, however. Estimated health impacts or climate change impact modeling can provide guidance. One large U.S. study for instance, estimated that the health damages from fossil fuel power plants range from 0.002 to 0.12 cents per kilowatt house depending on the size and age of the plant (NRC 2010). A study by Chinese experts estimated that adding a comprehensive estimate of the social cost of coal—including indirect costs from mining, transport, production, and emissions—would raise the market price of coal by 23.1 percent (Mao, Sheng, and Yang 2008). The social cost of climate change damages from energy use are more difficult to determine, because of uncertainty about specific impacts. The U.S. government recently revised its official estimates of the social cost of carbon upward based on extensive modeling—to $38 per ton of carbon dioxide for the year 2015.[17] This number is used to estimate the climate benefits of environmental rule making.

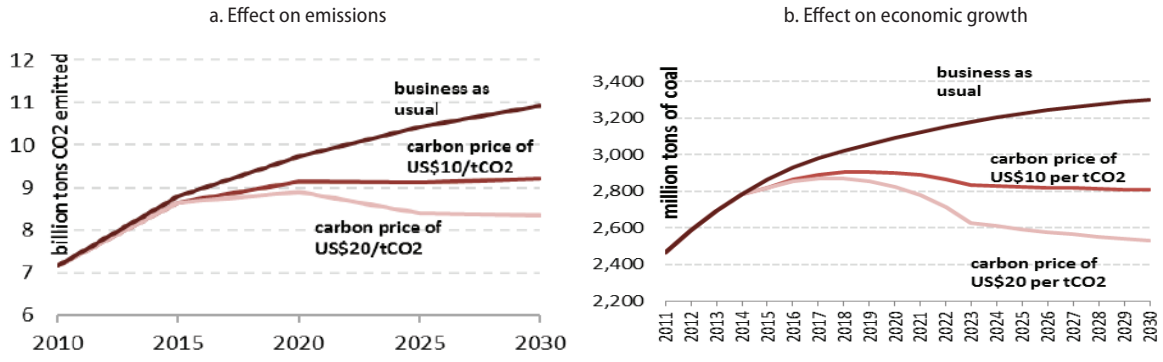
Such extra charges are imposed in two ways. One is through an energy or resource tax. Ecological tax reforms would put a charge on energy or water use to encourage conservation. Carbon taxes specifically charge greenhouse gas emissions (box 7.6). Charges could rise over time in line with efficiency improvements and become a new source of revenue, which can be earmarked for related goals, such as funding energy efficiency investments, or they can reduce other distorting taxes such as those on labor or replace municipal revenue from land sales. The alternative policy is a cap-and-trade system. This system establishes a clear limitation on pollution and lets a market for emission allowances determine the price for pollution, ensuring that pollution reductions occur where they can be achieved at least cost. Allowances have been initially distributed freely to make the system acceptable to firms, which if possible should be avoided. They can be auctioned off to raise revenue similar to a tax. Revenues from a tax

[17] Other studies, such as the Stern Review (Stern 2007), come up with higher estimates.

BOX 7.6 China 2030: Estimated Impacts of Carbon Pricing

According to a recent analysis by the World Bank and DRC, a price of $10–$20 on a ton of carbon dioxide (CO_2) (RMB 83–166 in 2004 prices) starting in 2015 would effectively bend the curve of China's rising greenhouse gas emissions, causing emissions to plateau or peak before 2030. Total coal use would peak in or around 2020. The price would effectively be equal to a tax on steam coal of about $22–$44 a ton. While carbon pricing would have a dramatic effect on CO2 emissions and the use of dirty fossil fuels, it would only have a modest long-run effect on economic output (box figure). Even with a carbon price of $20 a ton, average annual growth in GDP slows by only .06 percent between 2015 and 2020 and .05 percent between 2025 and 2030 compared with a baseline scenario.

FIGURE B7.6.1 Effect of a carbon price on emissions and economic growth



Source: World Bank background analysis done for World Bank–DRC 2013.

or cap-and-trade allocation auctions can be reinvested in further resource savings or emission reduction, contributing to higher benefits than the price effect alone. Pollution trading systems in China have been piloted for sulfur dioxide (SO_2) and carbon, and in several countries they are also used for water pollution (Fisher-Vanden and Olmstead 2013).

The following sections on sector priorities discuss the use of some price instruments in China in more detail. Several policies and pilots introducing environmental taxation and cap-and-trade systems are already under way in China. These will be useful as a way to collect information and experiences but will need to be expanded nationally if they are to become truly effective. Furthermore, cap-and-trade systems need to be frequently recalibrated. An economic slump will reduce emissions or pollution even without firms' efforts, adding to the frequent problem of initially overallocating allowances. In addition, complementary energy efficiency and renewable energy policies may "loosen" the cap and add to a surplus of allowances, dragging down CO_2 prices, as seen in the EU carbon trading system (Grubb 2012). As China moves from pilot schemes to full deployment, these interactions among overlapping policy instruments need to be dealt with based on careful analysis with a coordinated effort between ministries and agencies.

Regulations

Price incentives are an efficient and noncoercive way to encourage changes in behavior, but there remains an essential role for strict environmental regulations as well as for social transfers. Price instruments can be blunted by behavioral factors such as short-termism (people look at the higher purchase price of energy-efficient light bulbs but ignore their long-term savings) or split-incentives (a landlord may not make energy saving upgrades as long as the tenant pays the

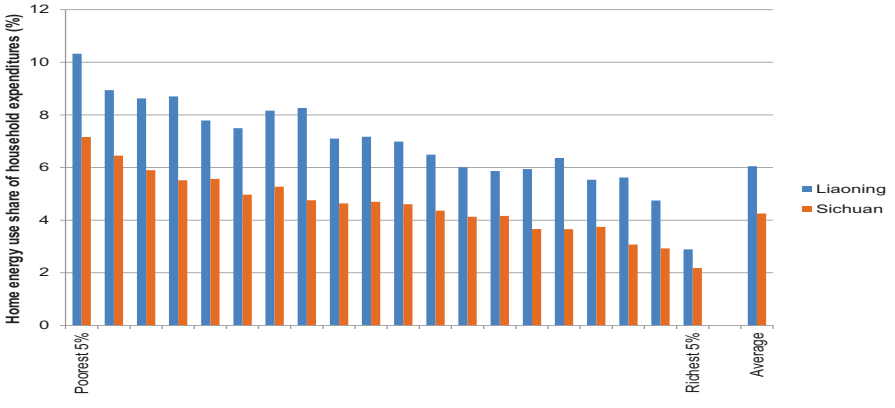
utility bills). Regulations can also be more effective when the need to stop or reduce a harmful activity is urgency. But regulation is only as good as its enforcement. China's current reliance on target-based regulations is producing desirable results but may lead to unintended consequences and weaker compliance incentives. The regulations are often rigid and may not reflect local environmental conditions and priorities, often lack a scientific basis, are sometimes arbitrarily exaggerated as they pass through the administrative hierarchy, and compliance is difficult to verify (Kostka 2013). More rigorous technical, social, and economic analysis of regulatory decisions and investment projects could make them more effective.

Investments and transfers

Besides influencing prices and issuing regulations, governments also spend money directly to pursue greening, for example by funding information programs, training, or upgrading public infrastructure. In some instances, such direct government expenditures can help buffer the unintended consequences of environmental policies. Market instruments are economically efficient, and complementary regulations are effective where markets do not work well. But both usually raise prices for resources, at least in the short term, which can affect the competitiveness of firms and the welfare of low-income households. For environmental policies to be efficient, effective, *and* fair, assistance to households and companies will sometimes be necessary.

For instance, household expenditure shares for energy in two of China's provinces, Liaoning and Sichuan, range from about 2 percent for the richest households in Sichuan to just over 10 percent for the poorest in Liaoning (figure 7.10 shows expenditures are higher in Liaoning because of winter heating needs). Wealthier households usually have higher total energy expenditures, but the expenditures account for a smaller share of their income. An international benchmark for energy poverty is when households have to spend more than 10 percent of their income on energy. If energy prices rise by 15 percent when cross-subsidies are removed or an ecological tax is imposed, up to 20 percent of households in Liaoning could fall above that threshold. This example illustrates that the social consequences of sustainability policies need to be studied carefully, but it does not argue against raising prices to market or even to social cost levels. A block tariff that maintains a lower price for a minimum amount of energy is one option to address social concerns, as already implemented for electricity. But, if the block is not well designed, it can have significant benefit leakage to the nonpoor. Generally, rather than keeping energy prices low across the board, which would discourage energy efficiency efforts by households, a more effective strategy is to complement sustainability policies with targeted sector and social protection policies that help the poorest cope with energy price rises (Ruggeri Laderchi, Ollivier, and Trimble 2013).

FIGURE 7.10 Household energy expenditure shares, 2012



Source: China Household Income and Expenditure Survey data.

Local officials in China already have extensive powers to force the shutdown of inefficient or outdated production capacity for which energy efficiency upgrades would not be sufficient. To soften the blow to local employment and economic output, city governments may provide reemployment assistance to displaced workers, financing for affected enterprises to pursue other lines of business, and partial compensation for retired equipment (Kostka and Hobbs 2012; Taylor and others 2010; Li and others 2009).

Sustainable sector policies are closely aligned with green objectives

Differing resource endowments, economic structures, climactic conditions, and other conditions mean there can be no universal definition of a green city. Because the specific issues that need to be addressed in these sectors vary widely, and because sector reforms have advanced more in some sectors than in others, no generic set of options or recommendations can be applied. But there are a number of common themes. First, action in all sectors is urgently needed because of the immediate health and ecosystems impacts from high pollution and because poorly designed urban infrastructure investments during the next wave of urbanization could lock China into further cycles of unsustainable development.

Second, problems of the magnitude and complexity faced by China's urban policy makers cannot be solved in sector silos or geographic niches. Land management, transport, building, and public service sectors need to be closely coordinated to shape cities that are resource efficient and low polluting while also promoting economic efficiency and quality of life. And because air pollutants travel over long distances, air quality management needs to be organized at a geographic scale that matches the footprint of the problem.

Third, reducing local pollution (immediate benefits) and global carbon pollution (with most benefits in the future) often go hand in hand. Increasing energy efficiency, by reducing fossil-fuel burning, can save lives that would be lost to air pollution today and will also help reduce future global warming. But end-of-pipe abatement technologies for power plants and cars, for instance, can reduce air pollution concentrations but will not capture carbon emission. As a rule of thumb, when retrofitting existing infrastructure, it will often be most cost-effective to prioritize local pollution reductions because they bring important, near-term benefits to local populations. For new investments, low-carbon designs will be easier and often cheaper to incorporate at the beginning than retrofitting these assets later, so both objectives can be considered at a lower life-cycle cost. Assessment tools are available that evaluate both local and global emissions, and these should be developed further to optimize solutions based on local circumstances (annex 7B). Sector investments and policies should seek to limit environmentally harmful resource use as much as possible and clean up what cannot be avoided. Table 7.1 presents the main messages for each sector.

Crossing jurisdictions for effective air quality management

Recent episodes of severe air pollution in many cities have brought air quality into the center of environmental policy debates in China. There is a growing realization of the scope and scale of health impacts from polluted air, and the government has demonstrated its willingness to use its financial and administrative resources to address this problem more forcefully. Improving air quality in China's cities is a massive challenge not only because of the scale of the problem but also because the large number of pollution sources, and chemical reactions between different pollutants, make it particularly complex. Some of the key elements of an effective air quality action plan are addressed here. Three principles for policy making stand out. One is that adopting a more flexible approach for setting targets for air quality management (AQM) within China's National Ambient Air Quality Standards (CNAAQS) could facilitate implementation by accounting for the currently very large differences in pollution levels and conditions across cities and regions. A second point is that regional institutions for AQM must be endowed with greater authority, because air pollution travels across municipal boundaries and solutions can be cost-effective only when applied at a larger scale beyond the jurisdiction of each city and province. Third, spending resources for air pollution mitigation wisely requires a comprehensive, multipollutant approach that identifies those policies and interventions that provide the largest

TABLE 7.1 Sector priorities for green urbanization

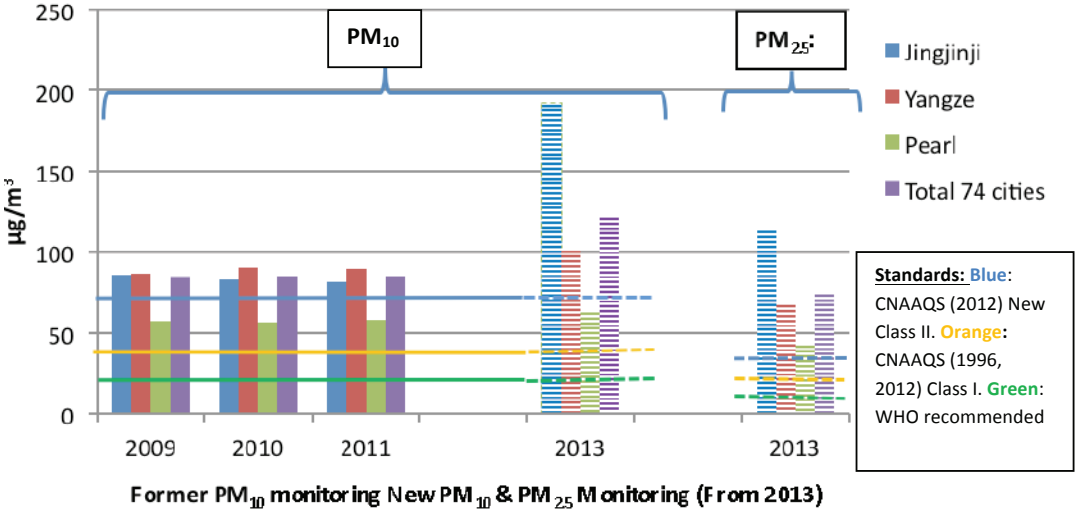
Integrated approaches to resource use efficiency and pollution management	
Promote resource efficiency by revising statutory urban planning rules and coordinating urban and sector planning more closely.	Implement regional air quality management based on sound monitoring, comprehensive technical assessment, and economic analysis.
Providing sustainable and safe urban transportation	
Reduce reliance on private cars by charging the full cost that their use imposes and by making urban public transit and nonmotorized transport more attractive.	Enforce fuel quality standards, continue to tighten and enforce vehicle emission standards, expand low-emission and alternative fuel vehicles, and encourage retirement of older, highly polluting vehicles.
Meeting urban energy needs by prioritizing efficiency and greening the energy mix	
Rebalancing markets and mandates to reduce energy use in industry	
Rebalance administrative measures with more market-based approaches that motivate enterprises to prioritize energy efficiency as part of their own business interest; maintain enterprise obligations while providing more options, like trading, to meet targets; and strengthen local government capacity in regulatory supervision and policy implementation.	Strengthen development of energy-efficiency services industries, giving enterprises increased access to technical services and financing, and promote deeper penetration of energy savings performance contracting.
Leading by doing: serving the people in more efficient and cleaner buildings	
Lead by example with aggressive building efficiency programs in public institutions. Establish targets for progressively tightening energy efficiency codes to set clear market signals; broaden use of benchmarking for existing buildings as basis for retrofit policies and programs; promote green buildings by linking incentives with clearer labeling schemes and strengthening capacities across the supply chain.	Phase out harmful construction materials to reduce indoor air pollution.
Securing clean energy sources	
Minimize the direct use of coal in cities by expanding access to piped gas (with priorities given to households, commercial uses, and district heating) and clean energy sources.	Establish a more even playing field for cleaner energy to contribute to urban energy supply by removing pricing distortions and by improving efficiency of energy supply systems through increased competition and modernization of sector regulation.
Integrating water resources and pollution management to improve water quality	
Ensure a efficient, safe, and secure water supply by reforming the water rights system, using smart technologies to measure consumption, and enhancing water resource and pollution discharge governance at the basin level and at local levels; broaden use of payments for ecological services to address nonpoint source pollution challenges; and increase public awareness through new means like water footprint accounting.	Modernize urban utility management by reforming water pricing to improve sustainability of water and wastewater treatment services; strengthen governance by piloting mechanisms like water boards in metropolitan areas and aggregating services in small towns, adopting transitional arrangements for meeting wastewater standards for weaker cities to help improve coverage.
Improving solid waste management: waste reduction, recycling and disposal	
Charge waste removal fees that can fund more efficient collection, separation, and disposal of waste, and encourage life-cycle product stewardship programs that help avoid waste generation.	Improve the planning of waste disposal by strengthening environmental impact assessments, improve their operations by reducing air and water pollution from incinerators and landfills, and provide for the proper closure, rehabilitation and safe reclamation of old landfills.

pollution reductions at the lowest cost. This strategy also includes the identification of abatement options that result in both local air pollution and climate change reduction (co-benefits). Specific abatement actions will occur at the sector level. Because of the cross-sectoral nature of the air pollution problem, an effective institutional and regulatory framework is critically important.

Urban air quality has gradually improved as prevention and control policies have been successively tightened (World Bank–MEP 2012). The annual average concentration of relatively coarse particulate matter (PM_{10}) for 113 priority cities fell by about 40 percent, from 145 to 83 micrograms per cubic meter ($\mu g/m^3$) between 1997 and 2012. SO_2 emissions have been declining since the late 1990s and particularly since the mid-2000s, mainly because of the wide application of flue-gas desulfurization at power plants (Lu and others 2010). Overall, NO_2 emissions have also showed a decreasing trend over the past 15 years, although this trend has leveled off in recent years most likely because of the increasing vehicle fleet in Chinese urban areas (Nygard and Deichmann 2013). Much progress has also been made in collecting and disseminating information on urban air pollution. A nationwide monitoring program for fine particulate matter ($PM_{2.5}$) initially covered 74 cities. China's Center for Environmental Monitoring now provides hourly updates of air quality for about 175 cities on the web, with plans to expand the program to all 325 prefecture-level cities.

Despite these positive trends, air pollution levels remain high. Average PM_{10} concentrations in 2012 are still more than 20 percent higher than the new Class II rating under CNAAQS and 325 percent higher than the WHO preferred standard of 20 $\mu g/m^3$. Moreover, these averages mask far higher levels in individual cities and city clusters, especially in the North China plain including the Beijing, Tianjin, Hebei (Jingjinji) region (figure 7.11). Furthermore, data for the first half of 2013 suggest that PM concentrations may have increased, with $PM_{2.5}$ levels about twice the Class II standard and seven times the WHO standard of 10 $\mu g/m^3$. $PM_{2.5}$ is of great concern because these very small particles can enter deep into the cardiovascular and respiratory systems, causing high morbidity and mortality. Overall, the newly available monitoring data suggest that PM_{10} concentrations appear substantially higher than earlier reported. The Jingjinji region experienced severe pollution, where even healthy people should avoid outdoor activities, on 48 days during the first half of 2013. While cities in West and North China once had the highest PM_{10} concentrations, the new $PM_{2.5}$ and ozone (O_3) data indicate that the centers of heavy air pollution are now in the industrial centers in the North China Plain. Unless the

FIGURE 7.11 **PM_{10} and $PM_{2.5}$ monitoring results from 74 pilot cities, including 3 regions, 2009–13**



Source: Calculations based upon Renmin University 3E data base, World Bank–MEP 2012, and CNEMC 2013.
Note: Since the 2013 figures are for the first half year only, both the standards and the concentrations levels are illustrated in dotted lines and bars.

TABLE 7.2 Breakdown of PM_{10} and $PM_{2.5}$ sources nationwide and in Beijing

Sources:	PM_{10} (1) % share	$PM_{2.5}$ % share	
		Nationwide	Beijing
Suspended dust	30–60 (North) 5–30 (South)	34 (North) 29 (South)	17 (suspended) 7 (construction)
Coal combustion	20–60 (Winter) 5–20 (Summer)	10–30 (within city only)	16.7 within city 24.5 outside city
Industrial processes (iron steel, cement dust)	Up to 20	Up to 32 (mainly cement)	—
Vehicle emission	5–20	15 (North) 20 (South)	22
Biomass burning	Up to 10	14 (North) 20 (South)	9
Secondary PM (Beijing, Yangtze, Pearl River)	20–40 (largely $PM_{2.5}$)	10–57 (from SO_2, NO_X, NH_3)	40-50% (from SO_2, NO_X, NH_3)

Source: World Bank-MEP 2012, 11; Nygard and Deichmann 2013; Yang and others 2012; Lei and others 2011.

patterns found in early 2013 are due to unusual circumstances, it seems unrealistic for many cities to achieve CNAAQS Class II standards as intended by 2016.

China's air pollution problem may be getting more complex

The causes of these unexpected spikes in air pollution are still debated, and they may well be temporary. But air pollution problems will remain challenging for a number of reasons that also have a bearing on possible mitigation strategies. First, the composition of pollution sources in China's cities is gradually changing. It is also highly variable, because China's cities have different geography, industrial structure, and energy supply patterns. Far too few rigorous and comparable pollutant source apportionment studies have been done for Chinese cities. Overall, coal combustion—in power plants, industry, and residential use—remains an important contributor to China's air pollution, especially in winter, where it can account for as much as 60 percent of PM_{10}. The share of emissions from vehicles is rising. Although new cars are cleaner, the volume of new vehicles is very large and vehicular emissions can account for as much as 30 percent of $PM_{2.5}$. Natural sources in the form of dust worsen air pollution problems, especially in the North, where seasonally and during severe dust storms they can make up to 60 percent of PM_{10} in some cities, including Beijing (table 7.2). The continued uncertainty about pollution sources and the dynamic nature of source compositions show the need for a much better understanding of where air pollution comes from.

Second, the way in which particulates form is growing more complex, with the share of so-called "secondary pollutants" increasing. This is the share of fine particulates such as $PM_{2.5}$ that forms in the air when gases such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), and ammonia (NH_3) react chemically. Most SO_2 comes from coal combustion, while most NO_x is emitted by vehicles. However, ammonia is necessary to turn these gases into particulates.[18] In

[18] As one researcher writes, "It is very difficult to get aerosol formation if only SO_2 and NO_x are present. Ammonia is the key step to neutralize SO_2 and NO_x to aerosols, because SO_2 and NO_x are acidic gases and ammonia is the only alkaline readily available in the atmosphere." Kang Sun, "Ammonia: An Overlooked Byproduct from Energy Generation," Princeton University, China Energy Group, August 19, 2012, http://www.princeton.edu/~puceg/perspective/ammonia.html (accessed December 2013).

fact, such chemical reactions are facilitated by cold temperatures such as those that the Jingjinji region experienced in early 2013 during the spike in $PM_{2.5}$ concentrations.[19] Over the North China Plain, most ammonia comes from agricultural activities—nitrogen fertilization (54 percent) and livestock emissions (46 percent; see Zhang and others 2010). Ammonia emissions have increased rapidly over the past twenty years. Because ammonia emissions worsen the impact of gaseous emissions from fossil-fuel burning by helping to create more $PM_{2.5}$, reducing them will also lessen the impact of emissions from energy generation and use. That will require halting the considerable overapplication of fertilizer (Liu, X., and others 2013) and introducing better livestock management. The complexity is further increased by the need to also consider greenhouse gas emissions. Air pollution abatement often can yield significant CO_2 reductions as a co-benefit (Liu, F., and others 2013) and also reduces short-lived climate pollutants, of which black carbon is of particular importance. Because pollutants from different sources interact in complex ways, it is important to address pollution from all sources—that is, a multipollutant approach that also considers carbon pollution—rather than focus on one in particular.

The third aspect is the role of long distance transport of air pollutants. Dust and particulates produced in one province can reach cities in a neighboring province. Emissions caused by agricultural activities in distant rural areas can worsen urban pollution problems. As a result, already high pollution levels may become even more severe by events or actions that take place far away from the area of impact. In the Jingjinji region, Hebei accounts for as much as 89 percent of the industrial PM emissions and 81 percent of the SO_2 emissions, while Beijing accounts for only 4 percent and 6 percent, respectively (Xinhua 2013). Similarly, in the lower Yangtze River Delta, 84 percent of industrial PM and SO_2 originate in the neighboring Jiangsu and Zhejiang provinces, while 16 percent of the emissions originate in Shanghai city. Long distance transport of pollutants implies that air quality management cannot only be done on city-by-city level but rather must be planned and implemented at a closely integrated regional scale (for example, in a regional "airshed") that brings local urban and regional AQM together.

Finally, an emerging question is whether climate change could have an impact on local air pollution levels. One well-understood aspect is that the higher temperatures expected with global warming facilitate the formation of ozone, which can harm the respiratory system and lead to asthma, bronchitis, and premature death. A less researched aspect is arctic amplification that can cause greater swings and a slowing down of the jet stream (Francis and Vavrus 2012; Nygard and Deichmann 2013). Weather systems may remain in place longer, leading to a greater accumulation of pollutants. The possible role of climate change highlights the fact that uncertainty is likely to increase, so our assumptions must be continuously updated.

Strengthening air quality management

Many parts of China's air pollution control policies have worked well. For instance, the amended air quality law of 2000 focused control efforts on 113 priority cities with the greatest air pollution problems. These cities significantly reduced PM_{10} concentrations over the following decade. Lessons learned should now benefit all of China's cities that face air quality challenges. A comprehensive air quality improvement strategy needs to address three important aspects.

Different cities face very different challenges in meeting China's ambient air quality standards, and these differences should be reflected in the prescribed implementation schedule for pollution reduction policies. The standards establish a uniform target air quality level for all cities under the principle that all of China's urban residents should be able to enjoy clean air as soon as possible. But cities have very different pollution levels that arise from industrial

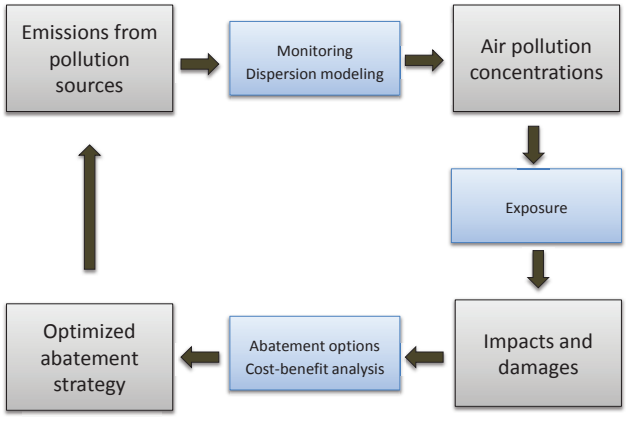
[19] Kang Sun, "Atmospheric Ammonia and the Air Quality of the North China Plain," Princeton University, China Energy Group, http://www.princeton.edu/~puceg/perspective/Atmospheric_Ammonia.html (accessed December 2013).

structure, natural conditions, and capacity to implement mitigation policies. A uniform path to compliance is therefore unrealistic and probably counterproductive. A more differentiated set of target dates, with intermediate targets for the most polluted cities, can make achievement more manageable while still retaining the incentives for already-cleaner cities to reach targets faster or to overcomply, for instance by pursuing the stricter WHO standards.

Because air pollution travels across administrative boundaries, control programs must be organized regionally. Much of the air pollution in many of China's cities originates from areas that are beyond the control of city governments—from other urban centers but also from nearby agricultural areas. Purely local abatement action will not be sufficient to clean the air, especially in larger city clusters. Other global metropolitan areas with historically large pollution problems have set up powerful regional AQM authorities. In the United States, the South Coast Air Quality District is in charge of air quality planning, regulation, compliance assistance, enforcement, monitoring, technology advancement, and public education for the greater Los Angeles region in California, home to 17 million people. And the Ruhr area in Germany established a regional AQM strategy (*Luftreinhalteplan Ruhrgebiet*) that coordinates abatement measures across 13 individual cities such as Essen and Dortmund. Such models could be adapted to strengthen regional institutions in Chinese city regions with severe air quality problems such as Jingjinji. To be effective, such regional institutions or similarly effective mechanisms need to be endowed with a clear mandate and legal authority across municipal boundaries, together with strong enforcement mechanisms, which in most countries leverage the legal system. A clear coordination mechanism also is needed covering the many municipal sector and environmental management bureaus whose actions affect air quality.

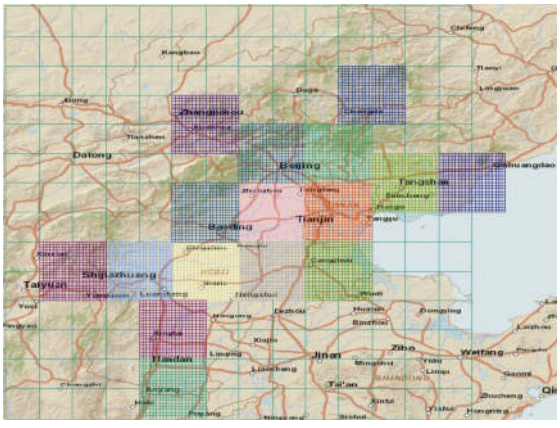
Air quality action plans need to be guided by a comprehensive and rigorous analysis of the costs and benefits of abatement options. In response to recent severe air pollution incidents in China, the government has announced large additional air pollution control efforts, including a RMB 1.7 trillion program to be implemented over 2013–17 (Xinhua 2013). To ensure that such funds are well spent, a solid technical and economic analysis should identify the most cost-effective abatement strategies. The approaches need to be both broader—by considering pollution sources and impacts in a larger geographic region—and deeper—by employing much finer-grained data on individual pollution sources and exposed populations. These are common in North America and Europe, and Chinese researchers and policy analysts also have the expertise to implement them. A comprehensive, integrated AQM approach involves four major steps (figure 7.12; see also box 7.7).

FIGURE 7.12 Framework for comprehensive integrated air quality management



Source: Nygard and Deichmann 2013.

FIGURE 7.13 Example of a nested modeling system of air quality in the Jingjinji region in China



Source: Nygard and Deichmann 2013.
Note: See text for explanation.

BOX 7.7 The call for integrated, multipollutant approaches to air quality management in the United States

An extensive review by the National Research Council of air quality management (AQM) in the United States since introduction of the Clean Air Act in 1978 concluded that further improvements would require "an integrated multi-pollutant approach to controlling emissions of pollutants posing the most significant risks" (NRC Committee 2004). The council advised that such approaches should seek opportunities for addressing air pollution and climate change mitigation simultaneously. Recent research has highlighted the importance of short-lived climate pollutants such as black carbon that are also reduced through measures that target $PM_{2.5}$. Since the council's review, states and local governments have passed laws requiring multipollutant AQM planning that takes greenhouse gases into account. States can also save money and achieve air quality targets more effectively if control measures for traditional pollutants, such as NO_x and SO_2, are integrated with required CO_2 reductions (James and Schulz 2011). As China embarks on more aggressive pollution controls and decarbonization efforts, such integrated, multipollutant approaches can identify cost effective pathways that lead to significant emission reductions in local and global greenhouse gas emissions.

Source: NRC Committee 2004; James and Shulz 2011.

The first step is the identification of emission sources, including their geographic location, by conducting a detailed inventory and analysis of emission sources, both stationary such as power plants and nonstationary such as vehicles. In the second step, a combination of ground-monitoring data and atmospheric dispersion modeling determines air pollution concentration levels in all parts of the area. In a regional application, this step will involve a hierarchically structured set of models with fine resolution local models nesting into coarser resolution regional or even national models.[20] In the Jingjinji region, for example, the overall regional level could be covered by 50-by-50 kilometer grids at a coarser resolution in an overall 700-by-700 kilometer coverage, while 14 urban areas would be covered by finer resolution grids of 1–5 kilometers within the 50-by-50 kilometer coverages (figure 7.13). The resulting information can then be used to predict how pollution concentrations in individual locations change with the introduction of very specific abatement measures, even at individual facilities. In principle, this procedure allows design of abatement options to achieve specific air quality targets at the level of individual monitoring stations.

The third step translates observed and modeled air pollution concentrations into impacts by estimating who is exposed to how much air pollution and then applying so-called dose-response functions, which link pollution levels to health outcomes including premature death. In an urban context, the impacts on human health are most important, but other impacts include diminished visibility, corrosion, or cleaning needs. In a broader context, impacts on natural ecosystems through eutrophication or acid rain as well as long-term climate change impacts, for example, should also be considered. Comparison of current impacts with those modeled under various abatement scenarios provides measures of benefit (avoided damages). If the abatement option is an efficiency measure, additional co-benefits could also include energy or other resource material savings. In the final step, these benefits are compared with abatement costs. Going through this process for various abatement options identifies the most cost-effective air pollution control strategy, for instance in the form of a marginal abatement cost

[20] An example of a method of nesting different levels of resolution is the RAINS and GAINS models of the International Institute for Applied Systems Analysis (see, for example, "The RAIS 7.2 Model of Air Pollution: General Overview," http://webarchive.iiasa.ac.at/Research/TAP/rains_europe/intro.html, accessed December 2013). The GAINS model can also be applied to combine co-benefits between local air pollution and greenhouse gas reductions (Liu, F., and others 2013).

curve that ranks policies or investments according to their damage reduction per unit of expenditure. An effective tool is to present the abatement options on maps and show how much air pollution concentrations will be reduced in separate sections of the city.

Given the recent spikes in air pollution in many Chinese cities, it is easy to forget that air quality today is better than a decade or two ago. With rising wealth, expectations for quality of life increase, and China's urban residents today value clean air more. China can leverage experience and technology from elsewhere and mobilize significant domestic expertise and resources to tackle the urban air pollution problem. But international experience also shows that quick improvements are unlikely. Heavily polluted cities in Europe and the United States reduced pollution levels by well over 90 percent from their peak, but it often took several decades of determined policy implementation. China can achieve its goals faster, but blue skies will not come overnight.

Shaping urban energy and infrastructure needs through urban form and planning

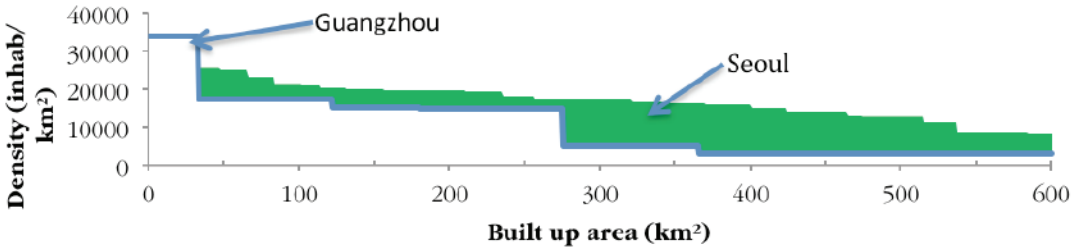
The urban form—a city's spatial development—will shape China's urban energy and infrastructure needs, and thus heavily determines their environmental impacts.[21] Urban form strongly influences city infrastructure and in turn the behaviors of city dwellers. Because of its multisector nature, urban form is a key lever for strategies to improve resource efficiency and to maximize use of renewable resources. Urban form, once established, is very difficult to change. Urban infrastructure embeds a path dependency, possibly for generations—it establishes the way people travel and live, encouraging a lifestyle that is hard to change after people grow accustomed to it. Yet it is still possible to change mobility choices and the sizing and scaling of street patterns that meet the needs of all users, both motorized and nonmotorized (Ollivier and others 2013).

China has the world's largest urban population, but, surprisingly, its cities are not particularly densely settled. Guangzhou for example, could increase its population in the densest 600 square kilometers by 70 percent, or 4.2 million people, if it raised its density to the level that prevails in Seoul (figure 7.14). Similarly, Shenzhen could increase its population in the densest 600 square kilometers by 98 percent. Population densities are also less uniform in Chinese cities. Densities of neighborhoods vary by a factor of 10 in the Paris and New York metropolitan areas but densities of some neighborhoods of Beijing, Shanghai, Guangzhou, and most other large Chinese cities are as much as 20 times greater than other neighborhoods in the same city.

Urban sprawl—with rapid growth of low-density areas at the urban periphery—increases resource use in three general ways. First, low-density development increases fuel consumption in urban transport through longer commutes and more private motorized trips. Second, low-density areas increase living space per person, and consequently lead to higher per capita energy use for home heating, cooling, and general power consumption. Third, low-density development produces infrastructure used less intensively than that in dense urban cores, lowering economies of scale (figure 7.15; figure 7.16) and increasing the capital, operation, and maintenance costs for infrastructure services. Globally, efficient urban forms are quite diverse because the relationship between end users and the urban fabric is complex. There is no ideal urban form that can be copied from place to place. However, there are characteristics common to most efficient cities that typify outcomes of good urban planning practices. First, while efficient urban forms vary in scale and density, compact urban forms make it easier to support public transport; generate lower demands for energy, water, material and waste; and limit encroachment on farmland and natural areas. Second, efficient urban forms mix different uses with housing to provide shops, services, and employment nearby, reducing the need for a car. Third,

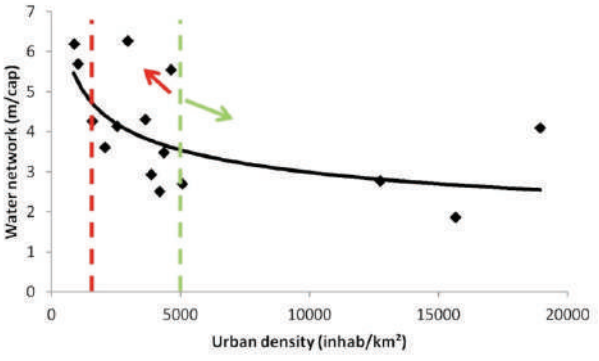
[21] This section draws extensively from Salat 2013.

FIGURE 7.14 Potential of redensification in the densest 600 km² in Guangzhou, compared to Seoul



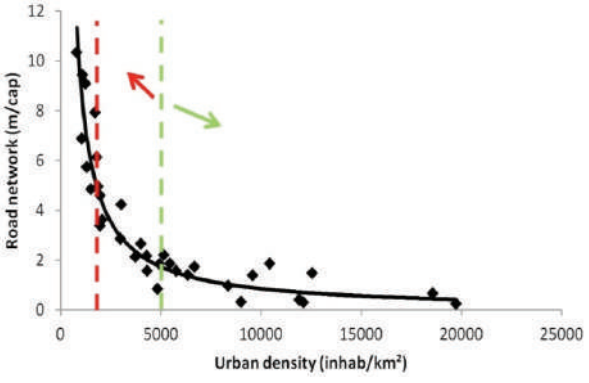
Source: Salat 2013.

FIGURE 7.15 Water network length and urban density



Source: Adapted from Müller and others 2013.
Note: This and subsequent figures map a set of cities worldwide to illustrate the relationship between density and water and transport networks. The green line corresponds to the current average urban density levels in Chinese cities. The red line illustrates urban sprawl impacts. The green arrow illustrates the path efficiency from denser urban development.

FIGURE 7.16 Road network length and urban density



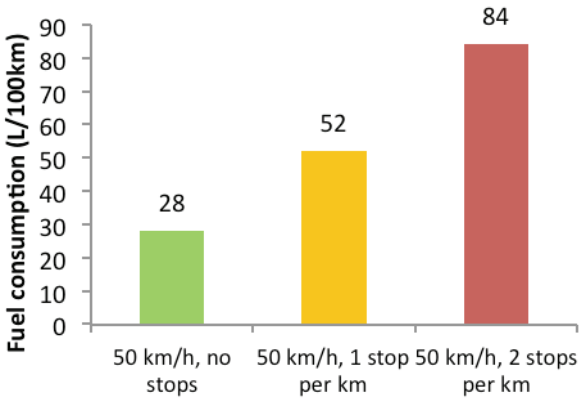
Source: Adapted from Müller and others 2013.

efficient urban forms stand out as high-quality places to live and offer a diversity of interactions among residents and businesses that fosters innovation.

As urban form locks in a path dependency, it locks out options for greener urbanization. For instance, studies have shown that a 10 percent increase in density reduces transportation energy consumption much more in already denser urban areas than in less dense ones, because the relationship between transportation and density is nonlinear (Porter and others 2013). Transit-oriented development, an energy-efficient option for cities, is generally not practical or economically viable in low-density suburban areas. Unbalanced metropolitan areas, with dense urban cores and an extended low-density periphery induce greater commuting flows from the periphery to the center. As a result, both transit capacity and road networks must be oversized to accommodate peak loads during rush hour. The resulting congestion of the street network is responsible for significant increases in energy consumption and greenhouse gas emissions from transportation, up to 300 percent for freight (figure 7.17). Studies in Jinan, for instance, calculated that household vehicle kilometers traveled are five times larger in the more modernist single-use superblock configuration than in a mixed-use, traditional street-grid neighborhood (MIT-Tsinghua-EF 2011).

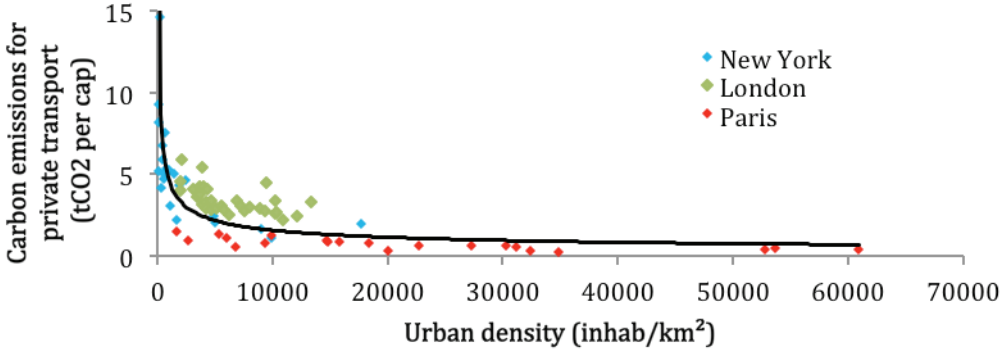
A priority action for promoting compact urban form is to revisit the statutory urban planning rules that are barriers to optimizing resource use. Lower densities are partly a consequence of China's statutory urban planning rules and related land market policies (see Supporting Report 2). Largely unchanged for decades, statutory urban planning rules require blocks to measure

FIGURE 7.17 Fuel consumption for freight (40 ton trucks) and congestion



Source: Larsson 2008.

FIGURE 7.18 Superposition of carbon emissions per capita for private transport and urban density in metropolitan London, New York, and Paris



Source: Bourdic 2011.

400 meters on a side, which locks cities into car dependence. Japanese cities, by comparison, have an average distance of 50 meters between intersections, making them more pedestrian-friendly. Among the key statutory urban planning practices or rules to be reviewed are:

Oversizing of urban street grids. Unchanged for the past 20 years, the sizing of the grid prescribes a main road every 500 meters and an even bigger road (10 lanes) every kilometer. This rule is responsible for three constraints on energy efficiency: the oversized urban "super" blocks; oversized main roads with 8 to 10 lanes and high speed limits create a "constrained" hierarchy that makes adjacent urban elements difficult to access; and they prevent street scaling that is needed for efficient distribution of traffic flows, resulting in lower linear densities of streets (kilometers of roads to square kilometers of urban area), more traffic jams, and higher energy use and carbon emissions from transportation. The absence of a scaling hierarchy in the street network—that is, the absence of secondary and tertiary levels of streets—results in a linear density of streets that is on average five times lower than in Europe and in Manhattan and ten times lower than in Japan.

Setback rules. In some cases, the frontage is set back 100 to 150 meters from the already oversized road width, resulting in distances of 300 to 450 meters between buildings on opposite

sides of the roads. These setback rules prevent reducing the size of the urban block to a more energy-efficient size—if the urban block were smaller than 400 meters, after deduction of setbacks, there would be very little land left for the building footprint.

Green space requirements in the block. Although a global target of 30 percent green space may be desirable if applied throughout a city or neighborhood, its calculation at the block scale and the requirement to implement it block by block, prevents any size reduction of the blocks—again, if the block size were reduced there would be little ground left for buildings.

Absence of superblock subdivision into smaller plots. This rule results from the state ownership of the land and prevents any complexity and fine grain in the clusters of buildings through a progressive development of the block. Once developed, the superblock cannot be redeveloped afterward because of the lack of a land market allowing further subdivisions and sales either of smaller land plots or of building rights.

Spacing between the buildings for solar access. The rule that requires spacing the buildings at a distance equal to 1.7 times their height to ensure solar access has a very strong impact on the built volumes by constraining the form and height of the buildings. Combined with the setback rule, the rule prevents a perimeter development of the block, it requires leaving the land in the superblock almost empty, with plot coverage ratios around 15 percent. The only solution left to developers to increase density is to make the buildings larger and increase their height, with detrimental effects on energy efficiency.

Large-scale zoning. Chinese zoning practices are set at a very large scale preventing a finer grain of zoning that would allow mixed uses. These practices could be revisited to promote greater mixed uses, which would bring amenities, jobs, and services, closer to housing, thus reducing transport needs.

Compact urban forms will need strict emission controls because more people will be exposed to pollution in a smaller area. Many public outcries from environmental incidents originated in cities in China. When people are concentrated in a smaller area, a single negative environmental incident can have large multiplier effects on human health. Therefore, policies that promote redensification offer both challenges and opportunities. While exposure levels have increased as a result of urbanization, measures to reduce exposure in dense areas can reach more people, more quickly, and thus improve cost effectiveness.

Providing Sustainable and Safe Urban Transportation

An efficient transport system supports urban economic growth by moving goods and people within and between cities quickly and at low cost.[22] Transport is also critical for social inclusion. As cities grow in size, the distance between one's residence and one's job also rises, and it is often low-income groups who can find affordable housing only far away from economic centers. Besides supporting growth and inclusion, transport also affects sustainability. Overreliance on individual transport and a large stock of inefficient vehicles lead to congestion, rising energy consumption, and air pollution. China's cities have two tasks to ensure that urban transport not only supports inclusive growth but also sustainability objectives. First, they can avoid emissions and lower congestion by continuing to encourage a shift to public and nonmotorized transport with much greater attention to the quality and convenience of public transport services. Price instruments and regulations will help reduce car travel, but urban planners should also create compact cities with well-coordinated land use and transportation plans

[22] This section draws from Ollivier and others 2013.

where alternatives to automobiles are more feasible and efficient. Second, for vehicle traffic that cannot be avoided, the second priority is to reduce emissions from a cleaner vehicle fleet. Here, China should broaden achievements in transport pollution control by accelerating the switch to ultra-low-sulfur diesel and gasoline for vehicles nationwide, transitioning to new vehicle emission standards for heavy-duty vehicles, and rapidly phasing out high- emission vehicles that account for a large share of emissions.

Reducing the environmental burdens imposed by a growing transport sector is not just a welfare issue. Impacts from the sector also have a large, measurable cost. Time lost to congestion and associated higher fuel use causes by far the highest external, or indirect, costs from transportation, followed by health damages from air pollution, traffic safety, and noise pollution. International estimates of total indirect costs from road transport range from $0.05 to more than $0.40 a kilometer (Proost and van Dender 2011). Two studies have estimated the indirect costs from transport in Beijing. Mao, Zhu, and Duan (2012) put the figure at 4.2 percent of GDP for congestion costs only, while Creutzig and He (2009) put it at 7.5–15 percent for all types of externalities. Even at the low end of these estimates, the large external costs from private transport can justify significant policy intervention including support for public transit from general revenue or dedicated taxes where preferred policies such as congestion charges or energy and carbon taxes are not feasible (Parry and Small 2009).

Encouraging more efficient urban transport

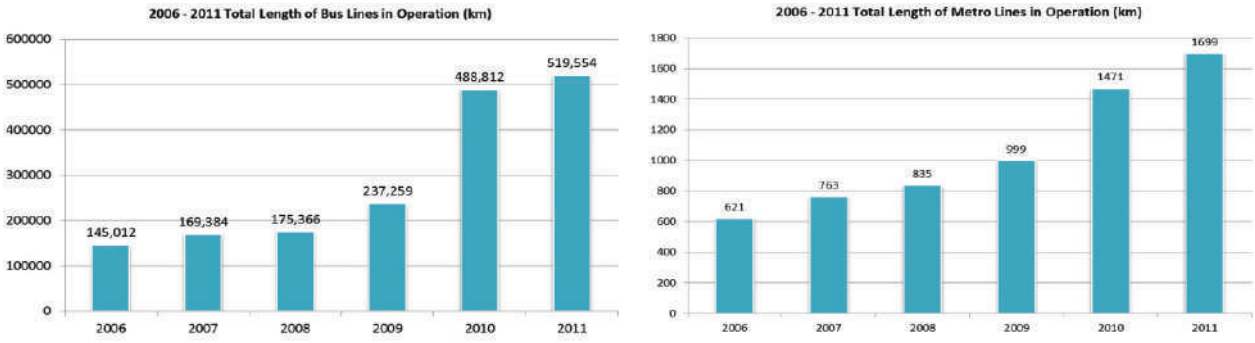
Urban road expansion will not be able to keep up with the continuously rising number of vehicles in China's cities. China's vehicle fleet has grown by more than 14 percent a year on average over the past two decades, largely fueled by private car ownership. In 1990, China had 5.5 million vehicles, of which only 800,000 (14.5 percent) were privately owned. In 2012, China had 121 million vehicles, of which 93 million (77 percent) were private cars. As incomes rose, the number of vehicles grew even faster. While better mobility is a universal human ambition, the reality has been that in Chinese cities, more cars have actually reduced mobility because many are stuck in traffic for long hours. So far, the response has been to increase the supply of roads, creating impressive urban road networks in many cities.

As road construction becomes more costly or impossible in dense urban areas, more emphasis must be put on demand management, which reduces the amount of travel and shifts traffic to public transit. The most effective management measure is to fully charge drivers the cost of using private vehicles, including environmental and social costs. Road pricing, including congestion charges in all or part of a city, is the economically most efficient management measure, but it is complex to implement and, like all price instruments, affects lower-income drivers relatively more. There are therefore few cities, such as London and Singapore, where comprehensive congestion charging has been introduced. It will often be more manageable to charge tolls on selected roads, such as major arteries or bridges into a city, as in Wuhan where electronic toll collection has been introduced on seven bridges and one tunnel. Parking policies also affect traffic densities. Cities can ration parking spaces, for instance by reducing required minimum parking spaces for new housing or office developments as is now happening in many U.S. cities. And charges for parking spaces should reflect the value of the land, which often exceeds the cost of the vehicles that occupy it.[23]

Other demand management approaches already used in some Chinese cities include quotas on license plates assigned through auctions or lotteries. International evidence has been mixed on temporary restrictions, for instance based on license plate numbers. Well-designed restrictions can reduce emissions quickly (Viard and Fu 2013), but they are usually not sufficient to

[23] Wu Hongpo, "Wuhan trapped in public parking lots: 45 out of 70 are facing delays" (武汉公共停车场陷困局 70个项目45个"难产"), Chutian Jin Bao (楚天金报),7 March 2013, http://hb.qq.com/a/20130703/003378.htm (accessed June 2013).

FIGURE 7.19 Total length of bus and metro lines in operation



Source: NBS 2007a–12a.

stem the growth of the car fleet over time, and, if poorly designed, they can increase emissions as many households purchase lower-efficiency second cars with different plate numbers. The central government can play a role in establishing clear guidelines for introducing demand management procedures for congested cities. Technical standards and public communication strategies to make congestion and parking charges more acceptable would be included. While national guidelines provide a reference frame, the most appropriate specific policy mix will be city specific.

Policies to reduce driving by making private vehicle use more expensive or more difficult should go hand in hand with making mass transit options more convenient. Chinese cities have vastly expanded public transport. The total length of bus lines in operation increased from 145 thousand kilometers in 2006 to 520 thousand kilometers in 2011, about 62.5 thousand kilometers a year (figure 7.19). The total length of metro lines in operation increased from 621 kilometers in 2006 to 1,699 kilometers in 2011. By the end of 2012, the total length of metro lines in operation had reached 2,008 kilometers in 17 cities in China. Moreover, metro systems in 28 additional cities have been approved or are already under construction, and the total length in operation is expected to reach 5,000 kilometers by 2015.

Despite these significant capital investments in and operating subsidies for public transport in recent years, its modal share in major Chinese cities remains lower than in other major cities such as Seoul, New York City, and Tokyo. Not only is more investment in capacity needed, however, service quality and comfort needs to be improved through better system integration and accessibility. Better service integration includes more convenient, efficient, and safer access to train stations and bus stops, particularly for walkers, cyclists, and people with disabilities; better connections between mass transit and buses; and improved and expanded park-and-ride lots. Integrated traveler information systems facilitate trip planning and keep travelers informed. Giving buses priorities on roads makes the service more convenient, reliable, and efficient. That can be done by creating bus-only lanes and queue jumps that allow buses to proceed with little or no traffic delay, providing traffic signal priority at certain intersections, and installing preboarding payment systems to allow passengers to board buses faster. These measures help buses keep to their schedules, improve bus service, and reduce roadway congestion.

Transit-oriented development (TOD) can further improve the convenience of public transit and the efficiency of service provision but has rarely been a specific aim of major developments and transport investments in China. In California, research showed that TOD can increase ridership on rail and buses by three to four times relative to control sites (Lund, Cervero, and Willson 2004). TOD emphasizes compact, mixed-use buildings and neighborhoods that encourage walking, cycling, and use of public transit. The high density of residential and commercial buildings allows proximity to and a functional relationship with transit stations and terminals,

giving easy access to high-quality public transport to a large share of the population. Construction of transit hubs as part of TOD also raises surrounding land values significantly. Part of the increased land values can be captured through taxes or special assessments, thus helping to finance public investments. Better road planning complements TOD through hierarchically classified road networks providing complete city coverage, and through people-oriented facilities for safe walking and biking such as those provided by "complete streets" that consider all transport modes equally.

To make integrated, multimodal transport planning work requires close cooperation among the planning bureau, development and reform commission, finance bureau, construction commission, transport bureau, traffic police department, land resources bureau, and others. Many cities have therefore set up a metropolitan transport authority with responsibility for planning and overseeing all transport mode investments and operations in that metropolis. Hong Kong SAR, China, and Singapore offer good examples in the region. Vancouver and London provide good international examples. Such transport agencies are suitable not only for large cities. In the United States, for example, almost 400 federally mandated and federally funded metropolitan planning organizations bring together representatives from a range of local and state agencies and from different transportation modes, such as public transit, freight, bicycling, and pedestrian. The planning organizations also have a citizens' advisory committee that represents community groups, professional organizations, neighborhood associations, and the private sector.

Building and operating an efficient transport network is not feasible without dedicated and predictable funding mechanisms, especially because of the long planning and construction process and the long life span of transport infrastructure. A dedicated fund to improve public transport services could be created in cities through various charges on private vehicles, including earmarking a share of the fuel levy and vehicle purchase fee, currently collected by the central government, but which is mostly used for highways. China's government should revisit the current central road-financing arrangement to allow for the establishment of urban transport funds for major cities.

Controlling vehicle emissions in urban areas

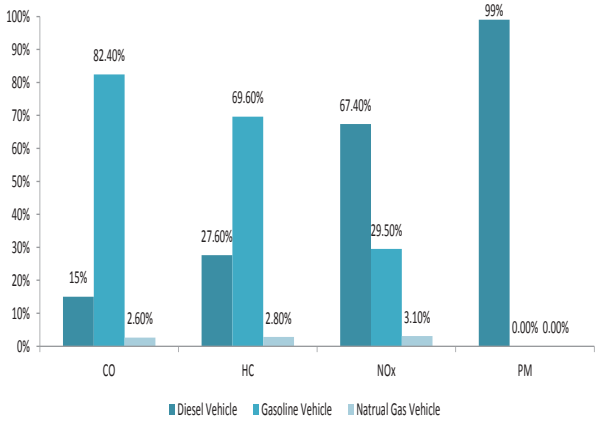
Transport-related emissions, mostly from road transport, are a large and growing contributor to air pollutants in urban areas in China. In 2011, vehicle emissions produced 621,000 tons of $PM_{2.5}$ in China, 4.4 million tons of hydrocarbons, 6.4 million tons of NO_x, and 34. 7 million tons of CO. Vehicle emissions account for a high share of emissions in cities: for example, 56 percent of NO_x and 22 percent of $PM_{2.5}$ in Beijing, 25 percent of $PM_{2.5}$ in Shanghai, and around 30 percent of $PM_{2.5}$ in Shenzhen.[24] A disproportionate level of NO_x and $PM_{2.5}$ vehicle emissions comes from relatively few vehicles. In China in 2011, about 4.6 million diesel-fueled heavy-duty and 2.7 million medium-duty freight vehicles together accounted for 7.7 percent of the total vehicle fleet but 62.8 percent of NO_x and 69.6 percent of $PM_{2.5}$ emissions from all vehicles (MEP 2012).

Sixty percent of emissions of four major air pollutants are caused by pre-China I and China I emission standard vehicles, which account for only a quarter of all vehicles (figure 7.20). A China I truck, if properly maintained, emits 36 times more $PM_{2.5}$, 20 times more NO_x, 9 times more hydrocarbon, and 3 times more CO than a similar truck that achieves the latest standard used in Europe (Euro VI). Vehicles also cause a significant and rising share of greenhouse gas

[24] Li Shaoyi, "With Traffic Jams in Beijing Comes High Levels of Pollution from Vehicular Exhaust" (北京汽车尾气污染严重：首堵伴随着首毒). Di Yi Caijing Ribao (第一财经日报), http://finance.sina.com.cn/china/dfjj/20130116/011014295729.shtml. Jing Bao, "Vehicular Exhaust Accounts for 30% of Shenzhen's PM2.5 Emissions" (汽车尾气占深圳PM2.5来源三成), http://news.sznews.com/content/2012-01/11/content_6383292_2.htm.

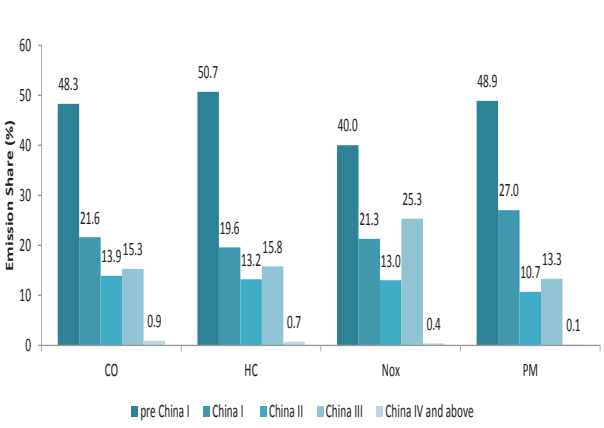
FIGURE 7.20 Vehicle emissions contributions in China

a. By fuel type



Source: MEP 2012b.

b. By vehicle emission standard category



Source: MEP 2012b.

emissions. Nationwide, the transport sector accounts for 7.1 percent of CO_2 emissions from fossil fuel burning, of which 78 percent are from road transport, according to IEA figures for 2010.

While the overall fleet is becoming cleaner, the sheer number of new vehicles is still causing emissions to rise. Continued efforts to reduce vehicle emissions are needed. China has already made major progress over the past decade in reducing such pollution. It has tightened emissions standards following European benchmarks, although with a time lag. Since 2009, it has also begun to encourage scrapping of older vehicles. Fuel standards have been improved to some extent. In its retrospective, the International Council of Clean Transportation (ICCT) estimated that the programs adopted avoided 44 million tons of hydrocarbons, 239 million tons of CO, 38 million tons of NO_x, and 7 million metric tons of particulate matter, preventing an estimated 170,000 deaths in 2010 (Fung and others 2010). In the long term, the use of natural gas could be expanded in the transport sector—if overall gas supplies can be increased. Hydrogen fuel cell and electric vehicles are expected to eventually capture a greater share of the transport market (box 7.8). In the meantime, China should broaden achievements in transport pollution control in three main ways:

Accelerate the production of ultra-low-sulfur diesel and gasoline for vehicles nationwide. Enabling China's refineries to produce ultra-low sulfur (10 parts per million or lower) will require large up-front investments, but the additional costs to consumers will be small. The ICCT estimated the annual cost of refinery upgrades (over a 10 year depreciation period) at RMB 9.6 billion for low-sulfur fuel and RMB 16.5 billion for directly upgrading to ultra-low-sulfur fuel. That translates to 2.5 fen and 8.1 fen per liter of low-sulfur gasoline and diesel respectively, equivalent to 0.33 and 1.08 percent of current retail value. Directly upgrading straight to ultra-low-sulfur fuel could raise prices by 5 fen for a liter of gasoline and 13.6 fen for diesel (ICCT 2012b). The most effective instrument to encourage the switch to cleaner fuels is through price instruments (ICCT 2013). For example, Germany's tax incentive of 12 fen a liter on ultra-low-sulfur fuel (both gasoline and diesel) led to a rapid drop in the average sulfur content to 3–5 parts per million (Walsh 2006). Consultation and communication well in advance of the introduction of these policies is essential to ensure their acceptance and effectiveness. Considering the relatively moderate fuel prices in China, a price differential between ultra-low-sulfur fuel and higher-sulfur fuel could be introduced through revenue-neutral preferential

BOX 7.8 Promoting electric vehicles in China: Opportunities, challenges, and implications

Hydrogen fuel cell and battery electric vehicles (EV) produce no tailpipe emissions and accordingly little direct pollution in urban areas. Where electricity comes mostly from clean energy sources, total emissions associated with electric vehicles can be dramatically reduced. The introduction of such vehicles has accordingly become central to emission reduction objectives in many places such as the European Union. By 2030, the European Commission targets a 50 percent reduction in the use of conventionally fueled cars (EC 2011). If China's continuing efforts in energy restructuring are successful, vehicle electrification could contribute significantly to pollution abatement and climate change mitigation over the long term.

In 2009, the Chinese government initiated the *Ten Cities, Thousand Vehicles Program* to stimulate EV development (later expanded to 25 cities). Meanwhile, there is significant EV technology development in China by industry and academia, focusing primarily on batteries and charging technology. The result is an emerging EV value chain with new business models to provide the infrastructure, components, vehicles, and related services. But several challenges need to be addressed to enable more widespread adoption of EVs:

- *Standards*. China has not yet launched its national standards for EVs, including those for vehicle charging, physical interface, safety and power grid standards, and compatibility with international standards.
- *Integrated charging solutions*. Since the pilot program focused on fleet vehicles (such as buses or taxis), charging infrastructure for private cars has not been fully developed technically and systematically.
- *Commercial models*. It is essential to build a commercially viable business model that bears the cost of charging infrastructure, because the industry cannot indefinitely rely on government funding.
- *Customer acceptance*. The significant up-front vehicle cost still deters customers, even as the lifetime ownership costs gradually become more favorable for EVs. While leasing could help address this issue, a secondary market for batteries in addition to a vehicle finance market would have to be established.

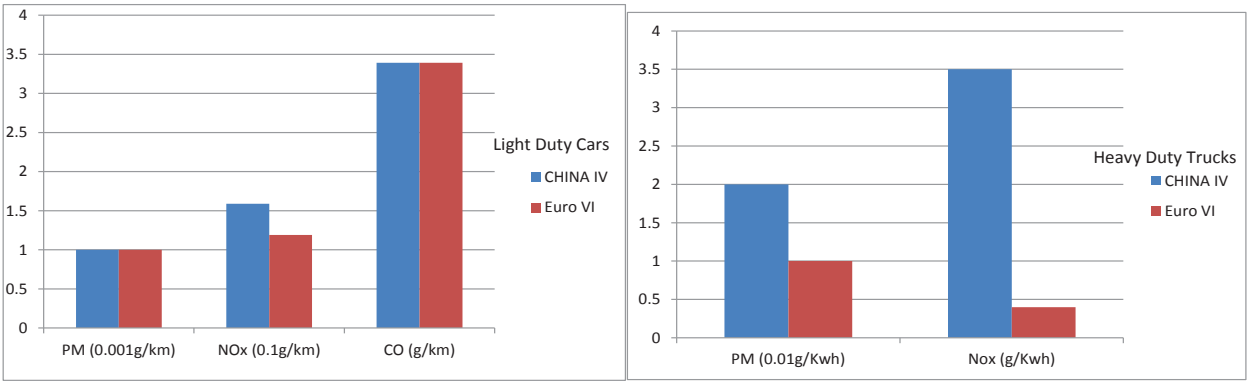
Source: Cackette 2013.

fiscal policies. Tax incentives to refiners provided in the form of accelerated depreciation, deductions in corporate taxes, and direct government subsidies have accelerated the transition to ultra-low-sulfur fuel in Japan. In the United States, small refiners were given a tax incentive of RMB 0.08 a liter to produce ultra-low-sulfur fuel.

The transition to low- and ultra-low-sulfur fuels needs to be accompanied by strong standards, coherent administration, and effective enforcement. Currently in China, authority for vehicle emission control is scattered across multiple agencies, with MEP setting vehicle emission standards, the Ministry of Industry and Information Technology registering new types of vehicles, and the National Petroleum Products and Lubricants Standardization Committee (called TC280) setting fuel standards. Oil industry representatives and experts close to the industry dominate TC280 and its subcommittee (Fung and others 2010). MEP also lacks capacity for both fundamental research and testing capability. It currently has far less expertise and technical capability than the oil industry, particularly in evaluating the emission implications of various fuel compositions, which is essential for recommending standards. In addition, MEP has limited access to data on refinery capacity and has to rely on the industry's analysis of the cost and technical implications when considering adopting more stringent standards.

Transition to stricter vehicle emission standards especially for heavy-duty vehicles. Reducing emissions from new cars is important, because once on the road vehicles are usually not replaced for more than a decade. For China, the difference between current standards (China

FIGURE 7.21 Expected pollution reduction from raising current emission standards to Euro 6/VI standard



Source: Team calculations based on data from TransportPolicy.net, EU: Heavy-duty: Emissions, http:// transportpolicy.net/index.php?title=EU:_Heavy-duty:_Emissions (accessed December 2013).

IV) and Europe's current Euro VI standards will be relatively modest for light-duty vehicles. The difference is much larger for heavy-duty diesel-fueled vehicles, where NO_x emissions are 80 percent lower and $PM_{2.5}$ 50 percent lower under Euro VI compared with China IV standards (figure 7.21). One reason for high truck emissions is that there are fewer joint ventures in truck manufacturing compared with the car industry where there is greater access to cleaner technology and domestic innovation are more widespread.

The cost of adopting new emission standards evolves over time. The standards specify the emissions rather than the technologies to be applied. Accordingly, new emission control technologies emerge continuously and their cost drops as market penetration increases. For gasoline light-duty vehicles, the cost increase is low—on the order of $45—to move from Euro III to VI. For diesel vehicles, the cost is substantially higher—$1,200 for light-duty, and $5,000–$8,000 for heavy-duty (ICCT 2012a). For the often very small trucking companies in China, these are substantive outlays, but the accelerated adoption of new standards is still justified by the large anticipated health benefits. For such regulations to be effective, they need to be supported by credible enforcement. Otherwise fake certificates and counterfeited or mislabeled fuel will inevitably appear. Enforcement requires resources and sufficient authority to apply fines, as in the case under the Texas Regional Emissions Enforcement Program.[25]

Achieving significant emission reductions in the urban road transport sector also requires addressing the administrative organization for enforcing vehicle emissions standards. The current Air Pollution Prevention and Control Law provides an incomplete framework to manage emissions from vehicles. It does not explicitly confer to any ministry the authority to recall vehicles that do not meet emission standards. While it allows provincial and municipal level EPBs to randomly select vehicles for in-use testing (like conducting road-side tests), it does not explicitly grant MEP such authority. Lacking clear authority to conduct in-use testing, to assess a penalty on manufacturers producing nonconforming vehicles, or to require manufacturers to recall noncompliant vehicles, MEP has weak enforcement power and limited means to deter production of sub-standard vehicles.

Rapidly phase out high-emission vehicles. With China's rising motorization rate, the number of new vehicles entering its roadways each year far exceeds the number of old vehicles being scrapped. To lower the average emissions of the entire fleet, the phase-out of the most polluting

[25] North Central Texas Council of Governments, "Regional Emissions Enforcement Program," http://www.nctcog.org/trans/air/hevp/reeptx.asp (accessed December 2013).

cars and trucks from urban areas should be accelerated. Governments in other countries have used two main measures to achieve this goal: penalizing high-emission vehicles, and providing incentives for early scrapping. Annual vehicle registration fees based on a vehicle emission levels provide the most straightforward way to charge for the damages caused. Seventeen European countries have also extended this concept to address climate change concerns and base all or part of their registration fees on vehicle CO_2 emissions.[26] Individual cities, such as Milan, have also begun to penalize high emission vehicles by either charging them to enter the central and more congested areas or prohibiting them altogether. Providing a subsidy for owners to scrap high-emission vehicles can also be an effective way of accelerating fleet turnover. Several countries introduced time-limited scrapping programs in recent years, although often primarily as a way to stimulate the economy during recession.[27] The environmental benefits of scrapping programs need to be carefully evaluated because running a higher-emission vehicle for a few additional years may have less impact than the emissions from producing a new car, especially when the emission requirements for the new car are not strict (Gayer and Parker 2013). Environmental objectives may sometimes be better reached through taxes on high-emission vehicles (Li and Wei 2013).

Meeting urban energy needs by prioritizing efficiency and greening supply

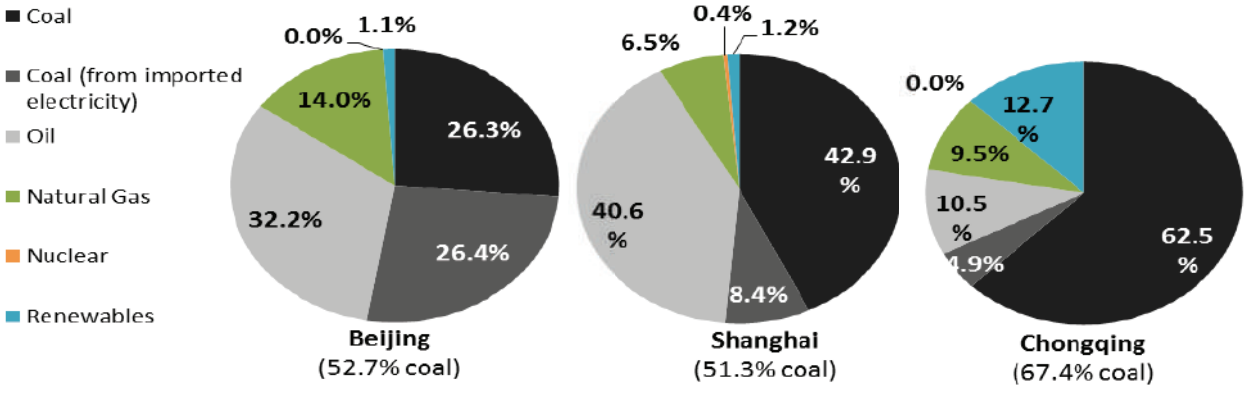
China has made enormous strides to improve the energy efficiency of its economy and mitigate some of the environmental impacts of burning fossil fuels in urban areas. Reductions in energy intensity reductions during the 11th Five-Year Plan averted the use of 630 million tons of coal equivalent, or 1.46 billion tons of CO_2 emissions. Uncontrolled emissions of SO_x, NO_x, and PM_{10} are in decline overall. Yet, the scale and complexity of the challenge remains daunting. Coal still hovers at around 70 percent of primary energy consumption, a similar percentage as in 1980, and severe air pollution persists in many cities despite ever stricter standards. As China's urban economy grows more efficient and sophisticated, continuing with the same approach to energy policy will not yield the visible, stepwise improvements in environmental quality that China's urban dwellers will increasingly demand.

With efforts in three main areas, China's cities can accelerate their progress in lightening the environmental footprint of their energy use. First, energy planning should be coordinated with the planning process for cities. City planners should work with energy planners to take a systematic approach in evaluating ways to optimize energy consumption by reducing demand across the main end-using sectors and greening the supply mix to meet the residual energy demand. Second, broad-based energy efficiency efforts should be accelerated in the main end-using sectors through a better balance of regulations and market-based policy tools. Third, after measures are taken to reduce energy demand, direct use of coal in cities should be eliminated as much as possible by expanding access to natural gas, removing barriers to commercial renewable energy, and continually strengthening emissions controls of remaining coal-fired power plants and industry. Across all three policy areas, encouraging compact urban forms will be fundamental.

The rapid, sustained growth of energy demand presents a unique environmental challenge for China's cities. Few modern cities in the world depend on solid fuels to the extent that Chinese cities do. In London, for example, household coal use was banned in the 1950s in response to serious air pollution. By contrast, 43 percent of Shanghai's primary energy supply

[26] European Automobile Manufacturers' Association, "ACEA Tax Guide 2012—More Governments Introduce Incentives," 2012, http://www.acea.be/news/news_detail/tax_guide_2012_incentives_increase_further/ (accessed December 2013).
[27] Hunts Point Clean Trucks Program, "Frequently Asked Questions," http://www.huntspointctp.com/faq.html#overview (accessed December 2013).

FIGURE 7.22 Primary energy supply in Beijing, Shanghai, and Chongqing municipalities, 2011

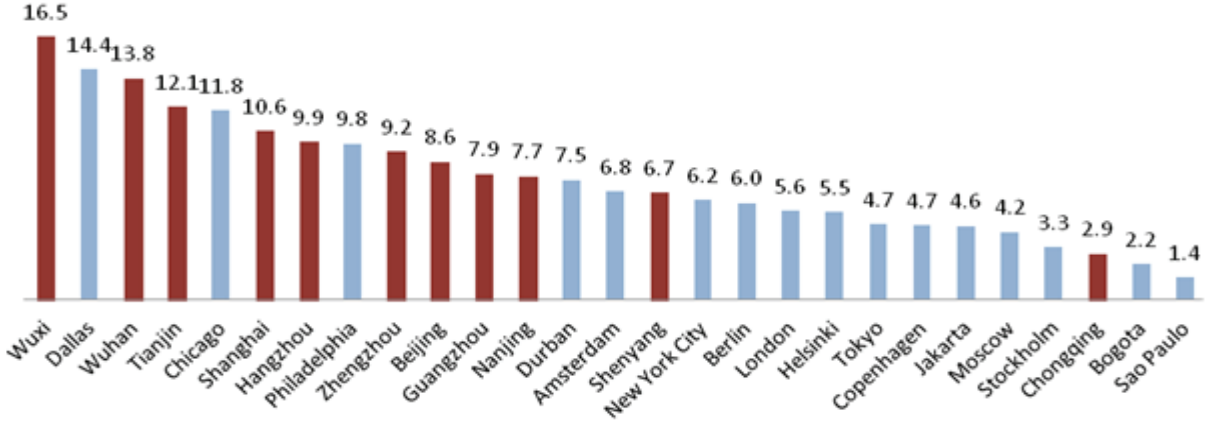


Source: Authors' estimates based on data from NBS 2012c; China Electric Power Yearbook Committee 2011; and State Grid Corporation of China 2011.

still comes from burning coal inside the city's borders (8 percent more is from coal-fired power "imported" into the city) (figure 7.22). Nor is the predominance of coal limited to China's big cities. For example, it makes up 65 percent of the primary energy supply in Zibo City, Shandong. In China's 15 cold climate provinces, where provision of heating is a legal requirement, coal represents over 90 percent of the fuel burned for district heating. Although a greater share of coal is being used in larger, more efficient power (and heating) units that are subject to stricter emissions standards—and pollution controls in all sectors have improved—the absolute increase in coal use in cities, driven by demand, is the number-one reason for poor local air quality and CO_2 emissions. Intensive coal use has resulted in per capita CO_2 emissions in large Chinese cities that are already higher than in many other cities around the world (figure 7.23).

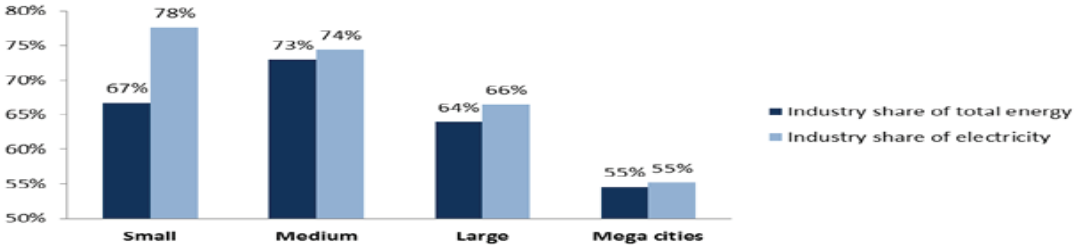
Industry uses the lion's share of energy in urban areas, representing an estimated 70 percent of total energy demand and 69 percent of electricity use in 2010 (figure 7.24). Heavy industries have been responsible for most of the historic growth in urban energy demand (Hong and others 2011; Ma and others 2012). Because these industries rely mainly on coal, they have also deepened the carbon footprint of Chinese cities. In 11 big cities studied by Wang and others (2012), 75 percent of total greenhouse gas emissions came from industrial fossil-fuel use

FIGURE 7.23 Per capita CO_2 emissions for 11 large Chinese cities and selected cities around the world



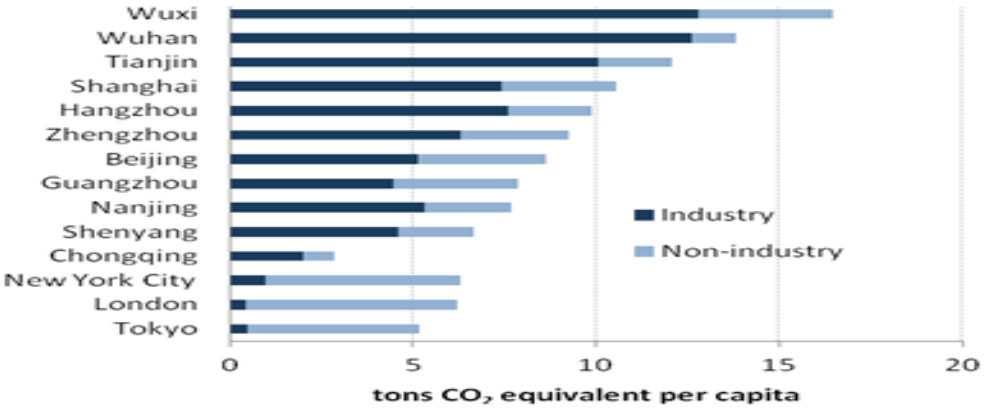
Source: Chinese cities: Wang and others 2012; other cities: Carbon Disclosure Project 2012.
Note: Per capita emissions for Chinese cities and C40 cities reporting Scope I and II emissions using similar methodologies.

FIGURE 7.24 Industrial energy use as a share of total energy demand in cities, 2010



Source: World Bank calculations using data from Renmin University, 3E database; NBS 2011a; NBS 2011b.
Note: Electricity use is for downtown areas (main city districts) of the 287 municipalities at administrative prefecture level or above; total energy use is for the entire municipality; where 2010 data unavailable, 2009 data are used instead.

FIGURE 7.25 Industrial and nonindustrial CO_2 emissions per capita in selected Chinese and other cities



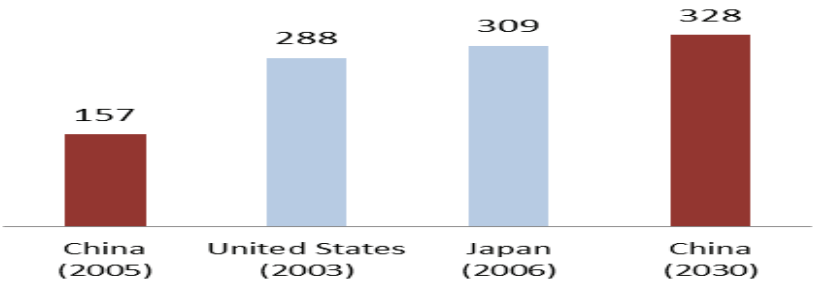
Source: China: Wang and others 2012; New York City: Dickinson and others 2012; London: Mayor of London 2007; Tokyo: Tokyo Metropolitan Government.
Note: Consumption-based accounting of greenhouse gas emissions, including emissions from direct energy use and from the power sector allocated to end-use sectors. Chinese data are for 2005, New York City data for 2011, London data for 2006, and Tokyo data for 2007.

(figure 7.25). By comparison, industrial emissions represent only 10 percent of total emissions for Tokyo (2007), 16 percent for New York City (2011), and 7 percent for London (2006).

Although industry will continue to account for the majority of energy demand in urban areas, energy for heating, cooling, lighting, and equipment in buildings is projected to be one of the fastest-growing segments of demand (Fridley and others 2012). In China's cities, energy use per square meter of floor space in buildings is still only a small fraction of that used in buildings in high-income countries (figure 7.26). Drivers of energy demand vary between residential and commercial buildings. Based on Fridley and others (2012) and Levine and others (2012), much of the energy used in urban residential buildings will continue to be for space heating and cooling, but by 2020, appliances will account for a larger share of demand. Increased energy requirements for commercial buildings will come mostly from lighting, plug-in equipment, and central space conditioning.

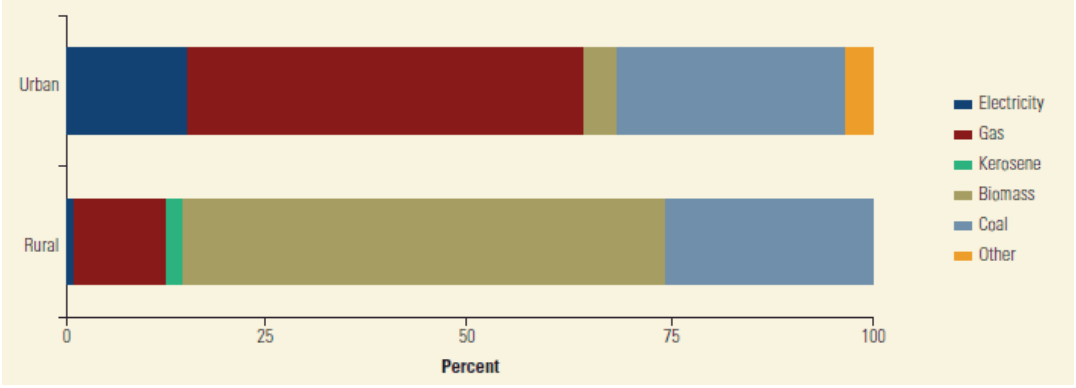
An estimated quarter of urban households in China rely on coal for their cooking and heating needs, representing an important and at times overlooked source of local exposure to harmful air pollution, most notably very fine particulates ($PM_{2.5}$) (figure 7.27). Coal-burning stoves and boilers typically have short stacks and no filtering systems. They are often used in peri-urban areas, where clusters of modern residences are intermixed with more rudimentary housing. Household coal use is most prevalent in—although not limited to—the poorer provinces, especially in the north (World Bank 2013a).

FIGURE 7.26 Energy use in commercial buildings in China, the United States, and Japan



Source: Fridley and others 2012; Levine and others 2012.
Note: Kilowatt hours per square meter of floor space.

FIGURE 7.27 Primary household cooking energy in urban and rural areas, 2006



Source: World Bank 2013a.

Planning for greener urban energy systems

Leading cities around the world are starting to take a more systematic look at how they can reduce the environmental footprint of their energy use by making energy supply and demand a more integral part of their city plans. Planning for greener urban energy systems is largely about finding synergies between different energy users in urban areas that can achieve environmental objectives through the most resource efficient and cost-effective path. Improving energy efficiency across the different end-using sectors is a top priority, followed by identifying local sources of green energy, "importing" cleaner sources of energy from outside city borders, and mitigating the residual environmental impacts from energy use. This approach to planning will require dedicated leadership to establish effective coordination across different departments and jurisdictions according to specific local circumstances. China is developing an ever-increasing range of targets for "eco-cities" and "low-carbon cities." If China's ambition is to bend its environmental Kuznet's curve more quickly, then it can encourage cities to do the same, especially the more capable ones. As China considers a mix of incentives and regulations to make cities greener, "green" cities could be recognized, like "top runners" in industrial energy efficiency, as those that not only meet their targets but exceed them.

While ensuring safe and reliable energy supply, some cities have recently taken a broader view of how they can control their own emissions and environmental footprint by looking at both energy demand and characteristics of the energy mix to see what they can do to green

BOX 7.9 "Energy Efficiency Utility": Efficiency Vermont, USA

Efficiency Vermont was the first "energy efficiency utility" in the United States and provides a good example of how local governments can structure a results-focused model using a third-party entity to package and deliver energy savings. Efficiency Vermont is a nonprofit corporation created to provide incentives and support to consumers for energy-efficiency programs. The corporation is run by a public board that oversees all power utilities; its members are appointed by the Vermont state governor and are subject to legislative confirmation. It is funded through surcharges on consumers' electricity utility bills. Some of these funds are used to provide technical assistance for auditing, project development, energy management, and employee training, as well as financial incentives to support companies investing in energy efficiency projects. Financial compensation levels for Efficiency Vermont are contingent on the corporation meeting specified targets for energy savings delivered and other performance indicators. The better the corporation performs, the more compensation it receives (up to a ceiling set by the state government). Energy savings are independently monitored and verified to ensure actual savings are achieved. Targets and funding may be reviewed and adjusted every three years, as part of a longer 20-year plan.

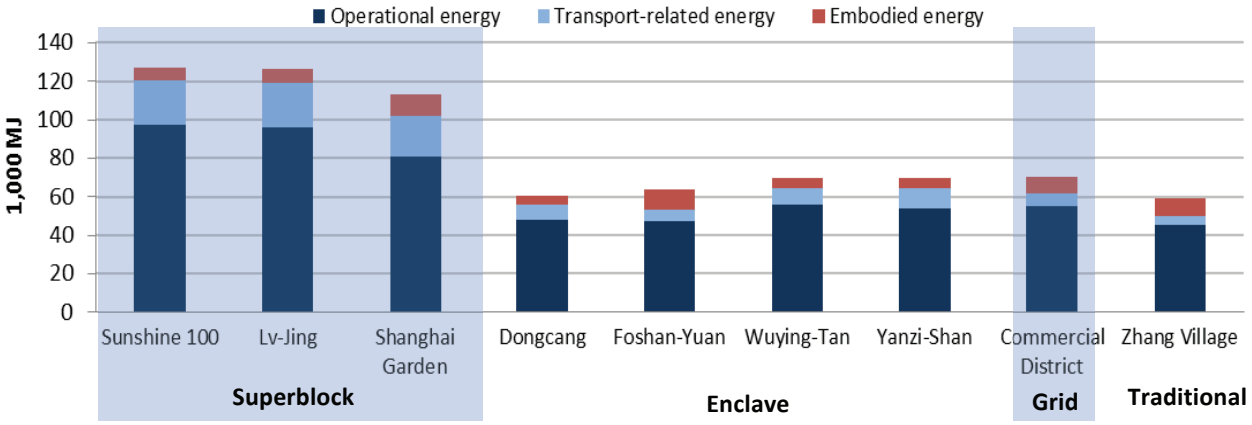
Efficiency Vermont has been highly successful in meeting and exceeding its goals. In 2011, initiatives financed and supported by Efficiency Vermont reduced the state's electricity needs by about 2 percent, at a cost of 4.3 cents (about RMB 0.28) a kilowatt hour—far cheaper than the 12.1 cents it would cost to supply a kilowatt hour of electricity. Because it had a good track record, it now participates in generation planning by offering predictable load reduction through its ability to package energy efficiency improvements.

Source: IIP 2012; Taylor, Trombley, and Reinaud 2012.

their overall urban energy systems. Traditional sector plans will continue to be needed—new approaches will always depend on strong and well-managed sectors, but they often neglect looking across sectors. Nearly all urban infrastructure systems depend on energy to function—water supply, wastewater treatment, solid waste management, and, of course, electricity, heating, and cooling. Until recently, city managers have tended to overlook the links between energy end-users, and the ever-growing possibility for end-users to capture and use waste energy and generate distributed energy. At the strategic level, a city should encourage coordinated and reoriented planning for meeting specific emission and environmental goals; this planning would systematically look first to reduce energy consumption as much as possible, then at supply options (prioritizing clean energy resources), and then to managing residual emissions from the remaining use of fossil fuels. As this coordination matures, planning methods integrating various energy sources can be introduced, including energy efficiency (box 7.9). As China's power sector planning process evolves, energy efficiency should be considered as a resource that is compared with conventional generation to develop a least-cost plan for meeting demand (RAP 2013). The national plan would need coordination with and support from provincial and national energy planning processes.

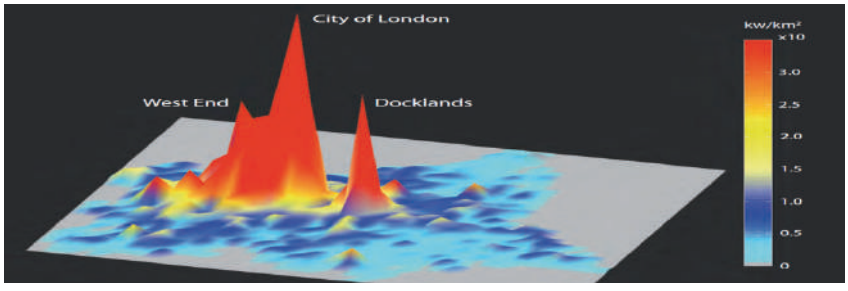
Urban planners should pay much closer attention to neighborhood-scale planning, especially for existing cities. Neighborhoods are fundamental building blocks of cities and can be a useful unit of analysis for understanding city energy patterns and issues. For instance the energy performance of a neighborhood comes from complex interactions of several factors, including construction and (eventual) demolition of buildings, which embody energy over their life cycle; operation of the buildings for heating, cooling, lighting, and the like; travel needs of residents and users of the neighborhood; and the ability of the neighborhood to produce on-site clean energy, offsetting the need to import it from outside its boundary. A joint MIT, University of Shandong, and Normal University of Beijing study compared 27 different neighborhoods in Jinan city, taking into account embedded, operational, and transportation-related energy

FIGURE 7.28 Energy consumption by neighborhood



Source: MIT-Tsinghua-EF 2011.

FIGURE 7.29 Mapping London's electricity demand



Source: UK Power Networks in City of London 2011.

consumption (MIT-Tsinghua-EF 2011). The study showed significant differences among different neighborhood forms and demonstrated that high-rise superblock forms consume up to twice as much energy as other neighborhoods (figure 7.28). Analyses at the neighborhood level such as these could start to identify locational priorities within cities, for instance. Apart from energy, the US Green Building Council has in the past few years initiated a neighborhood development sustainability rating system with a large number of indicators that aim to define and measure what it means to have a green neighborhood.[28]

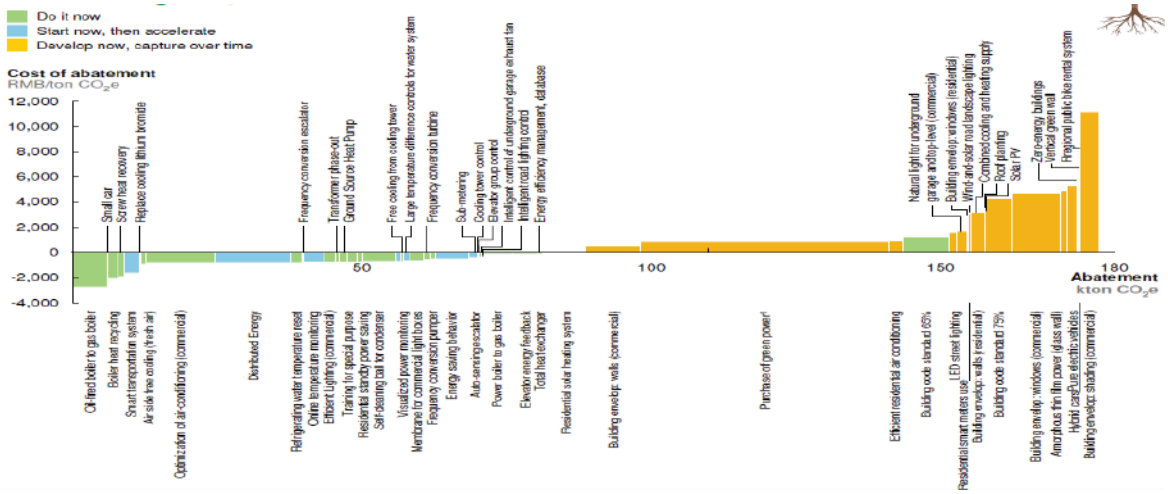
Systematic approaches to optimizing urban energy systems to meet specific environmental objectives requires rigorous data collection and synthesis. Dense, mixed-use neighborhoods, for example, offer opportunities for emerging approaches such as waste heat recycling (storing excess heat from a factory or office building for use in a nearby apartment complex, for example) and, in larger, dense areas, economies of scale for district heating. Yet, densely populated areas can constrain use of local renewable resources because energy needs may significantly exceed the locally available renewable energy (Grubler and Fisk 2013). Mapping where peak energy demand loads and potential local resources are located can help city managers and sector planners in identifying the best-suited energy supplies and uses of land for different neighborhoods or districts (figure 7.29). A number of analytic tools exist that can assist local

[28] US Green Building Council, "LEED for Neighborhood Development," http://www.usgbc.org/neighborhoods.

BOX 7.10 Tools for low-carbon development planning: The experience of Changning District in Shanghai

Shanghai City's Changning District has set out a vision to become a leader in low-carbon urban development. To advance its vision, the district teamed up with the Shanghai Energy Conservation Supervision Center, the World Bank, and McKinsey & Co. in 2010 to develop a marginal CO_2 abatement cost (MAC) curve for the Hongqiao area, an economic hub in the center of the district (figure B7.10.1). The MAC curve study will help the district set medium-term targets and policies for reducing CO_2 emissions by allowing city leaders to evaluate the abatement potential of a menu of technologies, weigh the cost and difficulty of deploying these technologies, and identify priority investments. The results show that Changning District can meet its target of reducing the carbon intensity of its economy by 17 percent between 2010 and 2015 by investing RMB 500 million in a basket of easy-to-implement, least-cost technologies.

FIGURE B7.10.1 Marginal abatement cost curve for Hongqiao area of Changning District, Shanghai



The MAC curve is a powerful tool to visualize abatement potentials and costs in setting CO_2 reductions for local city governments, but it does require a great deal of detailed information on energy use, technologies, and costs. It may be most appropriate for larger, relatively sophisticated cities where data are readily available. By focusing squarely on the technology options, other options such as land use planning and behavioral changes are separately considered.

Source: World Bank ESMAP 2013.

city governments in applying energy and emissions reduction planning principles and setting priorities (annex 7.2). Using these tools is still a stretch for many Chinese cities but could be introduced in a number of pilot studies. For instance, Shanghai (Changning District) and Qingdao have used marginal abatement cost curve tools to establish a cost-effective path to realizing their carbon emissions reduction targets (box 7.10).

Measures for controlling pollution that cannot be avoided by reducing energy demand or changing the energy supply mix are also essential. Understanding the residual environmental footprint of energy use will clarify outcomes of the choices made for efficiency and supply. It can help to compare the costs of greater efficiency or greener supplies with the costs of end-of-pipe pollution controls. Furthermore, actions to abate local pollution may have trade-offs that affect local supplies of recycled waste energy, such as closing or relocating industry, which are a viable source of jobs and income. Land markets often play a major role in this process. As cities

BOX 7.11 New York PlaNYC 2030 case study: Integrated centralized planning relying on decentralized delivery

New York City, America's largest municipality, embarked on a long-term planning process called PlaNYC 2030 to devise wide-ranging strategies for reducing materials and energy use, improving natural spaces, planning for and mitigating the effects of climate change, and creating a more equitable and engaged society. Strategies were designed and are being executed by a joint task force, led by a specially designated mayoral office and comprising 25 city departments and stakeholders from state and federal agencies, businesses, and nonprofit groups. To strengthen local ownership of the plan, the task force has engaged in media outreach efforts and offered incentives and support to encourage active participation by local business owners and residents, including grant programs and changes in zoning codes intended to create new development opportunities (ICLEI USA and City of New York 2010). The plan is now in its fourth year of implementation.

The energy and emissions strategy for PlaNYC is focused on achieving a goal of reducing city-wide greenhouse gas emissions by 30 percent in 2030 compared with 2005. Because buildings account for 75 percent of the city's total carbon emissions, PlaNYC has kick-started a number ambitious programs and policies to improve energy efficiency in the city's building stock. This buildings effort has two major elements: the promulgation of new laws (together called the Green, Greater Buildings Plan), and the formation of the 200-person Green Codes Task Force to recommend code and other reforms to reduce a number of environmental impacts of buildings (that is, not just energy use). The green plan requires regular energy audits, retro-commissioning, and data sharing for large public and private buildings; lighting upgrades; and submetering of government buildings and commercial tenant spaces. These measures will cover more than half of the space in 16,000 buildings in the city. To ensure compliance, procedural incentives exempt from retro-commissioning and audits buildings that adopt measures early or comply with Leadership in Energy & Environmental Design (LEED) standards for existing buildings, a revolving retrofit loan fund has been created with federal stimulus funds, and the city is forming a large energy service company.

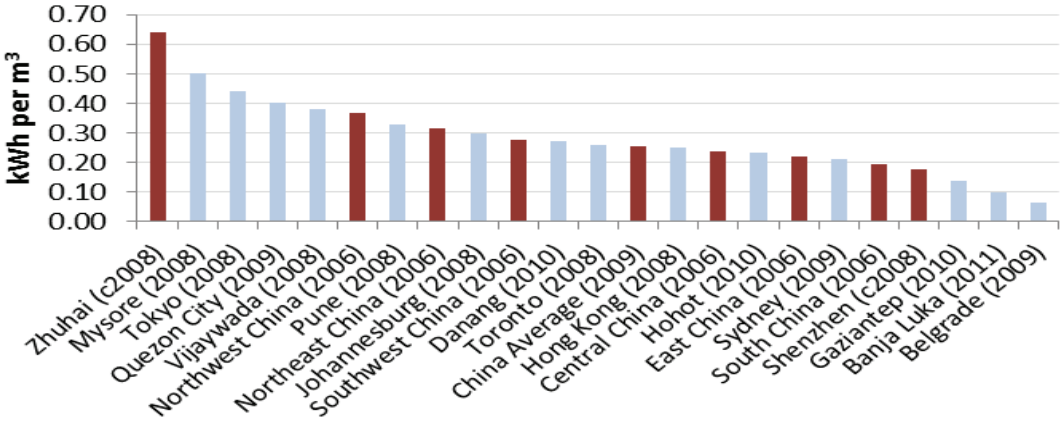
Source: Adapted from Zhou and Williams 2013.

become richer, land values in inner city areas rise, forcing low-value land uses such as heavy industry out of the city. Additionally, emission standards, if enforced, can play a supplemental role in relocating polluting enterprises. While the use of industrial waste heat for district heating may be an attractive option, for instance, it cannot be evaluated without taking these issues into account.

It is especially important to study how cities organized their many departments to work in an integrated and systematic manner. Because this systematic approach cuts across sectors, it does not have a natural constituency or agency that would "plan" urban energy systems. City mayors have been at the forefront of many global initiatives on climate change, and their leadership has been instrumental for green initiatives in their cities. Cities such as New York (box 7.11), Paris, Rotterdam, and Stockholm that have undertaken systematic planning for low-carbon and green development, which is principally looking at urban energy systems, have all used different tools and institutional arrangements to meet their specific needs. Based on local conditions, establishing formal institutional arrangements for this systematic approach to energy planning, optimization, and efficiency in Chinese cities would help meet energy consumption and pollution reduction goals.

Even if advanced tools and methods for energy planning are still out of reach for many cities, focusing on efficiency improvements in individual urban sectors can bring substantial benefits. Investments in energy efficiency can significantly lower the operating expenses of municipal service providers. Some measures can be done quickly, without waiting for new institutional mechanisms or plans. For example, cities can introduce requirements for the use of energy-

FIGURE 7.30 Energy use per unit of water treated by municipal water utilities, various years



Source: International city data from World Bank ESMAP TRACE database; China data from Wang and others 2012; Liu and Jiang 2012; Yang and others 2008; and Zhao and others 2010.
Note: Chinese city data includes electricity use only, which typically represents 60–90 percent of total energy use by wastewater treatment plants in China (Liu and Jiang 2012); international city data includes total energy use, in kilowatt hour equivalents.

efficient pumps or efficient street lighting that meet minimum energy performance standards and can be implemented through municipal investment approval processes or other oversight functions. Spending on electricity represents about 18 percent of the costs of supplying and treating water in medium to large cities in China—slightly better than the average for municipal water utilities in other upper-middle-income countries (19 percent) but still higher than the average for utilities in the upper-income countries (15 percent).[29] There are significant disparities between urban water utilities in China and room for improvement among lower performers to reach best-practice levels. If wastewater treatment facilities in all Chinese cities could operate as efficiently as they do in Shenzhen (figure 7.30), annual electricity use could be reduced by about 3.1 terawatt hours (TWh), translating into cost savings around RMB 2.4 billion.[30]

Reorienting approaches to optimizing urban energy systems involves not only local but also regional and national stakeholders. Cities will need to work actively with energy supply companies, and perhaps with neighboring municipalities, to promote greater supply of cleaner energy. This work is important not only because cities host the major energy consumers in China and can therefore influence supply, but because ambient air pollution trends in China show that cities are heavily affected by energy consumption in surrounding provinces. Policies influencing clean energy supplied from outside city boundaries also clearly need national leadership and support: green urbanization is a shared responsibility between national and local stakeholders.

The following sections of this chapter follow the principles of the approach above by first exploring options for improving energy efficiency in key energy using sectors of the urban

[29] Averages based on reported performance statistics for 269 utilities in the International Benchmarking Network for Water and Sanitation Utilities (IB-NET) database, http://www.ib-net.org/en/ (accessed 9 August 2013).

[30] China's cities treat an average of 108 million cubic meters of wastewater a day, as estimated according to the total volume of municipal wastewater that MOHURD reported being treated during the first quarter of 2012 (MOHURD 2012). Average electricity consumption per cubic meter of wastewater treated is 0.254 kilowatt hours, based on a survey of more than 1,800 facilities conducted in 2009 (Liu and Jiang 2012). Assuming an average electricity price of RMB 0.78 per kWh (the average for industrial users in 36 medium and large sized cities in 2012 as reported by the NDRC's Pricing Bureau). Cost savings are a gross, order-of-magnitude estimate intended to illustrate potential, not necessarily actual, room for improvement. Savings do not account for annualized costs of investments required to improve efficiency or for variations in climate, city, or plant characteristics that influence energy use per unit of wastewater treated.

economy and then identifying priority actions that can be taken to support shifts in the energy structure of cities.

Rebalancing markets and mandates to reduce energy use in industry[31]

While China has built a comprehensive system of regulations, policies, and institutions to improve energy efficiency in industries—and this system has achieved large reductions in energy intensity —the ability of the system to continue to deliver energy savings will depend on how well it can match the growing sophistication and diversity of the enterprises in it. The current approach has relied heavily on administrative targets and regulations. The system can be strengthened by rebalancing administrative measures with more market-based approaches to motivate enterprises to plan, manage, and implement energy efficiency measures as a part of their own business self-interest.

Two broad areas where the national government and cities can focus their efforts are rebalancing the current mix of incentives toward the increased use of market-based tools, backed by ambitious regulations and targets; and enabling companies, through supporting policies, to improve access to suitable technical and financial services for energy efficiency. Provinces and local city governments play an instrumental role in industrial energy efficiency policy. They are on the front lines of implementing policies and have the most direct contact with enterprises. They are often the pioneers of new policies, which are piloted locally and later scaled up.

The dominance of industry—its contribution to GDP, jobs, energy demand, and emissions—is a distinguishing feature of Chinese cities. In 2010, the secondary sector (composed of industry and construction) produced 49 percent of economic output and 48 percent of jobs in China's urban areas.[32] Even with a structural shift toward services, industry is expected to remain a mainstay of China's urban economy for decades to come.[33] It will also likely continue to be the largest end user of energy (Fridley and others 2012; Zhou and others 2011) and a major contributor to local air pollution. Reining in industrial energy consumption is crucial to the resource security and environment of Chinese cities.

Reducing energy needs will also be a key element in the competitiveness of industry. In some sectors such as cement, China's leading firms are nearing or have already reached best-practice levels for energy efficiency, but behind these leaders is a long tail of much more inefficient plants. Projected lower rates of growth in fixed assets and demand for industrial commodities over the next 10–20 years will start to unmask these inefficiencies, putting greater pressure on inefficient firms in energy-intensive subsectors such as iron and steel, cement, and aluminum (Fridley and others 2012; Zhou and others 2011). Firms will have fewer opportunities to grow out of their inefficiencies by increasing production capacity. The ability to capture cost savings from energy efficiency can contribute to competitive advantages.

China's 11th Five-Year Plan produced solid results of a reported 19.1 percent reduction in energy intensity (NDRC 2011), but perhaps more importantly, it laid the foundation of policies and programs for long-term energy savings: a legal and regulatory system with energy

[31] This section draws from Taylor, Sall, and Draugelis 2013.

[32] The "secondary sector" corresponds to ISIC divisions 10-45 in the International Standard Industrial Classification system (ISIC Revision 3) and is comprised of mining; manufacturing; construction; and electricity, water, and gas utilities. GDP is reported on a value-added basis. Urban industrial GDP and employment numbers reported here are for the 287 municipalities at the prefecture level. An "urban area" is the downtown area directly under the jurisdiction of the municipality and excludes outlying areas within the administrative boundaries of the municipality (NBS 2011b). The share of industry in GDP for urban areas in 2010 was slightly higher than the national average, which was 47 percent NBS 2011a, 2011b).

[33] Total industrial energy demand is projected to rise from around 1,500 million tons of coal equivalent (Mtce) in 2010 to around 2,500 Mtce in 2030, with industry continuing to be the largest end-user of energy in China's economy (Fridley and others 2012; see also Zhou and others 2011).

conservation offices or groups and supervisory offices set up at provincial and most prefecture levels of government. Cities acquired considerable experience with the design and implementation of major programs. When planning low-carbon and energy-efficient programs, cities can tap these lessons and help to introduce improvements and innovations. China's 12th Five-Year Plan expanded and improved the programs, and, while there are serious efforts to introduce more market-based tools and mechanisms, delivery largely continues to depend on this, still relatively new, administrative system.

While this system and its suite of evolving policies and programs will serve China well into the future, many policy makers and energy efficiency experts are asking whether enterprises and local city governments are fully seizing energy efficiency opportunities under the current mix of regulations, incentives, and financing options. Both enterprises and local city governments face challenges. Enterprises are offered little flexibility in meeting government-mandated targets for energy savings, which may be poorly matched to actual company potentials—leading to a passive mentality and little effort beyond meeting minimum requirements. A lack of high-quality energy audits and accurate benchmarking has limited the ability of enterprises to identify realistic or cost-effective efficiency improvements (see Yang 2010, for example). Flexibility in meeting targets has been limited by the hard timetable set for enterprises to achieve a certain level of savings each year during the 12th Five-Year Plan. While hard and binding targets do spur action, there are limitations if compliance is too prescriptive. Tight political timetables may conflict with longer-term business planning by enterprises and narrow the scale of energy efficiency investments. Local city governments, meanwhile, often lack the technical expertise and experience required for monitoring and reviewing energy use by industries and may not be able to effectively shoulder the burden of enforcing policies and targets.

A more balanced mix of incentives and supporting measures for industrial energy efficiency can help relieve constraints on enterprises and local city governments in pursuing energy efficiency improvements. With the right combination of incentives and supporting programs, enterprises may become more proactive, lightening the administrative burden on local city governments of meeting policy objectives. Local city governments meanwhile can play an important but more indirect role in helping enterprises do better by facilitating access to technical and financial services, monitoring the process, and supervising results.

Rebalancing administrative measures with greater use of market-based incentives

The government-enterprise agreements that set mandatory energy savings targets for enterprises and establish the mutual responsibility of the government and enterprises in fulfilling these targets, are a cornerstone of China's industrial energy efficiency policies and should continue. An extensive institutional infrastructure has been built up at all levels of government to implement the agreements, with the provinces playing a lead organizing role and local city governments assuming responsibility for day-to-day supervision.[34] The agreements delivered huge energy savings in the 11th Five-Year Plan, and savings targets have been ramped up for the 12th Five-Year Plan. Nearly 17,000 enterprises are now covered by agreements under national and local programs, representing as much as 60 percent of China's total energy use. Still, these programs need to be strengthened to ensure that they continue to deliver results in the 13th Five-Year Plan and beyond. Key issues are maintaining the coverage, ambitiousness, and motivational power of the agreements while also introducing greater flexibility for enterprises in meeting their targets.

At the national level, the government should continue to set ambitious targets for limiting energy use. In principle, useful targets for limiting energy use could be denominated in total

[34] From an administrative point of view, China has many different kinds of cities. The role of cities in the system of policies for industrial energy efficiency varies with their administrative rank. For the sake of discussion, the term "local city governments" is used in this section to refer mainly to cities at the prefecture level.

BOX 7.12 Maintaining coverage of energy efficiency obligations under the current system with the introduction of a new system of carbon emissions trading

In linking a nationwide carbon emission trading system (ETS) with the current system of energy savings agreements, two of the key design questions for policy makers will be what facilities will be covered by the two systems and whether a cap will be imposed on Scope 1 (direct greenhouse gas emissions) or Scope 2 (broadly, indirect greenhouse gas emissions from the consumption of electricity, heat, or steam) emissions. Energy savings agreement obligations under the 12th Five-Year Plan cover around 17,000 industrial enterprises, which together account for about 85 percent of industrial energy use or 60 percent of China's total energy use (NDRC 2012). If, hypothetically, the energy savings agreements were replaced with a carbon ETS for which allowances are issued based on Scope I emissions, as is the case in the European Union, direct coverage of industrial energy use would be reduced by about 25 percent. The remaining obligations would be shifted to electricity generators.

The effect on industrial energy efficiency would depend on several factors, including the stringency of the carbon cap, allowance prices, and the ability of power suppliers to pass on costs to consumers in the form of higher prices. If power utilities are not able to raise the price of electricity, caps are not tight enough, and carbon allowance prices are too low, then the incentives for industry to save energy could be severely weakened. Tightening the cap and allowing power utilities to raise tariffs would not necessarily solve the problem of incentives. Absent other reforms, the revenues of power generators and grid utilities would continue to be linked with sales of electricity and investments in expanding capacity. Thus, while power utilities would have an incentive to supply cleaner electricity—and to charge more for that electricity—they would have little motive to reduce demand by industry. Also, despite facing higher energy prices, industries may not invest in energy efficiency without other incentives and enabling policies. Should the accounting method change and include Scope 2 emissions, however, then the coverage could remain largely the same and incentives in place for industry to reduce energy demand.

Source: Robert Taylor.

energy, coal, or carbon. While each kind of target has pros and cons associated with it, the key issue will be to ensure that these targets are coordinated in order to avoid policy dilution or loss of regulatory coverage. Box 7.12 illustrates how obligations to reduce energy intensity might interact with a cap on carbon emissions under an emissions trading system. Both kinds of obligations, in addition to renewable energy targets, can and do co-exist in the United Kingdom and other European countries, but interactions between overlapping targets must be assessed carefully. New targets to limit carbon emissions and energy use should build on the current energy-savings agreement platform as much as possible to ease the burden of compliance for both industry and local city governments.

While maintaining coverage and ambitiousness of targets, the national government can give enterprises more flexibility in meeting targets for energy use by allowing for trade, giving enterprises the option of purchasing energy savings certificates (or carbon abatement credits if the ETS is implemented) as an additional way for them to meet their targets at lowest cost. A number of provinces and cities are already piloting trading schemes for carbon emissions, and a few exchanges have been established. Other provinces and cities outside the carbon ETS pilot areas could initiate pilots in trading energy savings certificates to build the experience and institutional architecture needed for larger-scale trading. These different pilot schemes would provide the national debate with valuable experience on various policy options for decarbonizing the economy, which include carbon cap and trade, carbon taxes, and green and white certificate trading. However tradable certificates are denominated—whether in carbon or energy savings—a national system of trading will require an extensive institutional infrastructure to monitor, verify, report, and register savings.

New targets should build on the current energy-savings agreement platform as much as possible to ease the burden of compliance for both industry and local city governments. Local city governments should continue to join national and provincial efforts to improve the collection of data on energy use by key enterprises and building third-party capacity for monitoring and verification (MRV). This system can also support potential trading schemes. Greater use of third-party MRV could also help to alleviate supervision burdens on local governments and help verify energy savings for projects receiving government support. China has taken steps in this area but could enhance it by standardizing qualification requirements and broadening the currently narrow base of companies in the MRV system. In addition, fixed asset investment appraisals for energy efficiency have been introduced and could play a more prominent role, with enhanced appraisal capacity from use of qualified third parties, in ensuring new investments are technically advanced, meet standards, and are energy efficient.

Adjusting fuel and electricity tariffs to better reflect social and environmental costs of fossil fuel use should continue. Raising prices on energy can provide additional market incentives for industries to improve their energy efficiency. China's national and provincial governments are in the process of reforming existing taxes on the production of fossil fuels including coal, oil, and natural gas. Proposals for a revised coal tax suggest a rate of 2–5 percent, which, based on average coal prices in 2012, would amount to about RMB 10–25 a ton.[35] By comparison, economic studies have placed the average damages to public health from burning one ton of coal in China at about RMB 156 (in year 2012 prices) (Ho and Nielsen 2007; Ho and Jorgensen 2003). China will need to conclude its debate over the effectiveness and transaction costs associated with ETS and carbon taxes and introduce a clear and consistent policy on carbon pricing so that businesses can plan for it.

Revenues from energy taxes or the sale of tradable allowances could be recycled for energy efficiency and emission reduction programs to provide additional, targeted incentives. Recycling revenues can have a tremendous multiplier effect on efficiency gains. For example, an analysis of household energy use in the United Kingdom shows that recycling the additional revenues from a 3-percent rise in energy prices into efficiency programs produces cumulative energy savings nine times greater than the savings that could be achieved with a price increase alone (Lees 2012). The recycling approach has been an important element in policy discussions and design in major carbon ETS examples in the northeast United States, California, and the European Union.[36] Regardless of how public revenues are recycled, government-funded incentives for energy efficiency should be evaluated regularly to ensure that the greatest amount of additional and verifiable energy savings are being achieved with the least amount of public money. The need for periodic review and adjustment is also needed for existing incentives, such as investment awards for energy efficiency projects and tax rebates for buying energy-efficient equipment.

Enable companies to respond more easily to incentives and regulations

Evidence has shown that higher energy prices have significantly reduced the energy intensity of Chinese manufacturing, but the impacts of higher prices vary considerably across consumer categories and between industrial sectors (Fisher-Vanden and others 2013; Lin and Liu 2011). Raising energy prices to capture the social costs of pollution alone will not always result in industries making investments in energy savings. Pricing will need to be packaged with other policies that address persistent barriers to energy efficiency. The barriers include organizational

[35] Xinhua, "Drawing the Bow on Coal Resource Tax Reform" (煤炭资源税改革箭在弦上), June 9, 2013, http://news.xinhuanet.com/energy/2013-06/09/c_124835728.htm (accessed December 2013).

[36] Recommendations on policy coordination of carbon ETS, revenue recycling to finance energy efficiency, and energy-related targets and caps benefited from written contributions by Max Dupuy, Regulatory Assistance Project, Beijing, May 2013.

challenges (such as low awareness of technical solutions or managerial bias in favor of investments in production growth); insufficiently developed financial services for energy efficiency investments (because of high transaction costs and small scale, for example); and regulatory shortcomings (such as inflexible or prescriptive compliance requirements that limit ambitions to go beyond government mandates).

A basic element of enhancing the ability of industrial enterprises to pursue energy efficiency projects is ramping up their ability to manage their energy use through accelerated placement of competent enterprise energy managers. Energy managers can also support government-enterprise dialogue on complying with energy efficiency policy. National regulations already require that key energy-consuming enterprises appoint energy managers, but in-house staff in these companies typically only have general knowledge about monitoring energy use and assessing savings opportunities. Local governments can greatly improve specialized, technical knowledge of energy managers by cooperating with provincial and national agencies to arrange for rigorous training, helping to monitor energy manager proficiency by ensuring they meet minimum job and professional criteria, among other things. Energy managers are responsible for establishing energy management systems (EnMS); [37] The government has required key enterprises to adopt these systems based on a national standard, but left it up to the individual provinces to decide whether certification of EnMS should be mandatory. To avoid superficial EnMS adoption, EnMS certification and accreditation standards should continue to be developed at the national level, drawing on local experiences such as an EnMS certification pilot with over 130 enterprises in Shandong province (Zhu 2012).[38] Local authorities could continue to propagate the EnMS concept, experience exchanges among enterprises, mobilize technical assistance, and evaluate and publicize energy savings performance outcomes from adoption of the EnMS.

Ensuring good-quality, competitive technical and financial services is also an enabling factor in which all levels of government play a role. Most enterprises, especially small and medium ones, cannot easily access all needed services alone—from energy audits to developing, financing, and executing projects. Te energy efficiency services industry has grown, especially the use of energy savings performance contracting promoted by energy service companies (ESCOs) (Sun, Zhu, and Taylor 2011). However, the capacity of technical service providers still lags behind the practical needs of many enterprises. For most financial institutions operating in the market, energy efficiency financing is at best a niche business. National policy encouragement, from the China Banking Regulatory Commission, for example, would be useful to further motivate Chinese banks to be more active and create and use appropriate new, innovative financial products. A greater diversity of financing mechanisms needs to be available to industries with different financial circumstances, such as financial leasing, equity, and use of off-balance-sheet energy performance contract financing from ESCOs. Local city and provincial governments can support the development of locally active service companies by procuring technical services for supervision of energy efficiency programs, fostering membership in regional and local associations, issuing guidance on common energy efficiency service standards, and facilitating information flow between enterprises demanding and supplying services. Among the many forms of support at national levels, strengthening energy audits by standardizing the procedures and providing good tools and training programs is a top priority because good-quality energy audits are fundamental to realizing opportunities and developing new projects. The key is to help the service industry grow without overregulating and stifling it.

[37] See Goldberg, Reinaud, and Taylor (2011) for an analysis of policies adopted in different countries to promote EnMS.

[38] Institute for Industrial Productivity, "China: Energy Management System Requirements under the Top-10,000 Program," Industrial Efficiency Programs Database, http://www.iipnetwork.org/databases/programs/energy-management-system-requirements-under-top-10000-program (accessed 7 August 2013). See also Zhu (2012).

Encouraging the innovation of new business models for promoting energy efficiency can help both industry and local city governments, particularly the use of specialized third-party companies to package and deliver their energy savings projects (Taylor 2013). Larger cities can be leaders in policy experimentation, testing new delivery models that maximize cost-effective energy savings from public investments such as energy efficiency utilities and energy efficiency resource acquisition programs, like those in the United States. In North America, for instance, local governments in about 30 states and provinces have through regulation effectively contracted for electricity distribution utilities or specialized third-party companies to deliver specific amounts of verified energy savings in key subsectors or targeted locations. Use of qualified third parties eases the local government's direct burden because the company is responsible for pursuing and delivering energy savings and receives compensation against verified performance benchmarks. The company has incentives to seek out the maximum amount of energy savings for the least use of public funds. Over time, third-party companies typically become more adept at delivering more savings at lower costs as programs grow, experience is gained, and market knowledge of end users is deepened (see, for example, box7.9). Such a program could be piloted in China is through the national Demand Side Management Pilot Cities program, which allows utilities and cities to experiment with new models for reducing power loads.

Leading by doing: serving the people in more efficient and cleaner buildings

To achieve deeper and more rapid reductions in energy consumption in new and existing buildings, a core task for China's national and local governments is to harness the business interests of building developers, materials and equipment suppliers, investors, and owners to construct and maintain a greener built environment. For new buildings, spatial planning rules, mandatory building energy efficiency codes (BEECs), green building labels, and financial incentives need aligning. BEECs should be broadened to encompass the main design elements of energy usage, and clear, time-bound targets should be set to progressively raise standards. Better training, technical services, and market awareness of green building designs and materials are needed across the entire supply chain. For efficiency upgrades of existing buildings, benchmarking can inform mandatory retrofit policies supported with incentives. Reducing exposure to indoor air pollutants will need consistent building material standards and tighter enforcement (see box 7.13). Local governments should lead by example, promoting energy efficiency in public institutions and helping to build a market for technical service providers, such as ESCOs—especially in still underdeveloped parts of China.

Buildings, where people live and work, are critically linked to the environmental sustainability of cities, primarily because of their operational energy use and, in China's case, the large-scale construction of new buildings. The staggering pace of new building construction over the past two decades has transformed China's urban landscape and deepened its energy footprint. Total floor space of residential and commercial buildings in China's cities has increased fivefold since 1995 to 33.3 billion square meters in 2011. As a result, energy resource use has doubled over the past decade for space heating and cooling, lighting, hot water, appliances, and equipment in residential, commercial, and public buildings in cities, reaching about 491 million tons of coal equivalent, or 14 percent of the nation's total primary energy demand (THUBERC 2013) (figure 7.31). This figure does not take into account the amount of embodied energy used in the manufacturing of building materials and appliances of building users. From an urban perspective, the operation of buildings dominates urban energy consumption in modern, service-oriented cities. For example, buildings account for roughly 60–70 percent of overall final energy consumption in Hong Kong SAR, China, and London. Energy consumption is likely to be similar in the urban core of large Chinese cities (such as within the fifth ring road of Beijing).

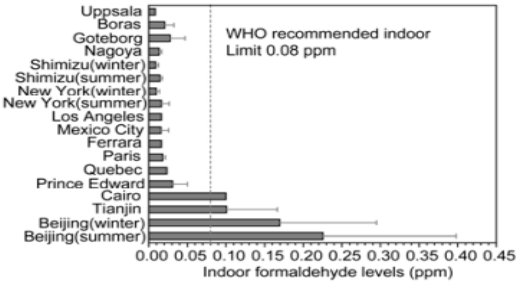
China has set ambitious goals and put in place a comprehensive policy framework for improving energy efficiency and environmental performance of buildings. By 2015, the

BOX 7.13 Cleaning the air indoors—The other air pollution

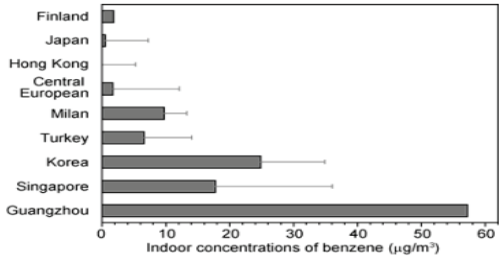
As the rapid pace of construction has transformed the urban landscape, the indoor environment of buildings over the past 20 years has also undergone transformational changes. Increased use of plastics, polymeric floor and wall coverings, synthetic wood products and cleaning agents, and air conditioning in closed spaces have significantly increased people's exposure to indoor air pollutants such as volatile organic compounds (VOCs). Medical studies in China suggest a possible link between birth defects and asthma in children in urban areas and increased exposure to organic pollutants and dust in the indoor air. In China, indoor concentrations of known harmful substances are typically higher than in other countries, so researchers anticipate that the negative health effects are greater (Zhang, Mo, and Weschler 2013).

FIGURE B7.13.1 Concentrations of formaldehyde and benzene concentrations in buildings

a. Concentrations of formaldehyde in the air inside residential buildings in various cities



b. Concentrations of benzene in the air of buildings in various regions



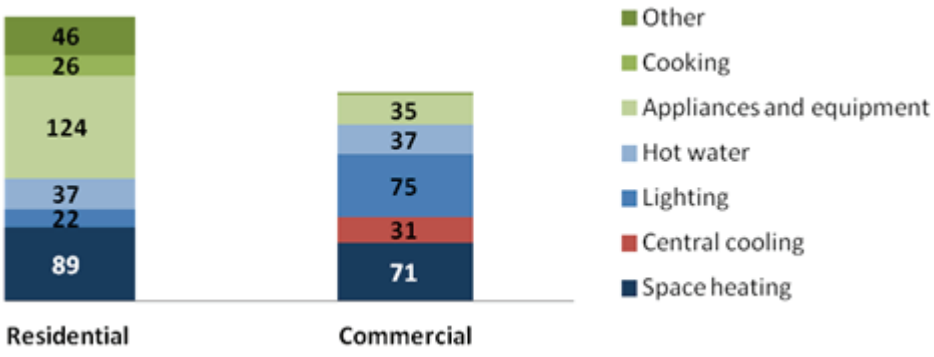
Source: Liu W., and others 2012.
Note: The World Health Organization does not have a guideline standard for benzene because "no safe level of exposure can be recommended" (WHO 2010).

China has issued several standards establishing allowable concentrations of VOCs and other harmful substances. Systematic monitoring in individual buildings is much more difficult than monitoring ambient air quality outdoors, because individual sources of pollution are harder to identify and the regulatory framework for enforcing many standards is lacking. Consistency between standards must also be improved. For example, exposure periods and allowable levels for VOCs in building design and acceptance standards are not the same (Huang and Wang 2010). In addition, China has introduced mandatory certification requirements for building materials (standards CNCA-12C-049, CNCA-12C-050, and CNCA-12C-051), but certification is limited. Other common materials are exempt.

Source: Huang and Wang 2010; Li 2010; Liu and others 2012; Zhang and others 2013.

country plans to reduce energy use in buildings each year by 45 million tons of coal equivalent (MOHURD 2012), and by 2020, national authorities have established a target for increasing the share of certified green buildings in new construction to 30 percent (State Council 2013). Policies to meet these goals include mandatory standards, voluntary rating systems and labels, and financial incentives for investing in greener, more energy-efficient buildings and appliances. Still, barriers remain. Even though many design techniques and technologies to achieve significantly higher energy efficiency in buildings have already been commercialized, market incentives for building developers to adopt green building features are weak. Developers typically do not operate the buildings they construct and may not see a direct benefit in reducing energy costs for owners and tenants. Some reports suggest payback periods of up to 10 years for

FIGURE 7.31 Primary energy consumption in China by end use in residential and commercial buildings, 2010



Source: Fridley and others 2012.
Note: Includes both urban and rural buildings, measured in million tons of coal equivalent.

the incremental cost of building to green standards. Conventional design practices rarely use reliable energy simulation modeling, design professionals lack expertise and experience with integrated design approaches, and there are few published green building performance data for monitoring and evaluation (China Greentech Initiative 2012). With uninspired developers, local city governments continue to struggle to monitor BEEC compliance at the torrid pace and massive scale of new construction. More expensive retrofits may be required in the future to meet national targets for curbing energy use in buildings.

Building energy efficiency in new construction

Mandatory building codes will continue to be the fundamental policy lever for the national and local governments to enforce higher efficiency levels in new buildings. However, BEECs can be strengthened and better aligned with financial incentives and voluntary labeling programs to promote ongoing improvements in environmental performance. Cities have the power, particularly through land use planning and zoning, to facilitate more energy efficient and greener structures (box 7.14).

Clear, time-bound targets should be set for tightening design standards for energy efficiency to eventually require "low-energy" buildings. In the Chinese context, low-energy buildings could be clearly defined in terms of maximum allowable design loads (that is, energy requirements for space conditioning, lighting, and ventilation), achievable cost-effectively through a broad range of techniques for different climate zones. The targets would provide a clearer signal to investors and direct the building market toward realizing longer-term targets for efficiency, allowing for BEECs to be raised progressively. Both the European Union and the United States have set time-bound policy goals for new buildings to achieve low-energy building status. by the end of 2020, new buildings in EU member countries will have to achieve nearly zero-energy building status. This type of long-term signaling can also have a strong influence on infrastructure planning in cities. For example, dramatically reduced heating loads may make district heating in some less densely populated, peri-urban areas uneconomic or require a higher degree of innovation in heating supply.

National BEECs should also be updated regularly on the basis of robust, whole-building life-cycle cost analysis, and they should be expanded gradually to include green building design elements like waste and material use. A three- to five-year cycle is appropriate to keep pace with the changing technologies and economics of energy efficiency improvement. A fixed cycle of revisions also improves the alignment of BEEC updates with the time-bound energy efficiency target. Underpinning the revision of BEECs with life-cycle cost analysis would help to

BOX 7.14 Münster, Germany: Low-energy building standards through sale of city-owned land

By mandating low-energy building standards in sales contracts of city-owned land, the City of Münster in Germany encouraged the local real estate market to embrace energy efficiency. The standard, locally known as Niedrig Energie Haus, imposes stringent thermal performance requirements for any building envelope that exceeds the existing German federal building regulations by 30 percent. Between 1997 and 2010, the standard was implemented in constructing over 5,600 low-energy housing units and 85 energy-efficient commercial buildings in the city. By 2010, 80 percent of all new buildings—even those not built on city-owned land—were following the city's energy efficiency requirements. The standard has saved the city 13 million kilowatt hours in annual energy use. The benefit-cost ratio to the city was more than 6 to 1 and the estimated incremental cost to homeowners was, on average, about €2,600 a house (about 1.4 percent of construction costs). Riding the momentum of positive market reactions, Münster's City Council has since proposed a passive house standard to raise the bar for efficiency even higher.

Source: Energy Sector Management Assistance Program, World Bank. www.esmap.org/node/1170.

determine the most cost-effective improvements to the codes. To this end, greater and more transparent use of building energy simulations are needed to help evaluate alternative building design approaches. BEEC design-based energy savings estimates can have "simulation gaps" because conventional design practices do not necessarily use energy simulation models.

As discussed, revisions to urban spatial planning regulations are needed to create urban forms that optimize the overall energy efficiency of the built environment. Over the past thirty years, China has created an urban fabric where buildings stand farther apart from each other, creating a broken urban "fabric." In cold climate zones, this broken pattern leads to higher energy requirements for heating than a continuous urban fabric consisting of buildings clustered together along the perimeter of street blocks. A comparative analysis done in Europe found that in a temperate climate, in a 1.44 square kilometer area, a continuous urban fabric consisting of 21-meter-high buildings requires four times less energy for heating than a broken urban fabric consisting of 60-meter-high, freestanding towers (Salat 2012). In warmer climates, buildings in densely populated urban areas can be spatially organized to create better ventilation and shading and reduce air conditioning requirements.

A main task for provincial and city governments will be to improve enforcement of BEECs throughout the entire construction cycle to reduce the risk that buildings will not be in compliance when they are completed, when they can be costly and difficult to fix. Local city authorities also play a crucial role in piloting and implementing new standards and are directly responsible for ensuring compliance. According to MOHURD's officially reported statistics, at the design stage, compliance rates with BEECs in prefecture-level cities rose from 5 percent in 2001 to a reported 99.5 percent in 2010 (Levine and others 2012).[39] Yet, especially at the county level, there is significant gap between large and small cities in BEEC compliance during implementation. In China's third-party compliance enforcement system, the construction supervision companies are held accountable for BEEC compliance inspection and reporting. Small cities often do not have sufficient resources to support the necessary government oversight of the third-party inspections. Such issues could be collectively addressed at the prefecture or province level, so that adequate training is provided for the construction trades in county cities, which are administrative subordinates of the prefecture cities.

Local governments can also play an instrumental role in encouraging broader market uptake of voluntary building labeling programs, including the three-star Green Building Evaluation

[39] Despite the apparent improvements, Levine and coauthors (2012,103) note "there are uncertainties about the accuracy and representativeness of MOHURD's officially reported compliance rates."

BOX 7.15 Singapore's Green Mark scheme

Singapore's Green Mark scheme, run by the Building Construction Authority, was launched in January 2005 with a strong focus on energy efficiency. It provides a meaningful differentiation of buildings in the real estate market and has had a positive effect on the industry's corporate image and on the leasing and resale value of buildings.

The distinctive aspect of the Green Mark scheme is that it is used to support the government's green building master plan by using it as the basis for technical capacity building and as a measure for determining government financial incentives for new constructions or retrofits. By purposely integrating mandatory requirements, voluntary ratings, and financial incentives for high achievers under a strategic plan for scaling up green buildings, Singapore demonstrates an effective way for transforming the building sector toward green and sustained energy efficiency improvement.

Source: Building and Construction Authority, Singapore, "About BCA Green Mark Scheme," http://www.bca.gov.sg/greenmark/green_mark_buildings.html (accessed December 2014).

Standard (GBES) and the five-star Building Energy Efficiency Labeling (BEEL) systems. Currently under revision, the GBES was established by MOHURD in 2007 and covers a broader scope, and is more stringent, than the national BEECs.[40] Both the GBES and BEEL are in an early phase of market adoption, although they are required for all large commercial buildings and public offices with an area greater than 20,000 square meters. By the end of 2012, just under 800 buildings had received green labels, and fewer than 300 BEEL buildings had been certified. Although national and local authorities are setting hard targets for new buildings to meet green standards, at this early stage, the profusion of multiple, overlapping rules and ratings can create confusion in the market (Levine and others 2012).

Compliance with more aggressive BEECs and uptake of voluntary rating systems for green building can be improved through a more strategic alignment of financial incentives with policy goals. Existing financial incentives for new buildings have mainly focused on integrated renewable energy systems, including rooftop solar photovoltaic capacity and solar hot water systems—although in 2012, new incentives of RMB 45–80 per square meter were announced for buildings achieving two- or three-star GBEL ratings. Given the speed and scale of desired market adoption for new green building standards, additional incentives and support, such as preferential tax treatment and assistance in completing the certification process, are needed. Perhaps most important, public incentive programs should seek ways of leveraging financial awards with improving access to commercial financing and project services. (Levine and others 2012). Piloting coordinated financing incentives with mandatory building codes and voluntary ratings can test such an approach, as in Singapore's Green Mark scheme (box 7.15).

In accelerating adoption of green building standards and given the high variability in capacities in design, supervision and inspection of buildings nationally, China will need a large-scale training and knowledge building effort across the entire supply chain. The concept of green buildings is rooted in an integrated approach to design, encompassing not just energy efficiency but also other environmental objectives, which may clash with traditional zoning regulations and overly prescriptive building codes. For instance, local design institutes may be more accustomed to traditional urban planning and building design approaches or may be concerned about transgressing codes and regulations. With the ambitious pace at which

[40] An alternative and competing green building rating system to the GBES in China is the Leadership in Energy and Environmental Design (LEED), an internationally recognized rating system originated in the Unied States. A comparison of the two rating systems indicates more similarities than differences and finds the GBES to be more rigorous (Levineand others 2012).

national and local governments are seeking to increase the share of green buildings in cities, there is a risk of "green washing"—the superficial and incomplete application or standards (Draugelis and Li 2012, 186). The success of the U.S. Green Building Council in promoting the LEED (Leadership in Energy and Environmental Design) standard in the United States, for example, is owed in large part to its efforts to reach out to all parts of the building community, including developers, property managers, materials suppliers, architects, and engineers.[41] An accreditation system similar to the LEED Accredited Professionals program could gradually increase the pool of qualified professionals in China. Training will also be needed for buildings authorities in local city governments. Flexible, holistic approaches to applying green design standards aimed at reducing the overall energy footprint of buildings can be further piloted in those cities that already possess a high level of competence and experience. Finally, as a part of knowledge-building efforts, the national and local governments should also work with industry associations and stakeholders to expand the scope, increase the credibility, and improve market awareness of green building materials labeling. Developers interviewed have cited lack of credible information on materials and suppliers as one of the main barriers to green building (China Greentech Initiative 2012).

Building energy efficiency in existing buildings

Focusing on efficiency in new buildings is not enough. Most buildings of pre-2005 vintage were constructed without accompanying BEECs. Especially in cold regions, upgrades of existing residential and commercial buildings will be critical for meeting targets for reducing building energy use. The government has initiated a large thermo retrofit program in northern China with significant subsidy support (15 to 20 percent of retrofit cost). During the 11th Five-Year Plan, 150 million square meters of residential buildings in cold and severe cold region were reportedly retrofitted. In the 12th Five-Year Plan, an additional 400 million square meters of residential thermal retrofit is planned for this region. Yet, these buildings only account for a small fraction of the pre-2005 urban residential building stock in the region (estimated at about 5 billion square meters). The main challenges to pursuing efficiency upgrades in existing buildings are less technical and more financial and organizational. Home and property owners need both incentives and effective local organization to stimulate interest in retrofitting. For instance, the current practice of flat fees or area-based billing for heating does not give residents incentive to save energy on space conditioning. Implementing consumption-based billing for heating in the northern provinces would allow homeowners to gain financial benefits from energy cost savings, while retrofits would increase comfort levels for people living in cold flats. How retrofits and billing are sequenced matters a great deal. Currently, retrofits are typically required before consumption-based billing for heating is begun to avoid saddling owners and occupants with high energy bills for poorly performing buildings that were constructed long ago. However, postretrofit billing lowers the motivation and interest of consumers. In principle, government subsidies for retrofits can provide incentives, but the level needed to accelerate renovations is likely to be very high. Any financial constraints could create an impasse that can slow down both consumption-based billing and the retrofits. Several countries in Eastern Europe facing similar problems in the 1990s started with consumption- based billing first and started various support programs, including lines of credit, to help stimulate homeowner interest in renovation. In China, the government could mandate a deadline for implementing consumption-based billing after retrofitting to make the link between retrofits and energy savings clear and it could allow cities to implement the billing before the retrofits if they choose to do so.

To address organizational barriers, many East European countries have promoted retrofits of existing building through vigorous public awareness initiatives involving homeowners, condominium associations, building managers, and NGOs. Major retrofits required homeowner

[41] Team interview with U.S. Green Building Council senior staff, October 1, 2013.

consent and financial contributions. Energy audits needed to be translated into clear investment proposals and communicated in ways occupants could understand. While there are some standard approaches, a degree of customization in technical measures and financing is usually required. Buildings with similar types, uses, and vintages might have significant structural and operational differences—and owners and occupants might have different preferences and financing capacities. It is advisable to introduce a degree of flexibility in government support programs that set clear metrics for energy consumption reductions but allow for greater customization to reflect local building conditions.

For commercial buildings, building operators might not find energy bills sufficiently high enough to concern themselves with retrofits, so additional motivation is needed. Shanghai is experimenting with establishing energy consumption benchmarks that building operators are required to meet, while extending dedicated lines of credit to support retrofits. There is ample experience and successful examples of national loans for building retrofits in EU countries, providing long-term, low-interest loans through commercial banks for residential retrofits based on a standard set of criteria and procedures, sometimes combined with additional capital subsidies for specific energy savings level achieved.

Promoting building energy efficiency in public institutions

Although the largest share of the building stock in China is privately owned, the public sector has a significant role to play in leading the move to buildings that are more energy efficient.[42] Public buildings represent about 6.2 percent of final energy demand in China and like other end-using sectors are dependent mainly on coal and coal-fired electricity. Upgrading of existing public buildings and better construction new ones will have an important demonstration effect and will create a larger market for green building products, resulting in lower costs and better access to services for private building owners as well. The benefits of improved energy efficiency in the public sector make a compelling case for local city governments to lead by doing. The local governments should institute consumption-based district heating metering and billing for all the facilities they own or control, for instance. A precondition for improving efficiency in the public sector is development of technical expertise and clarification of responsibilities for promoting energy conservation. That will be a major and multiyear undertaking because of China's size and diversity in public facilities. Among the highest priorities is the establishment of good statistics on energy use. Metering is fundamental to energy data collection and diagnostics but is far from universal. Better collection of energy use data through online monitoring systems, some already in place, should be supported by better public disclosure.

The use of awards can harness the natural interest of local leaders and managers of public entities for recognition. Award systems require unbiased data on energy use and environmental performance to be publicly available. Rating systems are another way to bolster enthusiasm for improving energy savings performance, including scorecards such as those issued each year to rate the performance of U.S. federal agencies in reducing greenhouse gas emissions, energy efficiency, and water conservation. Piloting the use of publicly disclosed scorecards in a subset of institutions, such as municipal office buildings, would recognize achievements, maintain accountability, and compel actions to improve their buildings' performance. Public facilities could also be allowed to retain the savings from reduced energy use in building retrofits, as laid out under the State Council's Order 531 (2008). Detailed local budget and accounting regulations are needed, and some cities, such as Beijing, have already developed them. Absorbing energy cost savings back into general funds is a strong disincentive. Instead, regulations should explicitly allow for various expenditures, including small upgrades or new equipment, that directly benefit the facility. Retrofits in schools can have multiplier effects when combined

[42] This section draws on World Bank 2012b.

with classroom lessons on energy efficiency and sustainability that students then share at home (World Bank 2012b).

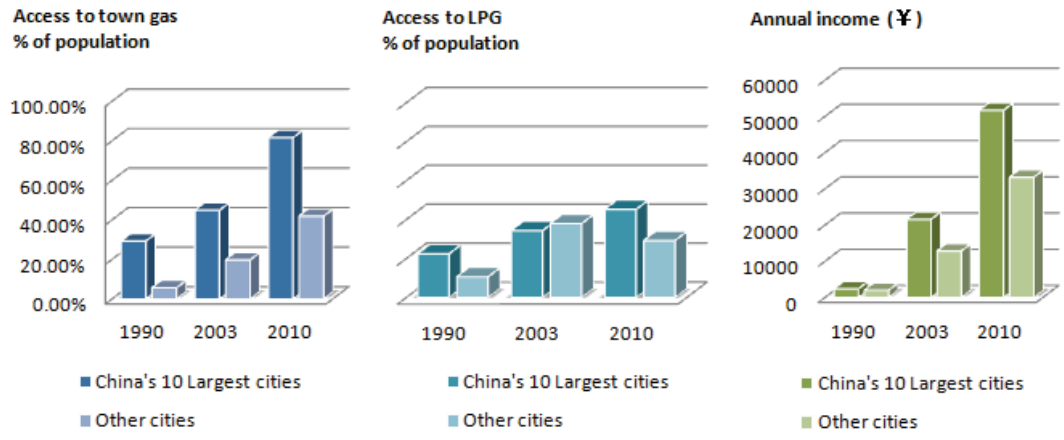
Capital budgets for public institutions are hardly ever sufficient in most countries, and China is no exception. Continued use of China's national- and provincial-level special funds to cofinance capital budgets for public institutions is encouraged. Budget support for project preparation costs, metering, and establishing statistics systems could also be shouldered by general funds to remove further transaction costs. China has just embarked on a power utility based demand side management program that could make special efforts to target public institutions, as is done in many countries. Revolving funds could be managed at local levels to help leverage capital budgets and subsidies. Careful analysis of these schemes would be needed to avoid crowding out commercial financing, where available.

Energy service companies offer an opportunity for public-private partnership schemes and provide an alternative source of financing for public institutions. ESCOs in China have started working in buildings but, unlike the ESCO market in the United States, industrial energy efficiency projects dominate the market. The State Council in 2010 issued a decree identifying ESCOs as a major market mechanism for promoting energy efficiency investments. Accelerating penetration of the public building market will require defining accounting rules for energy savings performance contracting and for selecting ESCOs through public procurement procedures, including prequalification criteria public institutions can use. It will also require strengthening measurement and verification to ensure efficient use of taxpayer funds. The European Union and the United States offer examples of different ESCO schemes, which local governments could study. For instance, the SuperESCO model experience in the United States Federal Energy Management Program provides opportunities to streamline procurement for energy efficiency retrofits across different public institutions. An ESCO could be competitively selected for a multiyear performance-based contract and allowed to approach departments with investment proposals without further selection procedures. Some transactions could be subcontracted to smaller ESCOs in the local market, further facilitating their development. The details are complex and need to be studied carefully to ensure transparency and efficiency. It is recommended local governments identify a specific unit that can provide technical assistance for facilitating use of ESCOs.

Securing clean energy sources

No modern cities rely on coal as much as Chinese cities still do. Because coal is a major contributor to air pollution and CO_2 emissions, reducing the use of coal must be a centerpiece of urban energy strategies. Coal use can be reduced in cities by expanding access to piped natural gas, scaling up local production of renewable energy, and "importing" from outside city boundaries supplies of energy that are as clean as possible. Natural gas is currently limited in China, but domestic production and imports are increasing. Given current supply constraints, gas usage should be prioritized in the residential and commercial sectors, where it can have the largest environmental and economic benefits. Because cities rely more on electricity and power generators and large industries will rely on coal for some time to come, emissions control standards must continue to be tightened and enforced in those sectors and efficiency improved. While natural gas can be an important fuel to transition away from coal in the near term, cities need to rely more on electricity and renewable sources of energy over the long term. Initially, most renewable energy will be produced outside city limits, which will require the removal of barriers related to pricing and grid access for commercial renewables and stricter emission controls on thermal power generation. Over time, distributed generation and production of renewables from municipal sources such as landfill gas, wastewater gas, and municipal solid waste within cities can contribute to meeting energy demand where feasible. China can adapt the most appropriate models for regulation, metering, and financing of small-scale renewable production based on experience gained elsewhere.

FIGURE 7.32 Access to natural gas in China's 10 largest cities compared with other cities



Source: NBS 1991c–2011c.

Cities around the world have tended to gravitate toward cleaner fuels as incomes rise and cities develop. In China's cities, however, the transition away from coal has not happened quickly enough or on a large enough scale to keep up with the rapid urban growth and avoid persistently bad air quality. Millions of urban dwellers continue to rely on dirty fuels for cooking and heating (figure 7.32). Although cities are actively taking steps to rein in the most harmful uses of coal (box 7.16), incomplete reforms in the gas, power, and heating sectors have posed additional barriers to expanding the market for cleaner energy alternatives. Completing these reforms will be necessary to accelerate efforts to reduce the burning of coal and improve access to cleaner fuels in densely populated urban areas.

BOX 7.16 Cities take active measures to reduce harmful burning of coal

In Taiyuan, the capital of China's largest coal-producing province, city officials have been reducing coal use by shutting down small heat-only boilers and expanding the district heating network, supplying gas to small and medium enterprises, and eliminating direct use of coal for cooking and heating in the city center and in peri-urban areas near the city. Beginning in the early 2000s, Shenyang removed 1,000 heating plants over the course of three years, reducing the number of heating enterprises from 1,062 to 410 (many operating small dispersed boilers) and increasing the share of centralized heating supply from 55 to 80 percent.

Urumqi has promoted the use of combined feat and power plants, larger district heating networks, and, since 2012, gas-fired heating supplies as a part of its plan to reduce severe winter air pollution. Heating in Urumqi was estimated to contribute 16 percent of total annual average concentrations of SO_2, and 8 percent of PM_{10} and NO_x. Since the 1980s, Beijing has led the trend in Chinese cities toward increasing the use of natural gas and phasing out direct combustion of coal by small-scale residential and commercial consumers. Many large district heating plants in the city were converted to gas, the most polluting factories were relocated, and a coal ban has been enforced in the central downtown area. The ban was extended to the fourth ring road by the end of 2013. The city also recently announced a hard target of capping its total annual coal consumption at 15 million tons by 2015.

Source: World Bank 2012a; 2011a, 2011b;World Bank-Shanxi EPB-Xinjiang EPB 2012; World Bank-MEP 2012.

Increasing the supply of natural gas to priority consumers in urban areas

The potential benefits to urban air quality of expanding access to gas are enormous, but gas supplies are limited, and certain end-using sectors should be given priority to maximize social benefits. Highest priority should be given to households—as cities worldwide have done. Once infrastructure for piped natural gas (or "town gas") is in place, small commercial users such as stores, hotels, and restaurants can gain more access to gas. Replacing coal with natural gas in the household and commercial sectors is especially important because end-of-pipe emissions controls are usually either too expensive or not technically feasible. After residential and commercial users, centralized heating facilities should be the next priority for supply. A few cities, such as Beijing and Urumqi, have already converted a large amount of district heating capacity to gas-fired capacity. Supply constraints make it important for each city to evaluate the most efficient configuration for gas-based heating (for example, whether to supply base load or peak load for district heating or distributed generation), taking into account potential renewable heat sources and existing sources from combined heat and power and waste heat sources. In distributed systems, natural gas units are able to meet multiple demands of cooling, heating, and power, and can reduce the transmission and conversion losses associated with heat-only systems with lower heat load densities, which is an important consideration as buildings become more energy efficient. Use of gas for electricity generation and industry, which currently account for 60 percent of gas use nationwide, should be carefully compared with the uses outlined above. Nevertheless, increasing gas supplies to China's power sector could provide important efficiency benefits if used for meeting high peak loads or it could provide additional flexibility to the power system, including easier accommodation of intermittent renewable electricity supply (Kahrl and others 2013).

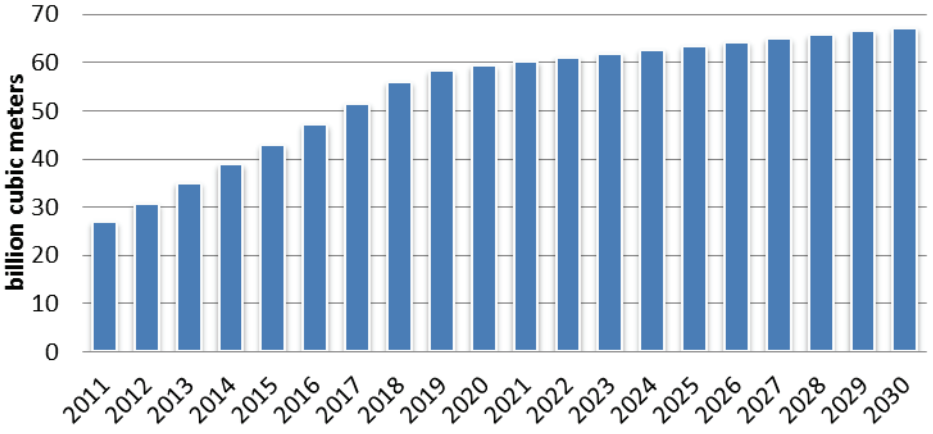
Because residential consumers are a top priority for scaling up natural gas supplies, achieving universal access to piped natural gas for urban households would require the supply of gas to increase from around 30 billion cubic meters in 2011 to nearly 70 billion cubic meters in 2030 (figure 7.33).[43] Urban population serviced by piped gas would increase from around 500 million in 2013 to about 850 million in 2020 and reach 960 million in 2030. Total investment required between 2014 and 2030 is estimated at RMB 154 billion, including RMB 16 billion in annual investment between 2014 and 2020. The bulk of the investment would be needed in the 2010s should China decide to make access to piped natural gas for households a priority, replacing the use of costlier fuels such as LPG and dirtier fuels such as coal. Up to 75 billion cubic meters would be needed to shift about 65 percent of district heating to gas (figure 7.34), dramatically reducing the use of coal for heating in northern urban areas and resulting in significant economic benefits from reducing local and global pollution.

While the available resources of natural gas can be expanded considerably, accommodating demand by urban users will depend largely on reforms to pricing and market structure. China is piloting pricing schemes that would help address price differentials between domestic and imported gas. Because imports may meet about 50 percent of China's demand for gas in 2020, narrowing this price gap is important.[44] Another needed pricing reform is to address incentives to develop the residential gas market, for which prices are very low compared with those in other sectors, particularly industry. Beyond adjusting prices, if China is to increase gas penetra-

[43] Supplying gas for individual space and water heating units in residences would require a larger supply. Estimates assume that per capita usage for households connected to gas remains about the same as in 2010. It is also assumed that once households are connected to piped town gas, they will stop using liquified propane gas (LPG). The number of households with access to LPG represents a substantial portion of the urban population in some southern cities in China, although LPG is typically more expensive and households tend to favor piped natural gas. An annual growth rate in the percentage of the urban population with access to piped gas is assumed at 6 percent, slightly faster than the average rate of 3 percent observed between 2004 and 2010.

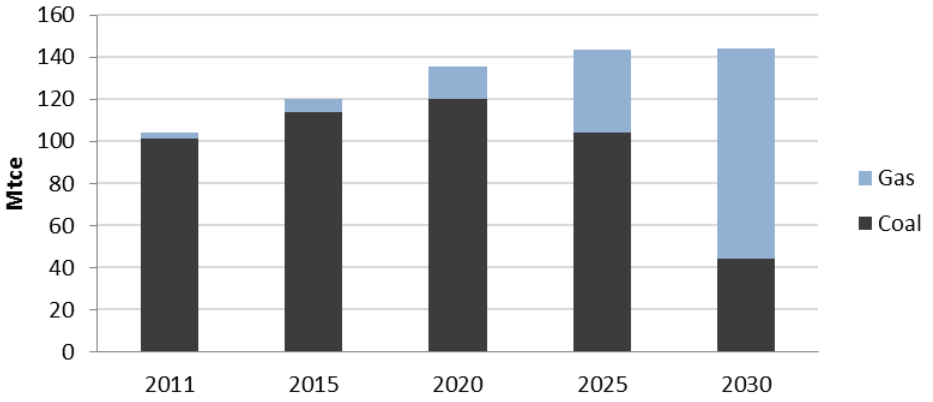
[44] "Breaking the Ice on Natural Gas Pricing Reform" (天然气价改破冰), Caijing Magazine (财经杂志), 3 January 2012, http://magazine.caijing.com.cn/2012-01-03/111587947.html (accessed December 2013).

FIGURE 7.33 Supply of piped gas to urban households needed to achieve universal access to piped gas by 2020



Source: Team's calculations.

FIGURE 7.34 Estimated fuel required to supply 65 percent of district heating with natural gas by 2030



Source: Team's calculations.
Note: Fuel use is estimated based on projections for the expansion of heated floor area in the more than 300 cities currently serviced by district heating, assuming continued improvements in the energy efficiency of buildings and supply units.

tion, ultimately it should develop a gas law that creates a competitive gas wholesale market and clearly defines the rights, responsibilities, and obligations of operators and government entities. A wholesale competition model could focus on bulk supplies of gas sold to large industrial customers and urban distribution companies. Prices could be determined by negotiated contracts and competitive spot markets; transmission and distribution tariffs could be determined according to a method approved by concerned authorities and regulated. While creating such a model is a medium-term goal, in the short term, it is critical that China allow third-party access to the market. Without third-party access, it will be difficult to increase competition because of the dominance of the three oil companies in upstream development and transmission.

Greater urban access to gas requires more investment in distribution networks and storage (especially for dealing with seasonal peaks). In addition to pricing, it will be necessary to address financing, regulation, and access to these facilities. Incentives and reasonable returns should be provided for investors and operators in domestic and upstream gas supplies, liquefied natural gas cargoes, pipelines, terminals, storage facilities, and distribution networks.

Upstream market players also must have a reasonable expectation that price-setting mechanisms will be stable and fair—a task that many developed countries have fulfilled by creating an independent gas regulatory body.

Removing barriers to renewable energy in cities

In addition to maximizing energy efficiency and optimizing use of natural gas in cities, China's cities can expand use of renewable energy.[45] Most cities in the world might be indifferent to receiving electricity generated from renewables or electricity generated from fossil fuels, since both are "clean" at the user end, in China's case renewable generation has added value by directly offsetting the amount of electricity that would be generated by coal. That can reduce air pollution regionally and lower the carbon intensity of the economy. Diversifying urban energy resources by introducing more renewable-based energy has the added benefit of enhancing cities' energy security through the "portfolio effect." Besides receiving more renewable-based energy produced from beyond city limits, cities can also increase their share of self-generated renewable production or distributed forms of energy, where feasible. Completing power sector reforms that began over a decade ago is a top priority for scaling up clean energy in cities. In 2002, the State Council issued Decree No. 5, which outlined comprehensive power sector reforms to introduce fair competition (starting with generation) and develop an open, well-regulated electricity market.[46] Although there have been many achievements in the sector, progress has stalled.

China's government can take four actions to support even greater development of renewables. As a first step, it can introduce a two-part generation tariff. Currently, generation tariffs of coal-fired power plants are given based on China's dispatching approach, which ensures a certain number of operating hours for each plant. Coal-fired power producers may incur losses when dispatch centers ask them to reduce their generating to accommodate more wind and other intermittent sources of renewable power. Worldwide experience demonstrates that this situation can be rectified by structuring two-part generation tariffs: one charge for available generating capacity (a capacity charge) and one charge for kilowatt hours generated (an energy charge). The capacity charge would allow generators to maintain their current annual repayments of their investments and fixed costs, while the energy charge would allow them to recover the cost of fuel and other variable costs. Such a reform could be implemented relatively rapidly and would need to be complemented by changes in dispatching practices (RAP 2013). Second, transparent and cost-recovering transmission pricing should be implemented to allow grid companies to recover all costs incurred in safely and reliably delivering power to consumers, including the additional costs of accommodating intermittent renewable electricity. Without such pricing, grid companies will continue to resist bringing more renewables online, and curtailment generation losses of renewables will become more severe. In fact, about 12 percent of wind power generated in the Three-North Region in 2010 was wasted because of curtailment. Because this reform will be based on the future structure of the power sector, it will need to be undertaken in a broader context of electricity pricing reform in China.

A third action is to consider adjusting incentives to guide wind developers to build closer to load centers (Song and Berrah 2013). Planning and coordination of grid development to accommodate major wind developments in resource-rich northern China will take time and should be supported by comprehensive studies that would aim to optimize connection size and connection circuit layout in consultation with stakeholders. Shifting the focus to central and eastern regions could lower overall incremental costs of wind power development. The fourth

[45] This section is derived from recent policy notes and other contributions from Xiaodong Wang, Senior Energy Specialist, World Bank; Ximing Peng, Senior Energy Specialist, World Bank; Yanqin Song, Energy Specialist, World Bank; and Nourredine Berrah, retired World Bank staff and senior consultant.

[46] See the Green Growth Chapter of *China 2030* (World Bank–DRC 2013).

BOX 7.17 The Beijing Sunshine Schools program: Linking green policy, pedagogy, and people

Under the umbrella of China's national Golden Sun Program, Beijing will install 100 megawatts of rooftop photovoltaic (PV) systems in schools and other educational institutions in Beijing Municipality. It is the largest such initiative in China to date. Most projects under the Golden Sun Program involve large PV installations in a single location. By contrast, the Sunshine Schools program will involve distributed PV capacity in about 800 facilities. The capacities of most systems are expected to range from 50 to 200 kilowatts. The program will test the renewable energy service company (RESCO) business model for distributed rooftop solar PV systems, whereby investments are financed by the service provider, which also provides maintenance and other after-sale service. The project is also expected to pilot two-way metering and net metering for rooftop PV systems. If proven successful, the project would provide valuable experience and demonstration effects for China's growing solar PV market.

In addition to policy replication, the program launched a parallel effort to educate students in the schools about environmental sustainability. It includes a competition with awards given out by both Beijing and central government officials as well as school administrators. Online monitors showing the amount of renewable energy generated and carbon dioxide avoided are displayed in the schools. Linking faculty, students, and parents with sustainability initiatives in schools should reinforce green lifestyle concepts both at school and at home.

The World Bank is providing a $100 million loan for the installation of the solar PV systems as well as a grant from the Global Environment Facility to establish online monitoring by the city of the renewable energy generation of the schools and to conduct technical studies on grid connection issues. The hope is that the Beijing project can be replicated in other Chinese cities developing similar schemes.

Source: Authors.

action would be to discourage local governments from imposing additional fees or harmful local sourcing requirements on wind developers that many have introduced as a result of value added tax reforms and rebates on wind power equipment. At higher levels of development, VAT from wind generation could be higher than pre-reform levels (Song and Berrah 2013).

Additional reforms are needed for regulating, financing, and metering distributed generation of renewable energy in cities. Worldwide, there is a trend toward consumers becoming generators of energy, which is transforming energy markets. In China, too, solar photovoltaic (PV) capacity has been growing rapidly, but the development of grid-connected solar PV has been inhibited by a combination of low retail prices for electricity and prohibitions by grid companies against installing distributed generation systems. Recent policy breakthroughs have helped break down some of these barriers to distributed generation and should be aggressively followed through with implementing regulations. In 2013, the State Grid began providing limited grid access to distributed energy, with support from the State Council, and the government announced that it would be shifting from capacity-based subsidies to feed-in tariffs (FITs) based on generation. These new initiatives should be complemented by efforts to develop new and appropriate models for advancing commercial renewables in Chinese cities, such as in the "Sunshine Schools" program in Beijing (box 7.17).

While power sector reforms entail action at the national level, local city governments can also take proactive measures to introduce more renewable energy into their supply mix. Because most Chinese cities import the majority of their energy from outside the city, they are dependent on regional sources of supply, which are mostly outside their control. Still, they can leverage their position in the energy commodity markets as large centers of demand to influence the types of energy they receive. Several options exist for cities to "import" more renewable energy by covering the additional cost for renewable energy until parity with traditional energy supplies is achieved. One is capacity-based, where consumers in a city pay a marginal fee on their

utility bills to install a specific amount of renewable energy capacity. Another is energy-based, where consumers pay a small premium for units of renewable energy they purchase (for example, as a fixed percentage of the electricity they use each month). The Shanghai Jade Electricity Program, started in 2005, experimented with the energy-based approach. Three important lessons were learned in Shanghai: the local government needs to play a very active role in promoting the initiative and, ideally, to link up with national efforts; public education and awareness is critical in achieving buy-in for both nonresidential and residential consumers; and financial incentives are needed to stimulate participation (Peng 2012).

District heating sector reform

District heating is one of the last vestiges of the welfare state in China.[47] District heating reforms offer some of the clearest and most direct opportunities for improving environmental quality in northern cities. In more than 300 cities where centralized heat in the winters is legally required, over 90 percent of the heat supply is fueled with coal. Most Chinese heating utilities continue to bill consumers for heating based on a flat rate per square meter, removing any end-use efficiency incentives. Old district heating systems in northern cities are often highly inefficient and have historically had poor pollution controls. As a result, ambient $PM_{2.5}$ concentrations of cities north of the Huai River were estimated to be about 55 percent higher between 1981 and 2000, and to have reduced average life expectancy by about 5.5 years, compared with cities where heating is not legally required (Chen and others 2013). The district heating sector has grown about 12 percent a year in the past five or six years and is about 50 percent larger in floor area coverage than in 2005 (World Bank 2012a). Achieving a greener district heating sector will require a broad range of technical innovations, pricing, and institutional reforms, including modernizing regulations. It will also require a major effort in building technical and managerial capacities in the utilities and regulators to usher in modern management techniques. Since the government issued guidelines for heating reforms in 2003, there have been many pilots and lessons learned that can be used to accelerate reforms.

Mandatory heat metering should be implemented at least at the building level with a binding timetable for introducing consumption-based billing and two-part heat pricing. Metering enables heating companies to understand energy consumption patterns and allows consumers to pay according to use. While apartment-level metering is preferable, building-level metering should be allowed to avoid expensive and disruptive internal pipe retrofits and accelerate metering. Two-part heat tariffs include charges for variable and ordered capacity costs, and thus are incentives for end-user efficiency while covering justified fixed costs. The popular practice to set the fixed part on a flat square meter basis should be changed to a capacity-based charge, creating incentives for consumers with energy-efficient buildings to reduce ordered capacity, freeing it up for new connections. Incentive-based tariff regulation would also encourage heat suppliers to improve their operating efficiency. Ensuring adoption of commercial accounting principles based on uniform guidelines from the Ministry of Finance by heat companies would help get tariffs right. The central government could clarify tariff methodologies for combined heat and power plants to improve transparency and consistency across cities. In addition, general subsidies to households, including low tariffs, should be replaced with more targeted assistance and extended also to poor households just above the current threshold for public welfare programs. A World Bank survey conducted in Liaoning Province in 2007 found that in RMB terms, heating subsidies for the richest households were similar to those for the poorest households, so that in the end, out-of-pocket spending on heating bills amounted to 2 percent of income for the richest households and 7–10 percent of total income for the poorest households (World Bank 2009).

[47] This section draws on Draugelis and Li 2012 and World Bank 2012a.

China could consider issuing a national district heating regulation to address the lack of a strong legal mandate for related institutions to undertake reform and issue national district heating planning guidelines to ensure consistent planning approaches that incorporate energy- and carbon-intensity reduction goals. The regulation could, for instance, establish licensing of operators as a key regulatory tool to force suppliers to meet their obligations (including for environmental performance and financial reporting). A broader provincial role in monitoring sector development, facilitating knowledge exchange, and supervising the regulation, if issued, would help with the supervision of district heating in the 15 provinces and over 300 cities where heating is mandated. With sufficient capacity, provincial authorities could take on licensing responsibilities and participate in dispute resolution. The lack of an autonomous regulator with clearly a defined role, budget, and enforcement authority is a key reason for uneven and relatively limited modernization of the sector. A national regulation could create such an institution, perhaps even at the provincial level. The guidelines would establish principles and approaches for least-cost planning as well as dispatching guidance. Because cities are very involved in the utilities' investment decisions, the city has important responsibilities in investment approval. The planning function, combined with the investment approval process, should not only aim to ensure heat supply security but also protect consumers from unreasonable costs

The use of coal for heating should be deliberately avoided. Coal should be switched to gas where supply can be secured, renewable resources integrated where feasible, and strict emission controls imposed on remaining coal heating sources. Gas is more expensive than coal, but a package of demand-side management measures, together with modernizing district heating systems, pricing reform, and targeted social assistance could help address affordability concerns. As a first step, gas should replace coal-fired heat-only boilers for peak loads, connected to cogeneration units. Gas boilers are more efficient and flexible and can open doors to more economic dispatch of heat sources, renewables integration, tri-generation technologies, and value-added services such as district cooling. Alternatives need to be carefully analyzed because heating is influenced by local conditions. Generally, over the longer term, the estimated economic benefits of switching to gas-fired district heating are significant and appear to outweigh the incremental costs (box 7.18).

Integrating water resources and pollution management

China's urban water sector faces two severe and interrelated problems. One is to supply a sufficient amount of water to a growing urban population, while also providing for the needs of the industrial and agricultural sectors as well as ecological requirements. Water scarcity has become one of the greatest threats to China's continuing urbanization process, especially in the north and west, and problems could become even worse in some regions under plausible climate change scenarios. The other challenge is to ensure the quality of water entering the city water system and of the treated wastewater returned to natural water bodies. Urban wastewater, industrial emissions, and agricultural runoff compromise water quality; poor water quality in turn threatens health and leads to higher treatment costs downstream. Water scarcity and pollution interact. Reduced river flow leads to higher pollutant concentrations because there is insufficient water for dilution.

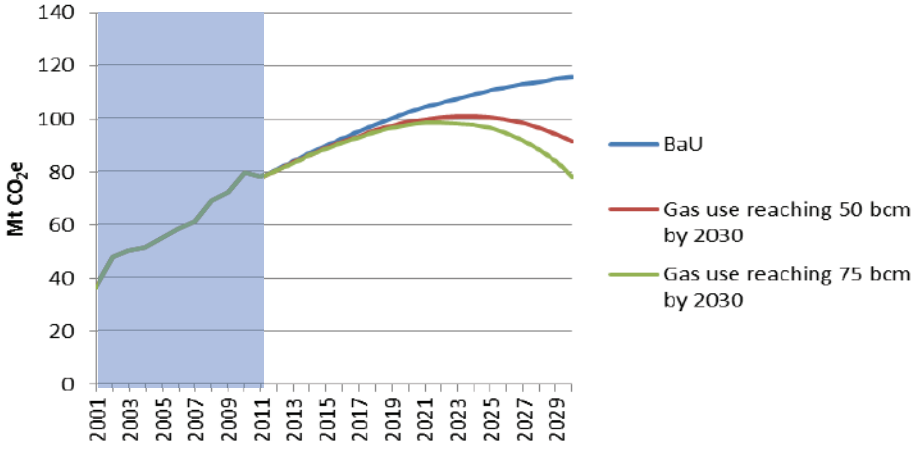
China has addressed these problems in the water sector by improving the legal basis for managing water resources and by investing in water supply and treatment infrastructure. Further progress can be made in three areas. First, water supply can be improved by increasing the efficiency of water use, especially in industry and agriculture, and by encouraging a more flexible allocation of water rights across sectors. Underpricing of water currently discourages use efficiency. Insufficient information about water resource flows hinders good decision making but could be addressed using new technologies such as satellite remote sensing. Second, improving water supply quality requires reducing industrial pollution and addressing nonpoint source pollution in the rural sector. Besides better enforcement of regulations, instruments such

BOX 7.18 Phasing out coal in district heating provides significant environmental and social benefits

As China's cities expand in the coming years, centralized heating will also expand. In a business-as-usual scenario, heated floor space in China's provincial, prefecture, and county-level cities current serviced by district heating is expected to nearly triple from 4.7 billion square meters in 2011 to 13.1 billion square meters in 2030. Heat supply meanwhile is projected to rise from 96 million tons of coal equivalent (Mtce) in 2011 to 149 Mtce in 2030. Assuming that the share of heat supplied by burning coal continues to hover around 90 percent, coal use for heating is projected to increase from 101 Mtce in 2011 to 120–151 Mtce in 2030, with carbon emissions increasing from 78 million tons of CO_2 to 116 million tons.

If the current share of centralized heating supplied by burning natural gas (about 3 percent) remains unchanged, total gas use is projected to be only 2.7–3.4 billion cubic meters by 2030 in a business-as-usual scenario (figure B7.18.1). If the share of gas-fired heating were to increase to about 45 percent of total heat supply by 2030, gas use would reach 39.9–50.0 billion cubic meters, requiring total additional investment of RMB 34.0–39.2 billion from 2014 to 2030 beyond business as usual (in year 2011 renminbi). Increasing the share of gas-fired heating to about 65 percent would require gas supply to increase to 59.8–75.0 –billion cubic meters and total additional investment of RMB 47.0–54.4 billion from 2014 to 2030 beyond business as usual. Cumulative benefits of reducing coal use and increasing gas use net of additional investment required are estimated at RMB 11.8–14.2 billion between 2014 and 2030 in the scenario where gas-based heating increases to 45 percent and RMB 17.3–21.0 billion where gas-fired heating increases to 65 percent.

FIGURE B7.18.1 Carbon emissions under different scenarios of increasing gas use for heating



Source: Team calculations.
Note: Estimates are based on projections for the expansion of heated floor area in 316 cities currently serviced by district heating.

as payments for ecological services can be helpful where urban water users support actions elsewhere in the watershed that protect water quality. Since one city's waste water becomes the water supply of another city downstream, further investments in waste water treatment will also be a high priority. Finally, and perhaps most importantly, better water resources management requires institutional reforms. Water utility governance reform could improve cost recovery and coordination mechanisms such as municipal water boards. And because urban and rural water issues are highly interdependent, regional and cross-sectoral water management approaches will be needed to reform water rights allocation and pollution control at a watershed level. Effective reforms will promote sustainable water management and help Chinese cities achieve a "water saving society," a longstanding concept in China that is in need of a strong boost from local governments.

Improving water supply by strengthening demand management

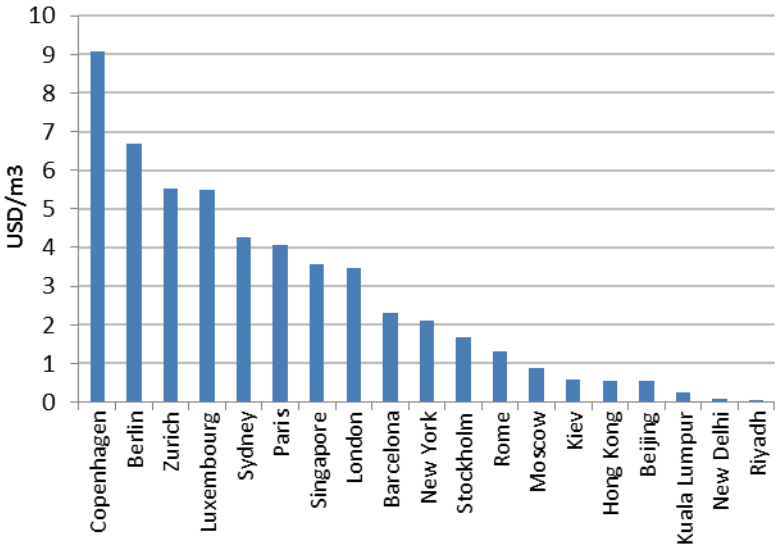
With 20 percent of the world's population but only 7 percent of its freshwater, water scarcity is a major problem for sustainable urban development in China.[48] Although China has the fifth-largest endowment of freshwater resources (Moore 2013), its annual per capita resources of 2,100 cubic meters are about one-third the global average. . There are strong spatial differences: 81 percent of China's water resources are concentrated to the south of the Yangtze River, where 60 percent of the population lives—only 19 is therefore available to the 40 percent of the population in the north, where most of the major grain production is located, and in the west. Annual per capita water availability in the north is only about 900 cubic meters (World Bank 2013b). About two-thirds of China's cities—420 cities—are water short; 110 of those face severe shortages, with a total deficit of 10.5 billion cubic meters. For instance, Beijing's and Tianjin's per capita water resources were less than 120 cubic meters, well below the benchmark for serious water shortage of 1,000 cubic meters (Wen and Zhu 2013). Eleven provinces overall fall below this level and are drier than Iraq or Lebanon. These shortages have led to severe overexploitation of groundwater resources, which provide about one-third of northern China's water supply and as much as two-thirds in places like the Hai River Basin, which is home to Tianjin and Beijing. Nationally, more than 160 groundwater overdraft areas cover 190,000 square kilometers, and each year overextracted groundwater exceeds recharge by 22 billion cubic meters. In the Hai River Basin, shallow water tables have dropped by up to 50 meters and deep ones by up to 90 meters.

The main driver of water demand is increasing consumption by a growing population, by agriculture, and by expanding water-intensive industries in the water-short north and west, although declining precipitation, possibly due to climate change, is probably also contributing to water shortages in some regions. By 2030, under current policies, China's total water demand is projected to rise by 61 percent over 2005 levels (2030 Water Resources Group 2009). Urban municipal and domestic use is expected to rise from about 12 percent of total demand in 2005 to 16 percent. However, the total amount of water use in China will be limited to 670 billion cubic meters by 2020 and 700 billion cubic meters by 2030, according to the National Water Resource Master Plan approved by State Council in December 2010. The water use sectors are expected to take reduction measures. Although average urban residential per capita water use is lower than in high-income countries, it is growing as living standards rise. In the southeast and coastal areas, per capita daily water use is about 190 liters, while in the northwest and upper Yellow River areas, it is only 70 liters. Industrial water use intensities remain high at 131 cubic meters per RMB 10,000 of industrial value-added. This is about twice the average for high-income countries and ten times that of the best performers such as Japan. Some of the most water-intensive industries are among the worst performers, with steel, oil refineries, paper, synthetic ammonia, and beer production having water use intensities about 10 times greater than those of advanced international competitors. The energy sector, dominated by fossil fuel use, is one of the biggest water users, and some of China's largest coal-producing regions are in the arid north. Fresh water use for mining, processing, and consuming coal accounts for a considerable portion of water consumption in industry (ADB 2008). Agricultural water productivity is also low. According to the Food and Agriculture Organization, crop water productivity was $3.60 per cubic meter in 2009, compared to an average of $4.80 for middle-income countries and $35.80 for high-income countries.[49]

The response to water shortages is usually to increase supply—digging deeper wells or building reservoirs or diversion infrastructure. But these are often no more than stopgap measures in the face of rising demand. The first priority therefore must be to create incentives for greater

[48] This section draws from Jiang and Li 2013.
[49] FAO, AQUASTAT, "China," http://www.fao.org/nr/water/aquastat/countries_regions/china/index.stm (accessed December 2014).

FIGURE 7.35 Water and wastewater tariffs in Chinese cities compared to other cities around the world



Source: Global Water Intelligence, "Global Water Market 2011-Meeting the World's Water and Wastewater Needs Until 2018" (2011), http://www.giiresearch.com/report/gwi108050-lob-water-wastew.html (accessed December 2013).

water conservation and for implementation of water-saving production technologies. Water prices have gradually increased but are still low by international standards. In Beijing costs are less than a tenth of those in Berlin or Copenhagen, for instance (figure 7.35).These low residential tariffs are offset in large measure by high industrial tariffs. In many developed countries, industrial water tariffs are usually lower than residential water tariffs. Berlin's urban residential water tariff is $6.67 a cubic meter, while its industrial water tariff is $2.16. The current industrial water tariff in Beijing of RMB 6.21 and in Tianjin of 7.85 RMB are higher than those in Canada, the United States and other developed countries. Agricultural water prices are also very low, as is common in many countries. China's agricultural irrigation water use charges consist of fees paid to state-owned water management agencies and end canal system water fees, and can vary widely. There appears to be room for water tariff adjustments that can better incentivize all water consumers to conserve water and to use it more efficiently in industrial and agricultural production.

Raising water use efficiency is critically important, especially in the large agricultural and industrial water using sectors where water productivity remains low. Increasing water productivity can help address the needs of growing urban population by reallocating water resources from rural or industrial use to municipal water supply. In some countries, that involves market-based trading of water rights between rural and urban users. A prerequisite for such reallocations and for reducing overextraction is better information about available resources and current consumption within a given watershed. Within any given watershed, water is extracted from surface or groundwater sources and used for urban, industrial, or agricultural purposes; some of it then returns to rivers or seeps back into the ground. Only a share is actually consumed, mostly as evapotranspiration (ET) during plant growth. Allocation of water rights requires information on the amount that may be withdrawn; the amount that may be consumed (ET from irrigation); and the amount that must be returned to the local water system at a level of quality suitable for downstream users and ecological needs. If only extraction is monitored, as is common practice today, there is a severe risk of overexploitation of water resources. New methods using satellite remote sensing have made it much easier to monitor ET as a good

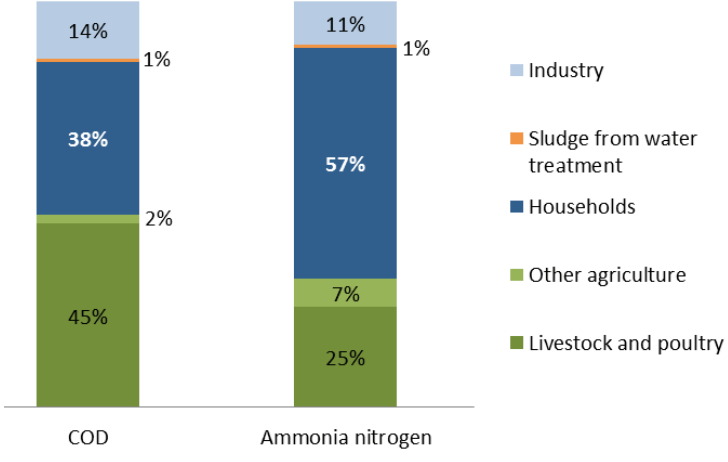
approximation to actual water consumption that could be the basis of an enhanced water withdrawal permitting system and in the future, potentially for water rights trading between sectors (World Bank 2013b).

In the medium term, a better understanding of virtual water flows—water that is embedded in traded goods—also helps identify opportunities for improving urban water supply. For example, water scarce Shanxi Province exports large quantities of virtual water to water-rich eastern China through trade of water-intensive products such as coal, metals, thermal power, and manufactured items (Li, Liu, and Liu 2011). At the same time, Shanxi imports virtual water in the form of agricultural products (153 million cubic meters in 2007, equivalent to over 2.5 percent of total water use), but unfortunately these come from even more water-scarce provinces such as Hebei, Shaanxi, and Xinjiang. In the Yellow River basin, in contrast, food for water trade between downstream provinces like Shandong and upstream provinces such as Ningxia presents win-win opportunities. Optimizing such flows, for instance by moving water-intensive agricultural production to water-rich areas or relying more on importing virtual water embedded in food products from international markets, would help increase water use efficiency and free up water resources for high-value urban uses.

Ensuring the quality of the water supply

Water scarcity compounds the problem of water quality, which is at the core of China's water-related challenges. As rivers and groundwater reservoirs shrink, pollution becomes less diluted and concentrations of effluents, and their impacts, rise. Problems include severe pollution incidents that may be causing "cancer villages" near polluted waterways, but also lower-level chronic pollution that affects health and increases urban water treatment costs. By some measures, water quality in China's major river basins actually shows small but steady improvement since 2001, thanks to investments in end-of-pipe controls for industry, although water quality continues to be far worse in the northern basins. Industrial pollution accounted for about 19 percent of chemical oxygen demand (COD, an indirect measure of organic pollutants in water) in 2010, declining to 14 percent in 2011. Discharges of wastewater from urban households, meanwhile, are growing and now account for 38 percent of COD in 2011 (figure 7.36). Yet, the largest share of COD comes mainly from nonpoint sources upstream of cities—mostly

FIGURE 7.36 Sources of main water pollutants, 2011



Source: MEP, "Total Emissions of Main Pollutants" (June 2012), http://jcs.mep.gov.cn/hjzl/zkgb/2011zkgb/201206/t20120606_231039.htm; MEP, "Waste Water," Environmental Statistics Report 2011 (March 2013), http://zls.mep.gov.cn/hjtj/nb/2011nb/201303/t20130327_249978.htm; MEP and MOA, 12th Five-Year Plan for Controlling Pollution from Livestock and Poultry Industry(全国畜禽养殖污染防治"十二五"规划) (November 2012).
Note: Share of livestock and poultry in total emissions is assumed to be the same in 2011 as in 2010.

BOX 7.19 Examples of cost-effective water treatment services provided to cities by natural ecosystems

Western Cape, South Africa: Removing thirsty invasive pine species from the Western Cape can reduce the unit costs of supplying water from facilities by $0.03 per cubic meter (2010 prices). Removing invasive species that used large amounts of scarce water was two to seven times cheaper than augmenting water supplies by treating effluence or desalinizing water (van Wilgen, Cowling, and Burgers 1996).

Bogota, Colombia: The city has saved $19.6 million in avoided costs for water filtration facilities thanks to wetlands above the city, which filter out contaminants and sediment in the city's water supply so well that only a chlorine treatment is needed for disinfection (Jones, Hole, and Zavaleta 2012).

Vientiane, Laos: Flood attenuation and wastewater treatment services provided by That Luang Marsh next to the capital city have saved an estimated $1.5 million in construction costs for sewage treatment infrastructure (Gerrard 2004).

Poyang Lake, China: Located in the heavily populated Yangtze River basin, the lake filters excess nutrients from the water, reducing sewage treatment costs by RMB 4.31 million each year (Zhao and others 2004).

Source: Sall and Brandon, forthcoming.

agricultural (also domestic)—and this share will likely increase (Guo and others 2012). Forty percent of Chinese rivers were seriously polluted and unfit for drinking water in 2010, and in 2011 the groundwater quality in more than half of 200 cities surveyed was rated "bad" (40.3 percent) or "extremely bad" (14.7 percent).[50] Groundwater pollution is especially worrying because it takes decades for polluted aquifers to recover. Also, there are now concerns in major urban centers about new kinds of pollutants such as medicine residues, micropollutants, and odor and taste pollutants (World Bank 2012c).

Treatment of water entering urban water supply systems is the most immediate way to ensure safe water, but with growing pollution loads accumulating upstream, that becomes increasingly more difficult and costly. Current utility charges are typically too low to fund the upgrading and operations of comprehensive water treatment. Reducing pollution of upstream water resources is thus an effective way to keep costs down and achieve greater water quality. Regulations of agricultural practices and industrial emissions such as technology and effluent standards will remain the main policy instruments. Market-based approaches can also be effective, although pollution rights trading is even more difficult to implement for water than for air, in large part because both the pollutants and the impacts are more varied (Olmstead 2010a, 2010b). Damages depend considerably on local conditions such as how quickly pollutants mix and disperse with large quantities of water.

Downstream water users such as municipalities can also compensate upstream areas for maintaining higher water quality by preserving forests and wetlands or reducing agricultural runoff. Such payments for ecological or environmental services (PES) can often achieve water quality targets at lower costs than additional treatment. Famously, New York City saved $6 billion in construction costs and $300 million in annual operating costs for a new water filtration plant by investing $1.5 billion over 10 years in conservation of the upstream Catskills watershed, where it sources 90 percent of its water. Stakeholders included state and federal agencies, environmental groups, and some 70 towns and villages. It reportedly took about 150 meetings to achieve agreement (Postel and Thompson 2005; Salzman 2009). Many such schemes have

[50] "China's underground water in poor condition," Gov.CN (Chinese Government's Official Web Portal), May 10, 2012, http://english.gov.cn/2012-05/10/content_2134183.htm.

now been introduced, including in China (box 7.19), but they are difficult to implement under the current fiscal system. PES requires transfers across municipal boundaries and to stakeholders who in turn must use the funds for intended purposes. This process requires competent and transparent monitoring. Nevertheless, PES programs represent an innovative strategy to rectify market failures and also to help address financial constraints faced by rural areas.

While maintaining the quality of upstream water sources for cities remains a major challenge, China has made significant progress in improving urban waste water treatment. Coverage improved from 46 percent in 2004 to 84 percent in 2011 according to NBS data, and the 12th Five-Year Plan includes RMB 380 billion for investing in urban wastewater treatment and expanding water quality monitoring stations.[51] Those central government transfers should be accompanied by a greater emphasis on cost recovery. Low tariffs weaken incentives to achieve the government's widely publicized water saving objectives. Even in better-performing cities like Beijing where the wastewater treatment tariff has already been increased to about 26 percent of the water price, the fee barely covers the cost of treatment and weakens incentives to decrease wastewater. Cost savings could be achieved in smaller municipalities by aggregating water treatment services into a competitive concession or lease arrangement where one utility serves multiple cities. This is a longstanding practice in many countries. Likewise, wastewater should be managed as a network utility business by integrating drainage and treatment management and charging users for drainage services rather than considering them as a public service. About two-thirds of the investment costs and about half of thte operational costs for wasyewater systems come from increasingly complex pipe networks and pumping stations across the city. Currently, wastewater utilities also have no control over industrial discharges into the municipal system, which can lead to overloading the drainage network and the treatment process. Incorporating drainage infrastructure as a part of a commercial or quasi-commercial operation of the treatment system can create the incentives to control and charge for industrial discharges.

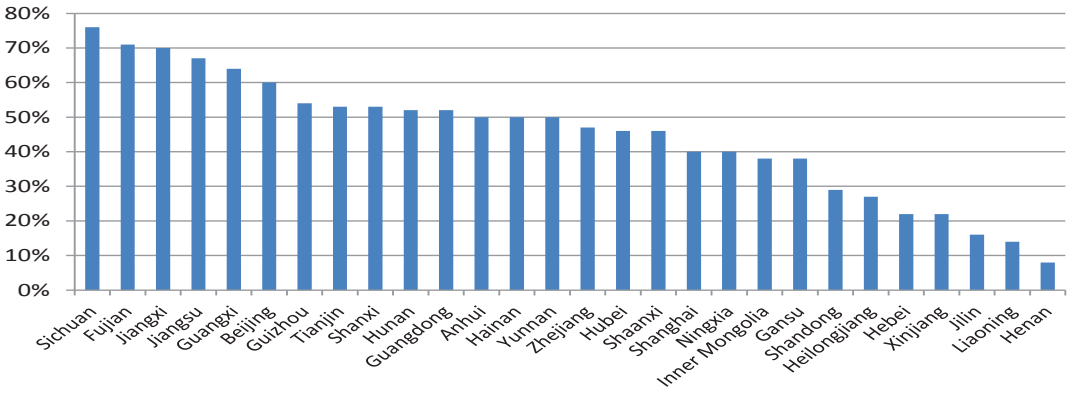
Better cost recovery in the water sector would also support implementation of tightened standards that could "leapfrog" to match those common in high-income countries. While many cities have the resources and capacity to achieve high water quality and treatment standards, some do not. China adopted ambitious new drinking-water standards, following WHO guidelines, in July 2012, but many cities do not have the technical means to monitor water quality according to those standards.[52] In addition, requirements issued in 2005 for expensive tertiary treatment for all municipal wastewater treatment plants (SEPA Circular No. 110) remain beyond the technical and financial capacity of many cities. Transitional arrangements for water treatment and wastewater standards could be introduced in cities with weaker capacities specifically to ensure full and efficient collection of wastewater. Cities and towns that cannot afford the Class 1 or 2 discharge standards (the top standards) could start by ensuring full collection of wastewater and low-cost treatment, with many technologies now available to come close to meeting Class 2 standards. Although this approach does lower standards, it can help to treat wastewater that would otherwise go untreated. Such arrangements need to be carefully monitored and understood to be part of the transition to full compliance.

Strengthening water sector institutions

In addition to continuing large investments in water infrastructure, achieving sustainable water supply for China's growing cities will also require institutional reforms. One priority is the reform of utility governance to strengthen the institutions that deliver urban water and treat wastewater and sewage. The other priority is the establishment of regional coordination mechanisms that can manage water allocations and implement measures to ensure water quality at the watershed or river basin level.

[51] This paragraph draws on Moore 2013 and World Bank 2012b.
[52] "China's New National Standard for Drinking Water Takes Effect," The Lancet Online, 380 (November 3, 2012).

FIGURE 7.37 Share of utilities with net positive margins, by province, 2009



Source: World Bank analysis and China Urban Water Statistical Yearbook 2009. No data available for Chongqing, Tibet, and Qinghai.

One aspect of utility governance, improved cost recovery by raising prices, has already been mentioned as an effective way to encourage water use efficiency. A World Bank analysis of China's urban water utilities from 2004 to 2009 showed weak cost recovery and difficulties with achieving greater self-financing of capital investments.[53] Only 44 percent of urban water utilities generated positive net margins, although this share varied by province (figure 7.37). Even the better performing utilities were operating at just above the breakeven point with only 10 percent generating net margins of over 10 percent (a healthy financial performance benchmark is 20 percent). The analysis also showed significant variations in utility financial performance across provinces and within provinces, suggesting that local government interventions do affect utility financial health. In addition, performance was not correlated with size in the sample. Smaller utilities can perform well with supportive tariff policies and competent management. Finally, while most utilities (84 percent) generated operating revenues that covered cash requirements for operations and maintenance, the ratios are razor thin and leave little surplus for capital investment. Further analysis of 27 utilities in 9 provinces between 2004 and 2009 showed that utilities' unit production costs rose on an annually compounded basis at least 5 percent and much more in some cases, so raising prices will be necessary to provide a predictable and sufficient source of revenue for utilities and make them less reliant on support from general revenue.

If urban utilities become more commercialized and autonomous, they will have incentives to solve some longstanding problems in the sector (Browder and others 2007; World Bank 2013b). Governance of the water sector is currently fragmented across different offices. To improve coordination, cities in some countries have created municipal "water boards" that coordinate and regulate their water sector. For instance, wastewater tariffs are currently often included in the water bill and collected by municipal water companies, which do not always make efforts to collect the wastewater bills. That also makes it difficult to collect wastewater charges from industries with their own water source. These two issues could be supervised by a water board—a mechanism that could be piloted in more advanced cities first. Members of these boards are typically appointed by city governments and have the power to make autonomous decisions or recommendations on key issues such as tariffs, budget transfers, and capital improvements.

As with air pollution, water supply and quality cannot be successfully managed at the level of an individual city or county only. Pollution and overextraction in the upper watershed affect

[53] The analysis was based on national statistical data, individual utility financial statements, data provided by the China Water Supply Association, and previous analysis for up to 699 utilities. Because of data constraints, not all findings covered all these utilities.

downstream users. Between 1995 and 1998, for instance, the Yellow River did not reach the sea because of excessive water extraction and as recently as 2009, 30 percent of the water in the Yellow River basin was unfit for human consumption, according to MEP. One regional coordination mechanism is an integrated water and environment management approach, which establishes a strategic framework at the river basin level for both water resources and environmental management. It brings together relevant ministries, local governments, major water users, and polluters. A pilot of the approach has been successfully tested in the Hai River Basin. It established a "joint decision-making conference" as a multistakeholder platform for debate and decision making among water users. These processes can reach consensus on water use targets and pollution controls, which are then allocated to the local administrations within the watershed. Without such an inclusive process and appropriate incentives, there may be less interest in staying within the targets as experienced in the Yellow River case, among others.

Finally, institutional reforms are also required at the administrative level. Water and environment management are split, with the water department in charge of water supply and water infrastructure in general, while the environment department is responsible for pollution control in general. Both have overlapping areas of responsibility for water quality control. A further problem is that each department has its own institutional and monitoring system and there is no culture of data sharing. No data sharing among related government departments can lead to disagreements and misunderstandings. Streamlining of responsibilities and greater incentives for cooperation and collaboration and information exchange, piloted in some parts of China, would contribute to achieving national water sector objectives.

Improved solid waste management

As incomes rise and more citizens join the urban consumer society, waste volumes in Chinese cities are growing rapidly. The estimated solid waste volume generated in China, including recyclables that are separately collected, was 346 million tons in 2011 (table 7.3), about twice the amount in 2000. Urban residents make up about 55 percent of the population but generate about 80 percent of the total waste amount, or 1.1 kilogram of waste a day, compared with 0.3 kilogram for rural citizens. The average of 0.7 kilogram is similar to other large world cities at comparable incomes. Waste volumes will likely double again by 2030. To ensure a sustainable waste management sector in China's growing cities, collection fees need to rise to full

TABLE 7.3 Estimated waste generation levels and main outlets in China, 2011

Population	Total waste generated by households (ton/y)	Total waste formally collected & transported (ton/y)	Total waste not collected (ton/y)	Total waste separately collected (=recyclables) (ton/y)	Total waste disposal in harmless manner (sanitary landfill/ incinerator/ composted) (ton/y)	Total waste not properly collected / disposed (ton/y)	Kilograms of waste generated/ person/ day
Urban							
722 million (55%)	281 million	219 million	14 million (50% of waste in towns)	48 million (20%)	177 million[1]	56 million	1.07
Rural							
578 million (45%)	65 million	18 million[5]	41 million	6.5 million (10%)	9 million (no data, estimate 14% of total; 50% of waste collected)	49.5 million	0.31
Total							
1.3 billion	346 million	237 million	55 million	54.5 million	186 million (cities 131; counties 46; towns+villages 9)	106 million	0.73

Source: NBS 2011a; statistical data from cities and county towns, estimates for towns, and calculations by the authors.

coverage everywhere, waste segregation and recycling must be improved, and safe disposal of the remaining waste ensured.

Achieving these objectives will also require changing the way waste management is financed. Municipal waste management has high marginal operating costs and is therefore different from other services such as water supply and sewage collection, which have high fixed up-front costs but relatively lower operating costs (Hoornweg and Bhada-Tata 2012). Comparable costs in China vary widely. For example, in Shanghai rates are RMB 120 a ton for collection and transport and RMB 90 a ton for disposal in landfill or RMB 240 a ton for incineration. In Kunming, rates are RMB 90 a ton for collection and transport and RMB 90 a ton for incineration.

Despite high operational costs, households are typically not charged for formal waste removal. Instead, costs are covered through general spending. Waste management is therefore underfunded in many cities, leading to poor performance. For example, incinerators with insufficient gate fees often operate with low temperatures and bad flue gas treatment, leading to environmental problems. Total national waste management fees were only RMB 4.4 billion in 2011, while national investment in fixed assets for waste treatment was RMB 19.9 billion and, assuming overall management costs (collection, transfer and transport, final disposal) of at least RMB 250 a ton, total municipal solid waste costs were likely no less than RMB 40 billion in 2011 for formal cities. These costs are expected to increase tenfold by 2030. A more sustainable financing model would follow international practice in high-income countries and charge households and firms the full cost of waste management, even if charges are combined with those for other utilities to ease administration. Such explicit charges would also encourage reduction of waste generation.

Improving the efficiency of municipal solid waste management

About 70 percent of the waste is currently formally collected in China and an estimated 54 percent of the total waste is adequately disposed of in sanitary landfills, incinerators, or composting plants. Average waste collection coverage ranges widely, from approximately 20 percent in rural areas to nearly full coverage in many big cities. The volume of waste incinerated (26 million tons in 2011) has increased rapidly. Another 15 percent is recycled. The remaining waste (about one-third of the total amount generated) that is not disposed of properly or collected as recyclables, is burned, dumped, or disposed of without special environmental controls.

Formally segregation of waste at source organized by local authorities is still rare, but a large informal sector collects and processes valuable recyclables (such as metals, plastics, paper, and appliances). This sector provides income for low-skilled city dwellers, but makes formal recycling of collected waste less profitable. Cities that seek to formalize these systems could integrate currently informal systems or aid informal waste collectors in finding alternative livelihoods. In the longer term, China could adapt European models of product stewardship at both national and local level. In such schemes, manufacturers consider the waste implications along the full life-cycle chain of their products, including the use of packaging materials and the final disposal of the product at the end of its useful life. The government could collaborate with industrial sector organizations and introduce voluntarily schemes and incentives that could eventually lead to mandatory regulations.

Besides raising the collection and recycling rates, better overall planning and management will boost sector efficiency. First, adopting international practices for master planning of integrated solid waste management systems will avoid overbuilding some parts of the waste management chain and neglecting others. To properly function, the various parts of the waste management chain (collection, transfer, transport, final disposal) need to be well matched and synchronized. Second, introduction of international data monitoring and financial accounting practices for solid waste management would better reveal the true costs of the waste management chain. About 50 percent of waste volumes are estimated simply by truck counting, meaning that large volumes of waste streams are poorly recorded, and tools for analysis at the

national level are inadequate. Accounting practices are also often insufficient. Even at the local level there is generally little insight into the capital and operating costs of all the components in the waste management chain. As a consequence, costs are routinely underestimated. Finally, better planning could yield greater economies of scale. Smaller cities, where geographically possible, could cooperate with adjacent jurisdictions to develop more efficient and well-operated waste management facilities such as landfills or incinerators. Unfortunately, despite the potential cost savings, such cooperation is still uncommon in China.

Reducing pollution impacts from municipal solid waste disposal

More efficient management can greatly reduce, but not eliminate, the amount of waste produced in China that requires disposal. Municipal waste disposal is a challenge for many local governments because volumes are rising and land is scarce. To improve the waste disposal system and reduce its environmental impacts, the national and local governments need to implement improvements across the entire waste chain—many of which have already been outlined in the 12th Five-Year Plan. One priority is to streamline administration by introducing greater independence and accountability for local EPB staff charged with oversight, clarify the roles between the Ministries (or Bureaus at local level) of Housing, Urban and Rural Development and of Environmental Protection, and reform technical standards and sector guidelines. As an example of the need for better standards and enforcement, during incinerator operation there is often no proper testing, treatment, or disposal of fly and bottom ashes, which causes local pollution problems. Beijing provides a good model for an improved waste disposal system. The city has invested in greater supervision of landfill and incineration operations with an institution responsible for monthly inspections. It developed standards for inspection and assessment of operational performance, which have resulted in improved environmental performance.

Cities should also integrate waste management facilities into land use planning. In the planning process, environmental impact assessments and permitting are currently treated as a formality rather than a regulatory tool. China currently also lacks hydrogeological information and know-how of contaminant hydrogeology, and these factors are therefore not sufficiently considered in landfill site selection and design. Finally, local governments need to properly rehabilitate or close unsanitary landfills in a way that minimizes long-term environmental impacts and allows eventual return of the land to productive uses. Some cities, such as Beijing and Wenzhou, have completely removed old waste disposal sites by excavating the waste, sorting it, and then transporting the light portion to a newly built sanitary landfill or incinerator. The remaining soil with some organic humus can then be used in gardens and parks. The cost of this restoration could be paid for from the increased land value of the site after it has been cleaned up for redevelopment.

A more sustainable waste management sector

At current growth projections, proposals for continued investments of RMB 264 billion for solid waste management are in line with the ambitions to reach satisfactory levels of waste collection, develop sufficient waste disposal outlets that meet international good practice standards, and introduce waste minimization and recycling schemes. The key challenge will be to match the investments with the operational budgets needed to manage these waste systems and to gradually move toward greater cost recovery through user charges for these services. Fees currently make up only about 10 percent of the RMB 40 billion needed to run waste operations, and these costs will further increase substantially due to the planned investments, the growth in GDP, and the urbanization process.

Cities where a billion people want to live and work

Three decades of economic growth brought great welfare improvements to China, but at the cost of unsustainable resource consumption and pollution. China's leaders have recognized that resource depletion and pollution have become a costly barrier to further development. And with rising prosperity, China's urban residents expect a future that includes clear water and blue skies. The ultimate causes of China's environmental problems are institutional rather than technical. The main problems are inadequate resources, ineffective organization, limited channels for public participation, and insufficient incentives for environmental management. China's leaders can strengthen green governance by focusing on the following reforms that have been discussed in this report:

- Increase resources and enhance authority for environmental management to support more staff who promote greening and enforce environmental rules. Strengthen data collection and widely disseminate information to better monitor compliance, which is necessary regardless of the policy instruments used.
- Revise the cadre evaluation system, so local leaders have a greater incentive to pursue environmental objectives and focus on quality of life of their citizens, while allowing some flexibility to adapt green goals to local conditions.
- Allow greater public participation in holding polluters to account. Citizens, nongovernmental environmental groups, and the media can all assist the government in ensuring that ambitious environmental rules are followed. Public disclosure of environmental performance shames companies into cleaning up. And the legal system can complement government enforcement if current experiments with environmental courts and tribunals are expanded and formalized.
- Rebalance environmental policy instruments toward more market-based tools such as taxes and trading systems, possibly for carbon and energy use if appropriate measurement and verification systems can be established and new mechanisms calibrated with existing policies—while enforcing well-designed regulations where price signals are insufficient.

Without strengthening green governance, necessary changes in resource- and pollution-intensive sectors will be difficult, if not impossible, because it is the application of green governance principles in sector policies that will encourage cleaner and resource efficient growth. As this chapter has shown, local environmental agencies need greater resources to encourage greening and to ensure compliance with environmental rules in the energy, transport, buildings, water, and waste management sectors. In particular, water resource and air pollution management need regional management mechanisms. Public participation and stronger legal mechanisms are most important in holding polluters to account but will also help gain greater acceptance for efficiency investments.

Across all sectors, the basic principle for environmental policy design is to rely as much as possible on market or price instruments, which provide the incentives for firms and households to seek efficient ways to go green. China has raised some resource prices, but must also do so for others such as water. China is also exploring carbon taxes and carbon trading, and similar mechanisms could also work for water. Regulations will be effective where price instruments are not sufficient, for instance where harmful pollution must be urgently stopped or where behavioral issues blunt price instruments. Finally, in some cases, the government will need to provide investments or financial support, for instance to finance pilots and to collect and disseminate information about what works in resource efficiency and pollution control; or more directly to make public transit an attractive alternative or to make building energy investments financially viable.

Technical measures across the sectors that make firms and households more resource efficient and reduce pollution are known. The core message is that sustainable sector practices are compatible with green sector policies. Although there are important nonfinancial barriers, investments in efficiency tend to be financially cost-effective even when ignoring broader ecological and health benefits, but deeper efficiency improvements to achieve greener ambitions will need smart incentives and mandates. Pollution abatement is a cost to firms that essentially must pay for a service—removal of harmful byproducts into air, water, or soils—that they previously received for free. Nevertheless, many barriers still prevent these measures from happening, and a combination of both enforced regulation as well as market-based approaches is needed. But the high social benefits justify the imposition of stricter emission standards, and firms can often achieve pollution reductions most cheaply through efficiency improvements or productivity enhancing capital upgrading.

China could also find it easier to make needed sector investments than many other emerging and developing countries that face severe environmental problems. It has the technical expertise among academics and professionals and a growing green industrial sector that can supply the needed technology. As *China 2030* report pointed out, there are large business opportunities in an ambitious green transformation. Countries such as Germany have shown that rising environmental standards encourage domestic industries to innovate, developing clean technology that is now exported around the world. Despite the needed rebalancing of the economy away from low-value industries, China will retain a large manufacturing sector. The examples of Germany, Switzerland, and Sweden, but also the Republic of Korea, for instance, shows that this rebalancing can be compatible with becoming a green growth leader whose cities top quality-of-life rankings.

Annex 7A Smart Greening

The foundation of green governance is credible, transparent, and publicly available data. With China's cities collectively growing by about 15 million people a year, traditional city management methods are being challenged. This report proposes some new approaches, but the lifeblood of new management methods will be data and how it is used. Improved data collection, management and dissemination should be able to improve the carrying capacity of cities' growing populations. There is no universal definition of a "smart"' city, but greater use of information technology (IT) can benefit cities by:

Promoting a more service-oriented government, moving away from traditional command and control approaches. Smart infrastructure moves information in both directions between government and its citizens. Two-way communication improves interaction and proactivity, and develops greater understanding. For instance, applications of smart technologies could reduce traffic congestion by providing greater logistical information and knowledge to travelers. Social media can help disseminate information in the public's interest and promote environmental awareness, while at the same time allowing for feedback in near real time.

Stimulating innovation in high-tech and information technologies. Information technologies as simple as metering and information systems can transform an industry like district heating through consumption-based billing or distributed generation in the power sector.

Enhancing public services and people's quality of life. Because the market still does not deliver many public services, information asymmetry is prevalent. Applying e-commerce principles to e-government can deliver public services more efficiently to a large and growing urban population. Greater public disclosure of pollution discharges and air and water quality can support market-based approaches by raising people's awareness and stimulating demand for green lifestyles, services, and products. Vulnerable groups like the growing number of elderly residents will also stand to benefit from information on pollution to help them protect their health. Medical specialists could also be accessed through remote service models.

There are many examples of smart city applications. For instance, Singapore has relieved traffic congestion despite having nearly two cars per resident by implementing an electronic pricing system for traffic congestion. When the system was first put in place in 1998, data collection was done by person. Now, traffic is monitored by sensors and infrared equipment installed on roadways. With this real-time data, citizens can check traffic conditions using their mobile phones or on-board global positioning systems in vehicles. Average vehicle traffic dropped by about 25,000 vehicles during rush hours and traffic flow improved by 20 percent.

Cities worldwide have used different approaches to constructing smart technologies for cities ranging from government investment and operation to outsourcing. Full funding by government has applied mainly to services such as fire prevention and emergency warning systems that are supplied exclusively by public entities (as in New York). For other services such as video monitoring, some cities, such as Singapore, Hong Kong SAR, China, and Shenzhen, have handed over operations to commercial companies. In these cases, the government typically finances the capital investment and part of the operating costs while the operator's price is negotiated through a competitive bidding process. Cities vary as to how much risk and control of operations they pass onto commercial companies.

Because China is still far behind in collecting basic data for many public services, leapfrogging to a big-data, smart-city concept is still an ambitious prospect. At this initial stage, Chinese cities should study the experience of other cities—both at home and abroad—with big data systems. But there are some areas in which immediate action can and should be taken, for example in metering district heating and water use. Government guidance should be developed

to avoid impractical applications of data and plan ahead for how different systems might be integrated in the future. Currently, the highly fragmented nature of data collected for public services is a major challenge for Chinese cities. Planning for better integration can help cities realize synergies in realizing cross-sector objectives such as the integrated management of the environment and water resources. It also makes it possible to use a more complete set of indicators for assessing the progress of city management. Beyond data collection, investing in smart applications in public services can help to unleash efficiencies—but with technologies comes a need to ensure public service managers actually use these enhancements and act on them.

As they build smarter cities, local governments in China will need to walk a fine line between providing public oversight of e-services and data systems and constricting a highly innovative IT market. In many cases, the market has solved problems on its own. Value-added services such as mobile Internet apps to hail taxis or map current traffic have boomed without government support, reducing wait times and traffic congestion. Yet, even with greater use of IT technologies, the government will continue to play a very important role in traditional public services, especially to ensure appropriate data and reporting for regulated services. Incentives will be needed for adopting smarter systems especially in utilities such as heating and water, which tend to be more conservative and face financing constraints. Strict public oversight will be needed for services involving the use of sensitive information such as personal medical records. The government should ensure norms and standards for information security are clear and enforced while guarding against creating roadblocks where the disclosure of information is in the public interest, for example, in monitoring pollution or assessing environmental impacts of projects. With the right balance, local governments in China can create smart cities that are greener, more efficient, and better serve the people.

Annex 7B Illustrative Framework and Analytical Tools for Urban Energy and Emissions Reduction Planning

While traditional energy sector planning is essential, leading cities around the world have started to coordinate these traditional sectors to achieve specific, ambitious emission reduction objectives. As major consumers of both benefits of energy use and its environmental consequences, cities have an interest in least cost paths to accelerated greening. While there are many similar approaches, this annex illustrates a model framework for planning, drawing on the Sustainable Energy and Emissions Planning (SUEEP) process that was developed by the World Bank through its experience working with cities in its East Asia and Pacific Region (World Bank 2012) (figure 7B.1). It also highlights some methods and tools Chinese municipal authorities could use in managing their cities' energy use and associated emissions of pollution. It concludes by demonstrating the need for cross-sector approaches and identifying and overcoming challenges.

Securing commitment

A key piece of advice for the ambitious mayor preparing to set out on the energy and emissions planning process is to focus on creating the enabling conditions for planning (box 7B.1). As experts experienced in urban energy and emissions planning have noted, securing commitment by city leaders at the beginning of the planning process is another key to success. What this means is making sure relationships can be built across agencies and across sectors, which would not normally interact. Establishing trust between municipal stakeholders—including energy, transportation, construction, and environmental protection agencies—is needed to encourage

FIGURE 7B.1 An example of the energy and emissions planning process

Source: Based on World Bank (2012).

BOX 7B.1 New York PlaNYC 2030 case study: Integrated centralized planning relying on decentralized delivery

The population of America's largest city, New York City, is expected to grow by 1 million people by 2030 and will place additional stress on existing infrastructure and resources, including energy. Faced with this challenge, the city embarked on a long-term planning process called PlaNYC 2030 to devise strategies to reduce material and energy use, improve natural spaces, plan for and mitigate the effects of climate change, and create a more equitable and engaged society. Strategies were designed and are being executed by a joint task force, led by a specially designated mayoral office and comprised of 25 city departments and stakeholders from state and federal agencies, businesses, and non-profit groups. To strengthen local ownership of the plan, the task force has engaged in media outreach efforts and offered incentives and support to encourage active participation by local business owners and residents, including grant programs and changes in zoning codes intended to create new development opportunities (ICLEI-NYC 2010). The plan is now in its fourth year of implementation.

The energy and emissions strategy for PlaNYC is focused on achieving a goal of reducing city-wide GHG emissions by 30 percent in 2030 compared to 2005. Because buildings contribute to 75 percent of the city's total carbon emissions, PlaNYC has kick-started a number ambitious programs and policies to improve energy efficiency in the city's building stock. This buildings effort has two major elements: the promulgation of new laws (together called the Green, Greater Buildings Plan [GGBP]) and the formation of the 200-person Green Codes Task Force (GCTF) to recommend code and other reforms to reduce a number of environmental impacts of buildings (i.e., not just energy use) (NYC 2011). The GGPB requires regular energy audits, retro-commissioning, and data sharing for large public and private buildings; lighting upgrades; and sub-metering of government buildings and commercial tenant spaces. These measures will impact more than half of the space in 16,000 buildings in the city. To ensure compliance, procedural incentives exempt from retro-commissioning and audits buildings that adopt measures early or comply with LEED for Existing Buildings, a revolving retrofit loan fund has been created with federal stimulus funds, and the City is forming a large ESCO.

So far, the city is making notable progress in implementing the GGPB and PlaNYC. The city estimates that nearly 70 percent of private building owners have submitted energy use data (Levine and others 2012), energy-efficiency program funding has increased six-fold in recent years, and 10 percent of the city budget is now committed to energy efficiency. The city plans to further increase energy efficiency investments through public contracting (ICLEI-NYC 2010; NYC 2011) and to roll out new programs for efficiency improvements in small and medium buildings.

Source: Adapted from Zhou and Williams 2013.

them to share their data, time, and resources. Involve these stakeholders at an early stage is also important because they will eventually be responsible for carrying out recommended actions.[54]

Diagnostics and benchmarking

Diagnostics entail an assessment of how well the city is currently doing and where it could do better. Elements of conducting a baseline assessment include selection of indicators, a bottom-up inventory of energy use and GHG emissions, and benchmarking to identify under-performing sectors and potential opportunities for improvement.

Hundreds of cities around China have put forward goals for becoming green, low carbon, or eco-friendly (*sheng tai*), but what it actually means to be a green, low-carbon, or eco-city

[54] Author's interview with Zhou Nan and Lynn Price, Lawrence Berkeley National Laboratory, August 1, 2013; interview with Pedzi Makumbe, World Bank ESMAP, July 29, 2013.

TABLE 7B.1 "Green" and "low-carbon" indicators for the transport sector in Chinese cities

Indicator	Benchmark	Source
Public transit network penetration *(km of network per km^2 of city area)*	4 km/km^2	Upper end of China national target for transport planning (Code GB 50220-95)
Share of public transit trips in total passenger trips *(%)*	60%	12FYP for Transport System target for cities with 10 million people or more
Access to public transportation *(share of built area within 500 meters of public transit)*	90%	MOHURD public transportation demonstration project
Municipal fleet improvement (*portion of electric, hybrid, biofuel, and compact [<1.6 L] cars in public vehicle and taxi fleet*)	100%	Lawrence Berkeley National Laboratory expert team assessment

Source: Drawn from indicators included in the ELITE Cities benchmarking tool for Chinese cities (He and others 2013).

is much less clear in practice (Price and others 2013; Zhou and Williams 2013).[55] Indicators bring operational clarity to goals and provide a concrete basis for cities to measure baseline performance, compare their performance against that of peer cities or best-practice standards, evaluate their potential for improvement, establish targets, and assess their progress over time.

Aggregated indicators such as energy use per unit of GDP and per capita CO_2 emissions are commonly used to evaluate provincial and local city governments in reducing their energy use and emissions. While these top-down, macro-level indicators give a sense of a city's overall progress, they do not provide a detailed picture of which sectors are most responsible for energy end use and emissions by the city. Also, overall measures may be biased by the structure of the urban economy, population, climate conditions, and other factors, creating the need for bottom-up, sector-level indicators of energy end-use and emissions (Price and others 2013; Zhou and others 2012). Examples of bottom-up indicators for the urban transport sector and proposed benchmarks are shown in (table 7B.1).

Target setting and prioritizing actions

Once reliable data and measurements are obtained, and key problems identified, strategic objectives and goals can be determined. Understanding the technical feasibility and incremental costs of abatement measures will help establish the technical and affordable abatement potential cities can strive for. Do cities promote micro-turbines or rooftop solar PV, or do they place their efforts more on importing green electricity? These questions can be answered through this process, but with strong technical support from sector specialists who understand the specific resource potential for cities.

[55] Indeed, this problem is not unique to China, as Zhou and Williams (2013) have written in their extensive review of eco-city and low-carbon city concepts and indicators. For words of caution on the need to clarify low-carbon city goals in China, see Zhang Xuan, "200 Cities Propose Establishing Low-Carbon City Targets, Blind Development of Targets is a Risk" (200城市提出建设低碳城市目标 或陷盲目发展误区). People's Daily (人民日报), June 11, 2012, http://npc.people.com.cn/GB/18138478.html (accessed December 2013); and "Li Xun: Concept Unclear, Many Low-Carbon Cities Are Only Low-Carbon in Name" (李迅：概念模糊 低碳城市多为伪低碳), Caijing Magazine (财经杂志), September 2, 2011," http://www.caijing.com.cn/2011-09-02/110838876.html (accessed December 2013).

Changning District in Shanghai offers an example of priority setting for energy planning based on strong analytics (box 7B.2; World Bank ESMAP 2013). Having identified potential energy savings and measures for reducing carbon emissions, experts grouped options into three categories:

- "D*o it now*" or "*no-regret*" options that are low-cost and are easy to implement
- Options to "*start now, then accelerate*" that are either low-cost but difficult to implement or higher-cost but easy to implement which can be piloted now and then scaled up over the medium term as technologies mature
- Options to "*develop now, and capture over time*" that come with high costs and significant implementation challenges but have high abatement potential, which can be studied and possibly piloted

Making use of these options, scenarios were developed to assess how far the city could "stretch" to achieve carbon emission reductions beyond baseline targets in the current Five-Year-Plan and become a leader for low-carbon city development.

Critically, stakeholder consultations are especially important to establish needed buy in from citizens, businesses and other concerned parties whose understanding and support will be needed for implementation. Feedback on targets, program design, affordability, implementing arrangements and so on can be extremely valuable in obtaining buy in to especially ambitious agendas.

Implementing, monitoring and reviewing

The quality of the monitoring and reporting process will largely depend on the quality of the data and indicators chosen. Periodic monitoring and reporting can sound mundane but it is essential to providing feedback and calibrating decisions. Cities should establish a mechanism that is suitable to local conditions and mobilizes timely action using the information that is gather. Online monitoring tools and public disclosure of progress helps to provide needed information that is in the public interest and develops and understanding, shoring up support for the abatement measures.

Tools to assist in the planning process

A variety of tools have been developed to assist city leaders in the process of urban energy planning. Diagnostic tools which help cities evaluate their performance include the Urban RAM and ELITE Cities tools. Urban RAM (Urban Rapid Assessment Model) evaluates final energy use by consumers in the transportation, residential, and commercial buildings sectors, as well as the embodied energy use in urban infrastructure and consumer goods (Fridley and others 2012). The tool's explicit accounting of energy embodied in consumer goods reveals the importance of purchasing habits and behavioral changes in shaping a city's energy and carbon footprint; however, it does not cover energy use and GHG emissions by industry, the dominant urban sector. Urban RAM has been piloted in Suzhou City. ELITE Cities (Eco and Low-Carbo Indicator Tool for Evaluating Cities) is a light-touch benchmarking tool that, like Urban RAM, was also developed specially for use by Chinese cities (He and others 2013). ELITE Cities is built on a system of indicators for climate, water, air waste, mobility, economic health, land use, and social health that enable cities to compare their performance against national standards, targets, and best-practice levels of cities in China and abroad.

Energy mapping for neighborhood and city-level spatial plans is another example of a cross-sector methodology. Energy mapping enables cities to identify opportunities for harvesting local energy supplies and utilizing flows of "waste" energy. For example, to assist the Hart van Zuid District of Rotterdam in realizing goals for becoming carbon neutral, energy planners

BOX 7B.2 Heat cascading in the Rotterdam Energy Approach and Planning

The Rotterdam Energy Approach and Planning (REAP) is part of the Rotterdam Climate Initiative, which aims to halve the level of CO2 emissions in the city by 2025, compared to 1990 levels. This is an ambitious plan which requires ambitious actions in terms of urban energy planning. REAP rests upon a simple concept based on re-using waste flows such as wastewater, household and agricultural waste, and residual heat, whilst using renewable energy to satisfy remaining demand.

REAP incentivizes urban planners to comb urban areas looking for opportunities to exchange energy. For instance, in the area of Rotterdam near the World Trade Centre, many new homes, offices and a second shopping mall and supermarkets are all forthcoming. All of these buildings have their own heating and cooling needs and produce residual energy flows that can be "exchanged." For instance, supermarkets must continually operate cooling systems which produce huge amounts of heat that, if not reused, simply disappears into the atmosphere. Within the REAP framework, heat pumps transfer this residual heat to nearby homes and buildings. This principle of heat cascading also allows for the exchange of heat between offices and homes. On hot days, for instance, office air conditioning units roar into action, yet the heat that is produced in this process is wasted. Within the REAP framework, this heat is stored, for instance in underground aquifer layers (heat and cold storage) for inter-seasonal exchange (and then used to heat homes during the winter months) or in tanks for covering diurnal or weekly differences.

REAP strategy was applied in Hart van Zuid, an existing district in Rotterdam, where urban planning calls for homes (to be built near a shopping centre), which can use the residual heat generated by a local supermarket. The Ikazia Hospital, which is located nearby and consumes huge amounts of energy, is also being modified to be energy self-dependent by reclaiming heat from residual hot air and water, while also becoming much better insulated by means of an overarching climate façade which resembles a huge greenhouse covered in vegetation.

REAP framework requires a substantial amount of infrastructure changes. For instance, small communal facilities must be built to store and redistribute energy. Moreover, heat pumps and heat storage systems are needed for counter-balancing daily and seasonal temperature changes.

The following steps are implemented:

Step 00. Make an inventory of the current energy consumption.

Step 01. Reduce consumption. New functions will be added: 20, 000 square meters shops, 6,000 square meter supermarket. Theatre Zuidplein and the infrastructure intersection will be renewed. Better insulation of the existing shopping centre will in itself already significantly improve the situation.

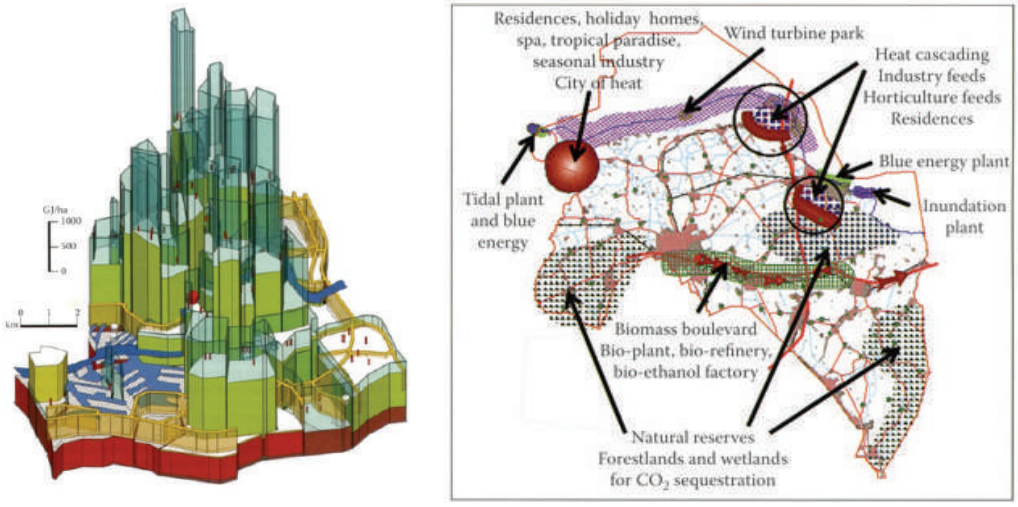
Step 02. Reuse of waste streams. The addition of housing will create a better heat-cold balance. The use of the waste heat generated by the supermarket and the typical morning and evening energy consumption in homes means that the match is perfect: 1 square meter supermarket can heat 7square meters of housing. If 665 apartments are added, the heat-cold ratio becomes 1:1,08 assuming that use is made of heat and cold storage.

Step 03. Renewable energy generation. The remaining demand for heat can be solved by the addition of greenhouses on the first floor, these could be public areas (or greenhouses for growing tomatoes) or by the addition of PVT-panels. PV panels could also be installed on the roof to supply electricity for the whole shopping centre. The remaining energy required could be sustainably generated at a higher scale level.

Source: Salat 2013.

used heat mapping to evaluate the possibility of recycling streams of waste heat from a new ice skating rink to supply a nearby swimming pool (box 7B.2). By reducing the pool's heating demand, planners found that it was possible to supply the residual demand for heat in the neighborhood by installing rooftop solar collectors on buildings (van den Dobbelsteen and others 2012). Additional examples of district-scale energy mapping by Dutch cities are illustrated in figure 7B.2. In the left panel, columns are filled according to the potential for local energy

FIGURE 7B.2 Examples of energy potential mapping from the Netherlands, Rotterdam (left) and Groningen (right)



Source: Broersma and others 2010 (left), and Dobbelsteeen and Stremke 2012 (right).

supplies in Rotterdam, including geothermal energy, biomass and solar energy, to satisfy heat demand. This method of energy mapping allows for city planners to incorporate local energy supply strategies into spatial planning for urban development, as shown for Groningen in the right panel.

Other tools link diagnostics with target setting and prioritizing actions, such as TRACE (Tool for Rapid Assessment of City Energy).56 Developed by the World Bank's ESMAP, TRACE is intended to assist cities with developing a portfolio of strategies for reducing energy use in six municipal sectors: passenger transport, municipal buildings, water and wastewater, public lighting, solid waste, and power and heat. TRACE enables cities to identify underperforming sectors, evaluate their potential for improvement, and select priorities for action among a menu of proven, cost-reducing measures for improving energy efficiency. Twenty-three cities around the world have deployed TRACE so far, including Rio de Janeiro, which is hosting the 2014 FIFA World Cup and 2016 Olympics, and Belo Horizonte, which is also hosting the 2014 FIFA World Cup. Outputs from TRACE have provided grounding for a US$ 100-million energy-efficiency investment program by the World Bank in the two cities. The Lawrence Berkeley National Laboratory is tailoring a new tool, built on the framework of TRACE, designed specifically for Chinese cities (box 7B.3).

Like TRACE and BEST-Low Carbon Cities, the MACTool (Marginal Abatement Cost Tool) assists cities with baseline diagnostics, setting targets, and prioritizing actions.57 MACTool compares the CO_2 abatement potentials and costs of deploying a suite of mitigation technologies, allowing users to construct a marginal cost curve for CO2 emissions reductions. National and subnational governments have used MACTool for estimating break-even carbon prices in setting up carbon ETS schemes. Shanghai City's Changning District has piloted and adapted the underlying methodology behind the MACTool for use in China. Other innovative examples of tools being tailored specifically for Chinese cities include the development of a simplified city-

[56] World Bank ESMAP, "Tool for Rapid Assessment of City Energy: Helping Cities Use Energy Efficiently," https://www.esmap.org/TRACE (accessed December 2013).
[57] World Bank ESMAP, "Modeling Tools and E-Learning," http://esmap.org/MACTool (accessed December 2013).

BOX 7B.3 Benchmarking and energy saving tool for low-carbon cities (BEST-Low Carbon Cities)

The Benchmarking and Energy Saving Tool for Low Carbon Cities (BEST-Low Carbon Cities), developed by the Lawrence Berkeley National Laboratory, is a decision-support tool designed to help city authorities in China identify and rank strategies that they can pursue improve city-wide energy efficiency and reduce carbon emissions.

Adapted from TRACE, BEST-Low Carbon Cities is intended to synthesize, package, and delivery best practices from around the world in a way that is relevant for Chinese city leaders. The BEST-Low Carbon Cities process begins with a quick assessment of a city's local energy use and carbon emissions in nine sectors: industry, public and commercial buildings, residential buildings, transportation, power and heat, street lighting, water & wastewater, solid waste, and urban green space. The addition of industry (which was not included in TRACE) is particularly important for China because industries account for 70 percent of urban energy use on average. Performance on key indicators is benchmarked against that of peer cities with similar climate conditions, populations, and levels of development, both inside and outside China, to identify sectors with the greatest potential for saving energy and reducing CO2 emissions. As with TRACE, BEST-Low Carbon Cities then allows city authorities to choose energy and carbon reducing measures from a "playbook" of proven options and to evaluate their appropriateness. By ranking strategies that yield the greatest reductions and are most suited to local circumstances, the tool helps local government officials to develop a low carbon city action plan that can be implemented in phases, over a multi-year timeframe.

Source: Adapted from Lawrence Berkeley National Laboratory description of BEST Low Carbon Cities and World Bank author's interview with Zhou Nan and Lynn Price, 1 August 2013.

level GHG accounting methodology and redesigned Long-range Energy Alternative Planning System (LEAP) by researchers at Renmin University, which they used to help Qingdao City craft a low-carbon development strategy (Wang and others 2012). The above is not an exhaustive list and other tools may suit specific circumstances (see table 7B.2 for illustrative examples of tools). Further tailoring China-specific tools can help improve the perceived credibility of these tools among city leaders and increase the likelihood that they are utilized.

Cross-sector approaches and methodologies for energy and emissions planning

Currently, there is a need for cross-sector planning approaches, methodologies, and tools that account for the interrelated effects of policy choices on energy, water, land, air, and waste in urban systems. Such tools can improve coordination of urban energy plans with master spatial plans and sector policies in industry, buildings, transport, health, water, and environmental protection. This section highlights two cross-sector approaches and methodologies that can be incorporated into urban energy and emissions planning: climate-friendly air quality management and spatial energy mapping.

"Climate-friendly" air quality management (AQM) aims to improve air quality and prevent dangerous climate change by pursuing concurrent reductions in traditional air pollutants and greenhouse gases (James and Schultz 2011, 1). Evidence from around the world supports that designing and implementing coordinated strategies for reducing local air pollution and greenhouse gases is more cost-effective and yields greater economic benefits than pursuing isolated strategies for controlling single pollutants. First, it is usually much cheaper for local governments and businesses to meet regulatory requirements for controlling criteria pollutants such as SO_2 and NO_x by investing in climate-friendly measures such as improvements in energy efficiency than focusing solely on end-of-pipe controls. The UNDP estimates that China can reduce the costs of meeting its air quality objectives by 60 percent and reduce local air pollution by an even greater margin if it integrates investments in energy efficiency, co-generation, and

TABLE 7B.2 Illustrative examples of tools to assist city leaders in developing low-carbon plans

Energy and Emissions Planning Tools	Process guide	Benchmarking		Scenarios	Target setting	Develop options for action			Implementation support
		Energy	CO_2			Identify	Cost/Impacts	Prioritize	
MAC Tool World Bank Energy Services Management Assistance Program (ESMAP)		•	•	•	•	•	•		
TRACE World Bank ESMAP	•	•			•	•	•	•	
BEST-Low Carbon Cities Lawrence Berkeley National Laboratory, US	•	•	•		•	•	•	•	
EFFECT World Bank ESMAP		•	•	•			• [b]		
Urban RAM Lawrence Berkeley National Laboratory, US		•	•						
SUEEP World Bank	•	•	•	• [a]	•	•	•	•	•
MCA4climate UNEP	•							•	
Climate Compass Compendium of Measures Climate Alliance						•			
A Guidebook for Low-Carbon Development at the Local Level Lawrence Berkeley National Laboratory, US	•					•	•		
Sustainable Energy Planning handbook UNHABITAT, ICLEI	•								•
ELITE Cities Lawrence Berkeley National Laboratory, US		•	•						

Notes: [a] scenario modeling is not one of the tools in the toolkit, al though the guidance document offers advice on considerations for creating scenarios; [b] marginal abatement costs analyzed for major energy using sectors under different scenarios, MAC curves can be created for technologies in industry sub-sectors

renewable power generation into local AQM programs (UNDP 2010). Second, accounting for both greenhouse gas mitigation and local AQM impacts can amplify the expected economic benefits of policy choices that may not appear to be cost-beneficial if impacts on local pollutants or greenhouse gases are considered in isolation. The United Kingdom's environmental agency estimated that measures to increase uptake of low-emission vehicles by consumers would cost around 72 million per year and provide annual benefits of 61 million from avoided air pollution. If avoided CO_2 emissions were also considered, however, total benefits would be around 163 million, a much better deal (UK DEFRA 2007, 12).

China's central government has already embraced the basic principles of climate-friendly AQM in calling for an integrated, multi-pollutant approach to reducing air pollution in key regions (James and Schulz 2011).[58] The main tasks for outline cities in the 12th Five-Year Plan for Prevention and Control of Air Pollution include measures with significant climate change co-benefits, such as expanding clean energy supply, limiting direct coal use, eliminating small and inefficient boilers, and encouraging cogeneration of heat and electricity (State Council 2012). New requirements for cities to develop AQM plans in the 12the Five-Year Plan—and mandatory targets for local governments to reduce their carbon intensity—thus present an opportunity. As they formulate their plans, cities in the key air pollution regions should seek to maximize co-benefits by beginning to consider the impacts of climate change mitigation as part of a multi-pollutant strategy. This requires a city greenhouse gas emissions inventory and an explicit accounting of climate co-benefits as part of the evaluation of abatement options. The accounting of climate co-benefits would in effect be an extension of the cost-benefit or cost-effectiveness analysis recommended by the World Bank and MEP for strengthening the AQM planning process under current ministry guidelines (see World Bank-MEP 2012). California's

[58] The State Council's Approval of the 12th Five-Year Plan for Air Pollution Prevention and Control in Key Regions calls for "coordinated actions to control multiple pollutants" and "strengthening holistic management of multiple pollutants" (State Council 2012).

BOX 7B.4 Climate-friendly air quality management planning in the San Francisco Bay Area

The Clean Air Plan issued by California's Bay Area Air Quality Management District (BAAQMD) in 2010 is the first AQM plan developed by a local public authority in the United States to take an integrated approach to air quality and climate change. The plan targets four categories of pollutants: ozone, $PM_{2.5}$, toxics, and greenhouse gases. The plan aims not only to meet federal and state air quality standards, but also sets long-term goals for reducing greenhouse gas emissions in the district to 1990 levels by 2020 and to 40 percent below 1990 levels by 2035. In developing the plan, the BAAQMD estimated public health impacts from air pollution in recent years and compared the health and climate protection benefits (expressed in dollar terms) of measures to reduce targeted pollutants under different scenarios. The analysis of abatement options included an evaluation of potential trade-offs for control measures that could reduce some pollutants while increasing others. In all, the district estimated that a 1 percent reduction in targeted pollutants would yield $202 million in health benefits, including $158 million in health benefits from avoided $PM_{2.5}$ and $29 million in climate protection benefits from avoided greenhouse gases.

Source: BAAQMD 2010.

San Francisco Bay Area offers an example of how local governments may take a multi-pollutant, climate-friendly approach to AQM planning (box 7B.4).

Identifying and overcoming challenges to urban energy and emissions reduction planning

Data availability is one of the main challenges preventing Chinese cities from using tools to develop low-carbon action plans.[59] Tools such as Urban RAM and MACTool have been piloted in larger Chinese cities with extensive resources and analytic capabilities, but may be more difficult to employ in smaller cities. Investing in technical capacity, including better data collection, monitoring, and reporting, is absolutely critical for cities to be able to manage their energy use and emissions and make informed decisions about reduction strategies. In addition, most local city governments—both small and large—will probably not develop their energy and emissions plans entirely on their own. They will likely seek outside help or out-source some of the key analytic tasks to experts. Thus, energy and emissions planning also depends on building up China's technical service industry and expanding public assistance programs for cities completing energy and emissions action plans

During implementation, finding champions of multi-sector solutions and then identifying financing to implement them are some of the challenges for getting actions off the ground. Examples presented in this report such as in New York City or Stockholm offer ideas for how city leaders could facilitate conversion of plans into actions. Public information of the plan and the objectives also helps to keep the agencies accountable for implementation. As in the case of Changning District in Shanghai, retrofitting commercial buildings would not happen on its own. A specific set of policy measures including targets and provision of financing through a World Bank loan were organized as a package of measures that are intended to facilitate implementation. Understanding the financial viability and nonfinancial barriers of the measures is critical for targeted and effective government support.

[59] Zhou Nan and Lynn Price, Lawrence Berkeley National Laboratory, interview with author, 1 August 2013.

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