



Eco-Development in the Chinese Context

4.1 CHINA'S URBANISATION ERA

China is undergoing the largest scale of urbanisation in history and at an unprecedented pace. Between 1991 and 2012, China's urban population has increased from 26.4% to 52.6% in percentage terms. The urban built areas have expanded from 12,856 to 45,566 square kilometres over the same period, an increase of 3.5 times in about two decades (China Statistical Yearbook 2013). Enormous new buildings around the country have been constructed to accommodate the increased population. In recent years, China has been adding about 1.7 billion square metres of new floor space on an annual basis (Li and Shui 2015). As illustrated by the Building Energy Conservation Centre (BECC) of Tsinghua University, the annual rate of new construction in China equals the total amount of new buildings in all developed countries (BECC 2009). Taking the annual addition to the residential building stock, the number has soared from 0.4 billion m² to approximately 0.7 billion m², a growth rate of 69% in the last decade.

In March 2014, China revealed a new blueprint to further expand urbanisation, which has been referred to as China's new urbanisation plan or strategy. For the first time, this blueprint includes and integrates debatable matters of human and social developments that are critical to China's growing urban population (Cheshmehzangi 2014). Despite the delay in developing such an urbanisation plan, the new strategies include fairer

conditions for rural-to-urban migration. The focus is a human-centric approach to urbanisation with a major emphasis on not only the urban but also the rural areas. The possibilities of giving access to public services and urban welfare are new in discussions and are opened up for gradual development; i.e., allowing the rural residents to migrate to cities in a gradual pace, including better benefits to access services. Having said this, there remains strong consideration about rural-to-urban migration with the enforcement of physical infrastructure development and industrial growth. The predicted figures for China's urban and rural population indicate China's consistent, but major influx of rural migrants to the cities. This is due in part to China's lack of investment and development in the rural and remote areas, leaving substantial social, cultural and economic gaps between rural and urban residents. This 'uneven development' (Smith 2010) is effectively a polarisation in capital, investment and income that can be argued as a global matter, yet is more significant for the case of China as the pace and scale are unprecedented.

Furthermore, the lack of public services and growing demand for the provision of daily needs in China's rural areas are becoming more apparent while the physical infrastructure is improving at the national level. Similar to many other developing countries, there is a perceptible decline in the rural areas of China, where social and economic attributes are more vulnerable. Therefore, the increasing influx of population to cities, if further characterised by a lack of structure and undetected mobility patterns, will result in severe challenges to the course of sustainable development.

Of all concerns about the role of the social sciences in urbanism in the case of China, we can refer to strategic plans that are shaping the course of national, regional and local development. It is certainly now clear that overspending on the physical infrastructure does not necessarily result in sustainable human development. A comprehensive socio-economic approach to development seems essential to the current phase of China's urbanisation. As a result, China is now expected to move towards a more structured approach bringing in together issues of urbanisation and urbanism. Therefore, it is essential to create opportunities for both the rural and the urban in order to reduce the burden from issues of rural-to-urban migration and approach towards human development. This complexity needs to get resolved along with the increasing public demand and the increasing gaps between the social classes. However, 'class struggles of some sort' is inevitable in such a process (Harvey 2013, p. 115). Strategically, the move towards human development and humane scale

approach to urbanisation requires huge force in bringing in disciplines in the social sciences and humanities. Although China is becoming a global role model as a result of its vibrant and thriving economic growth, it is still struggling with its own social and cultural aspects faced with rapid transformation(s) and even decline. China's ageing society and the growing demands from its rapidly increasing middle-class population remain as major concerns that may not allow China to be Asia's number one economic power (Cheshmehzangi 2014).

Given the current stage of China's growth and development, there is a certain need for urbanism with the support of the social sciences in making it sustainable. The change and reform in policies and development are the major mechanisms to address this need. For instance, the current urban-biased economic policies and the widespread extent of urban-rural inequalities, as discussed by Lu and Chen (2006), are issues that can only be resolved through the development of comprehensive social security and structured strategic plans. The disparities between China's rural and urban populations are not only limited to economic policies but also related to the urban-rural income gap (Yao 2005), the levels of investment and education (Wan et al. 2006) and labour allocation matters (Yang and Zhou 1999). Taking into consideration of the income disparities between rural and urban populations, we can refer to Lu's study (2002) on how this affects growth, allocative efficiency and local growth welfare; none of which can be resolved without a considerable input from the social sciences. In this respect, Yao (2005) discusses that a 'non-equilibrium financial development in China may lead to negative economic consequences', resulting in even larger gaps between different social classes and backgrounds in the country (mainly between the rural and the urban). Hence, some unprecedented challenges are currently escalating in China as they become worrying indicators for economists, local governments and policy makers. Some of these challenges have been under discussion and debate over recent few decades, including: changes in labour productivity between different sectors (Nolan and White 1984); issues of public policy on migration (Wong 1994); the threshold effect of income inequality on China's real level of economic development (Wang and Ouyang 2008); and impacts on urbanisation of the heavy-industry-oriented development strategy (Lin and Chen 2011). Alongside these already itemised challenges, the author aims to explore China's current and forthcoming challenges as part of the new urbanisation phase.

4.2 TOWARDS A COMPREHENSIVE DEVELOPMENT MODEL

4.2.1 *China's Challenges of Urban Growth and Urbanisation: Lessons for the Future*

China's new urbanisation is currently facing three major challenges: (1) rural decline under conditions of increased urbanisation; (2) over-urbanisation in coastal areas; and (3) unbalanced development for small and medium-sized cities (from the conclusion session of the EU–China Event on Urban Innovation 2013, Foshan, China). These three challenges bring about social pressures, such as social inequalities and social decline, calling for the development of social sustainability. The move towards one billion urban residents by 2030 (McKinsey 2009) indicates substantial pressure on China's future urban growth and urbanisation. Therefore, China's trend for urbanisation will require a more holistic approach than has taken place since the 1980s (Cheshmehzangi 2014).

The opening speeches by several mayors of Chinese cities in the major 'EU–China Urban Innovation Event' in May 2013 indicate three overlapping aspects: (1) People; (2) Land; and (3) Income. These three elements are the main pillars of the new phase for China's urbanisation. People, central to the current reforms, can boost China's growth by increasing the consumption. This is simultaneously a major challenge for local governments with pressures on expenditure and further demands for investment. However, in the coming years the main challenge will remain on development of mechanisms for the new urban residents, principally those who have migrated from rural areas. Through the gradual reform of the Hukou system (i.e., the official record of household registration in a government system in China), it is anticipated that a better balance should be achieved between living qualities, social development and migration. Similarly, land will play a significant role in China's new urbanisation. Cities will have to develop a better scientific understanding of urbanisation and urban growth, enabling them to become more inclusive, prosperous and international. The internationalisation of major cities and regional urban competitiveness will remain vital to development of thriving urban hubs in the country. Yet the forthcoming reforms should include substantial planning changes, such as: land use reforms (e.g., land ownership in particular); the integration of land issues with growing environmental concerns (e.g., global warming, exploitation of resources and pollution); and agricultural production and ecological matters (e.g., production and efficiency of food

supply and ecological protection). Lastly, the issue of investment and how income is generated and raised in comparison with the global figures will remain a principal aspect of China's new process of urbanisation. The major demand will be for institutional innovation and the development of public services, realising a balance for development of a fair pricing mechanism. The marketisation for both local and international markets will remain imperative in indicating how some of the urbanisation issues can be resolved over time. To sum up all three aspects, the forthcoming actions will require focusing on understanding people's needs, investing in social development and achieving a more harmonious approach to urbanisation. The pace of urbanisation may fall as the above challenges become more significant at certain times and/or certain parts of the country. The approach to urbanisation will require a holistic understanding to be achieved at both macro and micro levels, introducing considerable reforms, and supporting both communities and the local governments. The lessons learnt from the past will prioritise major aspects of environmental, agricultural and ecological importance in urbanisation and will be embedded in the process of urban growth (Cheshmehzangi 2014).

4.2.2 Urbanism and Urbanisation: Towards a Comprehensive Development?

Back in 1993, Nicholas Kristof (1993, p. 59) argued that 'the rise of China, if it continues, may be the most important trend in the world for the next century'. China is now establishing itself as a successful model for other developing countries, particularly for the rapidly developing countries. Yet it is often forgotten that urbanisation and development should not only be replicated but also require careful consideration in terms of how it is utilised, localised and reflected on the local demands. In this sense, we can refer to the role of urbanism in the process of urbanisation as a key matter. Through both governance and increasing the efficiency of planning and development, it is important to concurrently develop the welfare system and infrastructure, allowing for innovative and integrated solutions to overcome issues of poverty, deprivation and even decline. Urbanism, if it is to be integrated in this process, can help to promote the quality of urban development patterns and help to develop better institutional reforms and measures for an improved quality of life. It can then help to achieve a more sustainable way of development and growth. The follow-up matters will gradually shift towards the

improvement and/or enhancement of public services and the management of social development, both of which are essential to the achievement of a sustainable urbanisation.

As argued by Harvey (1985, p. 23), the relation between 'city formation and the production, appropriation and concentration of an economic surplus has been long noted'. Therefore, the dynamics of urbanisation are interlinked and often overlap. For China's new urbanisation process, the formation of a holistic approach is particularly critical, questioning how and to what degree it can happen in the coming years. The increase in China's production and demand are yet to bring more success and failed stories. In the current phase of new urbanisation, it is vital for new policies to enable the formation of cities beyond the current structure. The aim should ultimately be towards structuring and developing socio-economic strategies. This will potentially offer a mechanism to promote a less pro-planning urbanism in urbanisation, and may instead provide a comprehensive approach to shape a framework for future growth and development. Moreover, the successful effect of urbanism in urbanisation requires significant support and input from a wide range of disciplines in the social sciences. We can argue that a multilayered approach to urbanism is required to ensure the achievement of a comprehensive development. This cannot happen solely on the basis of economic growth or social development. The combination of the two, alongside environmental concerns and cultural values, are essential to achieving successful models. In this respect, we can simply refer to Jane Jacobs' statement (1961) that the combination of decay in cities, decline in economy and intensifying social distresses/pressures are not coincidental. The impact from one on another is becoming so apparent that it is often challenging to separate them from one another.

In the case of China, we can point out how the continuous social struggle and unbalanced economic situation are intertwined. The enduring issues related to rural migrants and the continuous decline of rural communities raise alarm bells of how this trend may continue in future. Undoubtedly, there will be more pressure on policy makers, as such major matters become more challenging. In this process, if the role of urbanism is neglected we may end up with policies and decisions that diminish the content of urbanisation. The content, embracing development and growth, will require careful consideration to become nourished in the process of urbanisation. On the other hand, there are major concerns on

environmental implications of urbanisation and lifestyle changes in China (Hubacek et al. 2009), which again reflect on inequalities in income and lifestyles, especially between rural and urban populations. From a different perspective, this is also discussed by Zhang and Song (2003) through their cross-sectional analyses on rural–urban migration and the impact on urbanisation. In their study, Zhang and Song (ibid.) refer to the rural–urban income gap as a major challenge for the process of urbanisation. Although their paper pays attention to the issue of inequalities, the authors’ place an emphasis on considering the rural as the pivot point of urbanisation. This merely means we cannot neglect the impact of urban growth (both physical and economical) on the rural communities. We also should not allow the significant decline of rural and peri-urban areas in the process of urbanisation. Therefore, carefully crafted planning is required to consider rural, peri-urban and urban areas under a single umbrella of comprehensive development. This will need to include contextualised ‘development policies and institutions’ (Whyte 2009, p. 371) and consider all previous development patterns and opportunities of future growth and development.

4.3 EVOLUTION OF ECO-DEVELOPMENT IN THE CHINESE CONTEXT

The term eco-development is a relatively one, although it can be tracked back to some ancient Chinese philosophies, as discussed earlier in earlier chapters. It originated first in the context of building energy saving in China. The Chinese central government began to take measures to reduce the building energy consumption in 1986 when the Domestic Building Energy Saving Standard (JGJ26-1986) was implemented and an energy-saving target of 30% (compared with the benchmark buildings built in 1980) was established. A milestone of eco-development at the building level is the launch of the Green Building Evaluation System (GBES) in 2006, which is the first national standard to evaluate comprehensive building performance in China, rather than focusing only on energy efficiency.

Eco-developments at the neighbourhood and city scales have occur much more recently. The concept of ‘eco-city’ or ‘eco-neighbourhood’, for example, was not translated into practical initiatives until the early 2000s. However, the country has seen a booming of eco-developments at neighbourhood and city levels since 2008, when the Scientific Concept of

Development was unveiled by the then President Jingtao Hu at the 17th CPC (Communist Party of China) National Congress. This concept called for a development model that places people first, and aims to achieve comprehensive, coordinated and sustainable development. After that, a number of pilot projects have been launched and evaluated. The following section reviews the national five-year plans (FYPs) from the 11th to the 13th (2006–2020) which marked a time period during which China commenced a more critical and thorough reappraisal of its developmental priorities and strategies in cities.

4.3.1 Policies on Eco-Development in the National Five-Year Plans

Since 1953, China has implemented a series of Five-Year Plans (FYP) which established the blueprint and targets for national economic and social development for a five-year period. FYP provides a main window to observe the directions, strategies and changes in development mode over a five-year period. They usually include a national-level masterplan that set key national overall targets and a number of special programmes that address sectorial targets and are usually drawn up by ministries that supervise a specific sector. For example, the Ministry of Housing and Urban-Rural Development (MoHURD) is responsible for the special programme of the construction industry, and the Ministry of Environmental Protection (MEP) focuses on the special programme for environmental protection. The national overall targets are also disaggregated and allocated to provincial level. Provincial governments need to make their own five-year plans (FYPs), and the provincial targets are then broken down further to city and county levels. Therefore, governments at various levels are obliged to achieve these targets. The national FYP and its special programmes, as well as local FYPs, constitute a systematic mechanism to move the country towards the targets established.

Traditionally, FYPs have been focused on economic development and related growth targets, with less consideration on the social and environmental aspects. In an address to the National Congress in 2006, Ma Kai, the then Minister of National Development and Reform Commission (NDRC) and one of the current Vice Premiers, admitted that the accomplishment of the 10th Five-Year Plan was at the expense of resources and environment (NDRC 2006). Ma (NDRC 2006) further remarked:

During the 11th Five-Year Plan period, we will implement the basic national policy of resources conservation and environment protection, develop cycling economy vigorously, protect and restore ecosystem and environment, strengthen environmental protection, improve resources management, promote the balanced development of population, resources and environment to realise sustainable development.

Recognising the limitation of the development mode featured with intensified resource input, the Eleventh Five-Year Plan for the period of 2006–2010 was rectified by the National Congress in 2006, which was described as ‘revolutionary’, ‘a watershed’ and ‘of turning point significance’ (Fan 2006) and ‘historic for its action on climate change’ (Ye 2011) by incorporating a number of indicators addressing environmental deterioration, resource depletion and social inequity. Two basic principles were reflected in the plan: ‘concept of scientific development’ and ‘harmonious socialist society’; in other words, economic growth was not to be sustained at the cost of environmental degradation and resource depletion, meaning that disadvantaged groups and less developed regions share the fruits of economic growth (Ye 2011).

Compared to the 10th Five-Year Plan, it is the first time that a quantitative target for energy efficiency was put in the national FYP, which required a reduction of 20% from the 2005 benchmark. This is measured as energy consumption per unit (10,000 RMB, approx. US\$ 1450) Gross Domestic Production (GDP). It was also defined as one of the ‘restricted’ targets which are tied in with governments at all levels from the central government down to the provincial, city, county and township levels. In other words, governments at all levels have responsibilities to achieve the disaggregated targets allocated and, as a result, to contribute to the accomplishment of the overall national target. This was quite an ambitious target because the increment of energy intensity was greater than the GDP growth rate during the period of the 10th Five-Year Plan (Lin et al. 2008). The introduction of such a target signalled a shift towards a new development mode that tries to make a balance between economic growth and ecological conservation. The 20% energy-intensity target also translates into an annual reduction of more than 1.5 billion tonnes of CO₂ by 2010 (Zhang et al. 2011) compared with the ‘business-as-usual’ development mode.

In September 2006, the State Council issued a disaggregating scheme to provinces with quantitative targets (The State Council 2006). The highest goals are for Shanxi and Inner Mongolia, both of which have strong

coal-mining industries, with a 25% reduction compared to 2005. The lowest target, a 12% reduction, was given to Hainan and Tibet. Twenty provinces out of a total of 33 were given a 20% energy-saving target, the same as the national target. These provincial targets were further broken down to the level of cities and counties. For example, the Shanxi Government approved a scheme in November 2006 disaggregating the provincial energy-saving target (25% reduction) into subtargets for each city (Zhang et al. 2011).

In June 2011, China announced that it had essentially met the energy-saving target, with a final achievement level of 19.1% (NDRC 2011). A field survey of local governments and enterprises conducted by Tsinghua University also confirmed the national reduction in energy intensity is in line with the 20% target (Ye 2013). This referred to a reduction of 1.55 billion tons of carbon dioxide emissions (*ibid.*).

The building sector was seen as one of three key sectors for potential energy saving in the 11th Five-Year Plan, along with power generation and the industrial sector. During this period, China had initiated a number of laws, regulations, policies, standards and pilot schemes to reduce energy consumption in buildings, including:

- The Green Building Evaluation System (GBES) in 2006, which is a national standard and is the first comprehensive green building rating tool in China;
- The Renewable Energy Law in 2006, which encourages the integration of solar PV in building design;
- The Ordinance of Energy Saving in Civilian Buildings in 2008, which is seen as a significant move in China's move to cut energy use. This establishes a framework for building energy saving by introducing various policy tools, e.g., energy-saving planning, a financial incentive mechanism, and market-access requirements for new buildings. The regulations have specified the responsibilities of designers, real estate developers, housing quality supervisors and even leaders of public institutions for saving energy in both residential and office buildings;
- Design Standards for Energy Saving in Residential Buildings in Severe Cold and Cold Zone in 2010;
- Design Standards for Energy Saving in Residential Buildings in Hot Summer and Cold Winter (HSCW) Zone in 2010.

All of these regulations, standards and policies mark China's remarkable transition to a more environmentally-friendly built environment. By 2010, 113 building projects have been labelled by GBES (MoHURD 2012). However, the efforts have been largely focused on energy conservation at the single building level, with little consideration given to larger spatial levels such as city and community. Green building development is still dispersed across the country and has not appeared at a large scale of implementation.

The 12th Five-Year Guideline was approved by the [National People's Congress](#) on 14 March 2011. The plan reiterated 'scientific development', and emphasised 'higher-quality growth', which gave priority to tackling sustainability issues, such as pollution, energy-intensive consumption, and resource depletion. It has put forward three key themes: economic restructuring; social equity; and energy and environment. This was the first time that a carbon reduction target was set in the main plan, building upon China's pledge to reduce carbon intensity by 40–45% by 2020 based on 2005 benchmarks, which had been made at the United Nations Climate Change Summit in Copenhagen in 2009 (China Dialogue 2011). The plan required a 16% and 17% reduction of energy consumption and carbon emissions per GDP unit, respectively, from the 2010 level (with 7% GDP growth). Though the energy reduction target was less than the previous FYP, it was still believed to be 'ambitious' as the easy-hit approaches such as shutting down small power plants and steelmakers have been largely implemented (*ibid.*). Further reductions would be more intensified on two key factors of technology and investment.

In May 2012, a Special Program for Building Energy Conservation was published by MOHURD. It is also the first time that such a sectorial plan was put forward specifically on the concept of sustainable built environment. The program aimed to promote large-scale green building development. Furthermore, in addition to promoting building performance, the program also focused on developing eco-developments at large spatial levels. It was required to establish 100 eco-cities, eco-districts or eco-industrial parks across the country for demonstration purposes, which should address issues, including:

- Energy reduction—including energy-efficiency design standards, renewable energy generation, energy consumption quota, etc.;
- Land use—including compact land use, neighbourhood pattern, use of underground space, etc.;

- Transport—including public transport network, clean fuels, green trips, etc.;
- Green building development—including a green building ratio, savings for energy, land, water, materials in buildings, indoor air quality, green construction, etc.;
- Environmental quality—including air pollution, water pollution, noise, urban island, etc.;
- Social harmonisation—including people's living quality, accessibility to facilities, community involvement, etc.

According to the official announcement by the National Development and Reform Commission, China has exceeded the targets set for the 12th FYP period. The energy intensity and carbon intensity have been decreased by 18.2% and 20% from 2010 level (NDRC 2016).

In 2015, China's urban population exceeded its rural population for the first time in its history. In recent years, urban problems such as air pollution and traffic congestion have caused widespread discontent among Chinese people. In December 2015, the CPC and the central government convened its first Central Urban Work Convention in 37 years since the reform and opening-up policy was initiated in 1978. The Convention calls for the following goals to be met in Chinese urban development (China Daily 2015):

- To enable people in central and western areas to benefit from the development of cities without leaving their hometown;
- To keep the distinctive landscape and cultural and architectural identities of cities;
- To carry on the historical and cultural heritage of cities;
- To build cities with beautiful natural landscapes;
- To keep the expansion of cities within planned boundaries and to build smart and compact cities.

On the heels of the convention, the Central Committee of the CPC and the State Council issued *Several Opinions on Enhancing Urban Planning, Construction and Management* in February 2016. These policy suggestions reflected the revised thinking of the new leadership, under President Xi Jinping, with regard to urban development models. Among the proposed measures are some unprecedented proposals that have stirred up widespread debate in the country. Typical urban development models

over the past few decades featured with superblocks, gated small residential districts, and giant streets have been overturned. Urban planning and development are now expected to follow principles such as the following (China Daily 2015):

- Increase street network intensity and walkability;
- Open up gated communities;
- Expand mixed-use development rather than the current functionality-based zoning approaches;
- Public transport-oriented urban development;
- Improve low-carbon city technologies and “sponge” city technologies.

One month later, in March 2016, the 13th FYP was approved by the National People’s Congress. The reduction targets for energy intensity and carbon intensity have been set for 15% and 18%, respectively. For the first time PM 2.5, a type of dangerous fine particulate in the air mass, was included in the plan. The FYP calls for the promotion of a healthy urbanisation plan. It addresses issues such as public transport-oriented urban development, the avoidance of urban sprawl, high-capacity infrastructure and mixed-use development, and the adoption of low-carbon technologies and smart/digital cities (China Daily 2015). Concrete policies and special sectorial programmes will be gradually made by various government agencies in the next couple of years in order to achieve the overall targets.

According to an article published by *Nature* (Tollefson 2016), a joint report from the Grantham Research Centre on Climate Change and the Environment and the Centre for Economics and Policy, China’s GHG emissions are likely to reach the peak by 2025, some five years earlier than the target set by President Xi in 2014 (Green and Stern 2015). Such a reduction in energy consumption and carbon emissions is accompanying a new development model—the so-called ‘new normal’, which embodies a focus on structural changes that can achieve still strong, but lower rates of economic growth of a much better quality in terms of both social equity and environmental sustainability. However, this report also predicts that a continuous increase of energy consumption and carbon emissions from the transport sector would be a focus area for future mitigation. An urban planning model featuring compact, high-density buildings and public transport links should be prioritised (ibid.).

4.3.2 *Current Incentives for Eco-Development in China*

4.3.2.1 *National-Level Incentive Schemes*

In January 2013, the State Council published a Green Building Action Plan, which signified that green building development in China has entered a new phase of large-scale development. Then, on 26 April 2013, MoHURD and the Ministry of Finance released the Implementation of Opinions Regarding Accelerating the Promotion of National Green Building Development. In this document, green buildings are recognised as projects that satisfy the requirements from the Green Building Evaluation System (GBES). The Action Plan requires:

- 1 billion metres square construction area of new buildings shall be certified by GBES in 12th Five-Year Plan period (2011–2015);
- 20% of all new construction shall be green buildings by 2015;
- Three types of buildings must comply with green building standards since 2014, including buildings invested by the government such as government offices, schools, hospitals, museums, science museums, stadiums; social welfare housing in provincial capitals and special cities; and large public buildings with single building area over 20,000 square meters such as airport, railway stations, hotels, and shopping malls.

To achieve these goals, there are subsidies provided by the central government to encourage achieving GBES certification. Forty-five RMB per square meter floor area subsidy is provided to new construction that achieves two-star certification, and 80 RMB for three-star certification. There is no subsidy for one-star certification. MoHURD (2012) estimated the average incremented cost are 60, 120 and 300 RMB per square metre for one-star, two-star and three-star certification, respectively, for residential buildings, and 30, 230 and 370 RMB for public buildings, respectively. It is noticed that the current government subsidies cover only a part of the extra costs of green buildings, particularly for public buildings.

The document also calls for the promotion of eco-cities and sustainable urban development. The central government will provide a minimum of 50–80 million RMB to support cities that are recognised as national eco-city demonstration projects. The grant is intended to offset the cost of large-scale eco-developments, such as a new urban area expanded from the existing city. However, the definition and criteria of what constitutes a

‘green ecological city’ still remain unclear in the document. It is noticed from the current practice of the national eco-city demonstration projects that the visions, strategies and their key performance indicators (KPIs) vary across projects. More discussions will be given in Chap. 5.

Incentivised by the policy mechanisms, in recent years there has been a growing interest in promoting green buildings and eco-cities. At the time of writing, around 280 Chinese cities that have declared an ambition to develop an ‘eco-city’ or a ‘low-carbon city’ (China Society for Urban Studies 2012). Green building development is a core requirement for these eco-city projects. For example, Tianjin Eco-City, a joint urban project between China and Singapore, requires the compulsory certification of all buildings within the city through a recognised green building rating system such as GBES, LEED and Green Mark. Such a city-scale implementation has deeply shaped the local construction industry, from design, material manufacturing, construction to operational management, and the green building sector has become a valuable contributor to the local economy.

4.3.2.2 The Application of Green Building Rating Systems in China

So far, a number of different green building rating systems have been used in China, including LEED, Green Mark, BREEAM, Green Star and Passive House. Of these, LEED has been the most widely adopted international rating system in China. According to Green Building Map (2015), a website that records certified building projects, there are 195 building projects certified by LEED up to 2014, increased from only 14 in 2008. Inspired by the success of LEED, some other international ratings systems have also been adopted in China. For example, Green Mark from Singapore has been widely used in the case of Sino-Singapore Tianjin Eco-city and BREEAM has been applied to a pilot eco-city project in Changsha (Meixi Lake Eco-City). Similarly, the German Passive House Standard has been used to certify ten buildings in China (up to 2016) since the first passive house was completed in the World Expo in Shanghai in 2010.

Compared to international systems, the Chinese Green Building Evaluation System (GBES) has a much wider application. GBES was officially published by the Ministry of Housing and Urban-Rural Development (MoHURD) in 2006, and was upgraded in 2014. It was developed based on the policy requirements outlined by central government in 2004. These requirements can be summarised as ‘Four-Saving and One-Benign’, i.e., energy saving, land saving, water saving, and material

saving, as well as environmental benign & pollution reduction. To reflect on these policy requirements, GBES provides a three-star rating system for two building types—residential and public. Public buildings in China covers a broad range of structures, including governmental buildings, school buildings and commercial buildings. There are two types of assessment; green building design labelling and green building operation labelling. The latter is granted only after a building has been in operation for one year. Different from some other rating systems which adopt a third-party assessment procedure, the government has been playing a key role in the GBES evaluation. Two assessment bodies—the Centre of Construction Science and Technology and the Chinese Society of Urban Studies, which are both affiliated to MOHURD—are responsible for nationwide certification. Some provinces, and provincial-level cities such as Beijing and Shanghai, can evaluate local green construction projects; however, this only applies to one- and two-star certifications. All three-star applications must be evaluated by the two national assessment bodies.

Akin to other rating systems, GBES comprises eight assessment categories: land saving, energy saving, water saving, material saving, indoor air quality, construction process, operation management and innovation. Within each of them are a number of assessment criteria and benchmarks. Within this context, GBES has become a major player in the market of green building certification in China. It is the first comprehensive system for whole building assessment and has been a national standard since 2006. Before GBES, there were fragmented assessments on various aspects of building environmental performance such as energy, materials and water.

By the end of 2015, there are totally around 4071 projects, or 472 million square metres in floor area, have been certified by GBES according to the 2016 statistics report from the China Society for Urban Studies (2016). Among them, 45% of the total ratings were granted to public buildings, 53% for residential buildings and 2% for industrial buildings. It is noticed that most ratings are for the design stage and only 159 projects have obtained operation labels. This indicates the actual performance of buildings with GBES design labels has not been widely validated in China. It is also noted by Ye et al. (2013) that the distribution of GBES-certified buildings is regionally uneven. More than three-quarters of GBES certified buildings are located in the east coast which is the region with the most

rapid economic growth. Although western China accounts for two-thirds of China's territory, its proportion is less than 10%. This reflects the development of green building in a city closely correlates with the economic conditions of that city because a vibrant economy can afford the incremented costs incurred by green buildings.

4.4 LOCAL EFFORTS FOR ECO-DEVELOPMENT IN CHINA

4.4.1 *Motivations from Local Governments*

It has been observed in recent years that there is a growing interest in promoting eco-development at the level of local government. For example, Beijing has announced that the municipal government would subsidise the energy-efficiency retrofit of buildings, offering 100 RMB per square metre in addition to the subsidy from the central government, and would furthermore subsidise any retrofit which included the installation of solar water heating systems by up to 200 RMB per square metre (Li and Shui 2015). The support for eco-development on the part of local governments is driven by the following motives:

- To reduce energy consumption and related carbon emission—Local governments have been bound to quantitative reduction targets. National targets are broken down to provincial-level targets, and then further decomposed and reallocated to city-, county- and township-level governments.
- To reduce local environmental pollution—Many Chinese cities have been suffering from severe air pollution. As around 78% of the national total electricity is generated by coal burning, consuming energy has been a main reason for local air pollution. To tackle air pollution, local governments in China need to bring down energy consumption in buildings as it is a major consumer of energy;
- To create new business opportunities. The delivery of green buildings, from a view of the entire supply chain, involves many aspects such as planning, design, geological survey, construction, material manufacturing, and facility management. Liu et al. (2012) estimate a potential market of green buildings in China would amount to 1.5 trillion RMB (approx. US \$220 billion). This implies an attractive business opportunity for local governments.

To implement the National Green Building Action Plan at local levels, by the end of 2015, 28 provinces, autonomous regions and municipalities have proposed their own timeframes to promote green building construction (China Society for Urban Studies 2016). They cross over the country from prosperous eastern coastal regions to the less developed western regions and some of them have higher requirements than the national one. For example, Beijing requires that all new construction must be certified minimum at the one-star level from 1 June 2013. Jiangsu province sets one-star standards as compulsory requirements for all new construction from 2015 and Chongqing plans to introduce such a scheme from 2020. GBES one-star standards have become compulsory requirements in some cities and incorporated into the administrative procedure for new construction permits.

In addition to direct subsidies, other policy incentives implemented at local levels include:

- Pre-selling commercial properties—Commercial properties with green building certification are allowed to pre-sell depending on the level of the green certification assigned. For example, a certified three-star commercial property can be pre-sold when the foundation is completed; a certified two-star building can be placed in the market when a minimum of one-quarter of the main structure is completed;
- Tax refund for housing buyers to encourage purchasing green buildings, for example, 20% tax will be refunded if buying a two-star green building, and 40% for buying a three-star housing;
- The cost for certification is fully covered by the government, for example, in Shenzhen and Beijing the cost will be covered by the government if a project is certified at the three-star level;
- The mortgage rate can be 1% less if buyers sign contract to buy a green building in Fujian Province;
- Increase of plot ratio for a commercial housing project, for example, an increase of 1%, 2% and 3% plot ration is allowed for projects achieving one-star, two-star and three-star certification in Fujian province.

Local government is a key player in the development of eco-development in China. The use of policy instruments is a significant factor to upscale green eco-development because it can help to create a large market for

green projects and cause major changes in construction practice. Local government involvement is one of the essential and effective ways in promoting eco-development through enhancing construction codes, direct financial subsidies and policy incentives. The next section discusses an example of how local government promotes eco-development in China.

4.4.2 *Local Initiatives: A Case Study of Ningbo*

Ningbo, located on the eastern coast of China and with a population of 7.6 million, has the most vibrant economy in China with a per capita output of US\$15,046 in 2013, three times higher than the national average. The city now serves as the economic centre for the southern Yangtze River Delta and has been ranked in the top ten cities for business in China by Forbes.

Ling and Ye (2012) found that green building development in a city correlates strongly with the macro-economic conditions of the city. The annual level of GDP is the most significant individual factor affecting a city's green building development. This is because a vibrant economy can absorb the incremental costs incurred by green buildings. It is interesting to note that Ningbo had a GDP rank of 17th among all Chinese cities in 2012 (Elivacity 2015). In contrast, the total green building floor area in Ningbo in the same year was ranked 35th (Ling and Ye 2012), which was behind many Chinese cities that have a lower economic growth.

The city has an official energy saving target of 18.5% for the period of the 12th Five Year Plan (2011–2015), which is higher than the national average of 16%. Building energy saving is recognised by the city government as a focus area to achieve this target. However, green building is still a new concept in Ningbo. Up to the end of 2014, only 19 buildings that have been successfully certified by GBES or LEED, including 9 public building projects and 10 residential projects. Ten of these buildings were certified in 2014. The local government has noted the underdevelopment of green buildings in the city and realised that the lack of a policy instrument is a key factor that impedes the green building development.

Government involvement is believed to be one of the essential and effective ways in promoting green buildings (Chan et al. 2009; Ofori 2006) as it can rectify market failure by introducing market-based incentive schemes (Chan et al. 2009). The reason behind this can be attributed to the fact that green buildings are often perceived as having higher upfront costs for the design, construction and optimisation of building service systems.

To respond to the National Green Building Action Plan, the city has placed this issue on the agenda as a priority, issuing three directives in July and August 2014 to accelerate the development of green buildings in the city, respectively, Opinions on Accelerating Green Building Development in Ningbo, Ningbo Green Building Development Action Plan and Provisions on Adjustment of Conditions for Commodity Housing Presale. The main points of these directives include:

- Set up a Leading Group for Green Building Development chaired by a deputy mayor.
- All government-funded construction must be certified by GBES.
- All commercial buildings with a construction area of more than 20,000 square metres must be certified by GBES.
- Over 10 million square metres of green building will be constructed by the end of 2015.
- Over 1 million square metres of existing buildings will be retrofitted to achieve energy efficiency.
- Commodity housing with green building certification is allowed to pre-sell depending on the level of the green certification assigned: for example, a certified three-star building can be pre-sold when the foundation is completed; a certified two-star building can be placed in the market when minimum one fourth of the main structure is completed.

All quantitative targets have also been broken down to district-level governments by years. The city government further organised a project team in September 2014, including external experts from the municipal construction committee, the University of Nottingham Ningbo Campus and the China Academy of Building Research Shanghai Institute, to examine the effectiveness of the current policy framework and introduce new robust instruments if needed. The project team then conducted a city-wide questionnaire survey to investigate perceptions of various practitioners in Ningbo on the driving and impeding factors for green building development. Between September 2015 and March 2016, the project team has submitted a series of work reports to the city government. All policy recommendations are generally classified into four categories—local financial incentives, local design standards and rating tools, administration, and technologies (Deng et al. 2016). Among the major points to be considered are:

- Local incentives: 15 and 50 RMB subsidies for two- and three-star certification; 70% and 100% exemption of municipal construction matching fee for two- and three-star certification; 20% and 40% refund of property deed tax for two- and three-star certification; 2% and 3% increase of plot ratio for two- and three-star certification;
- Local design standards and rating tools: GBES one-star is compulsory for all new construction and GBES one-star is required for all new construction funded by the local government;
- Administration: set up Ningbo Green Building and Energy Efficiency Commission; set up Ningbo Green Building Experts Pool; encourage and coordinate the third-party consulting service market;
- Technologies: promoting the use of building information modelling approaches in the construction industry; promoting the industrialisation of the construction industry; promoting energy performance contracting; publishing a list of green building products that are suitable for Ningbo.

The city is currently working on the 13th Five-Year Plan and it is assumed that many of the recommendations would be included in the plan and will be implemented by the government in the next couple of years.

As economic development remains a key goal for majority cities in China, strong governmental policy intervention and robust incentive schemes are the main drivers for eco-development, together with multidisciplinary coordination between the involved stakeholders. Furthermore, it is noted that the strategies and practices of promoting eco-development are varying greatly in different cities at different spatial levels. The next three chapters will discuss a number of case studies across the country at the three spatial levels, respectively, with the intention of providing a comprehensive and timely picture of current eco-development in China. These case studies, in contrast with the global examples discussed in Chap. 3, represent the latest policy development and practice of eco-development in China. In each of the case study chapters, we will discuss the case studies based on a defined categorisation at their spatial level. A few of these projects, such as Sino-Singapore Tianjin Eco City and Chongming Eco Island, are internationally renowned. Many are national-level pilot projects, which intend to provide models for future eco-development projects in the country. Most macro-level (city-scale) projects are still under development and are scheduled to be completed around 2020; thus, they also reflect the trend of eco-development in the near future in China.

REFERENCES

- Building Energy Conservation Centre (BECC) (2009) *China Building Energy Conservation Annual Report*. Tsinghua University, China Building Industry Press.
- Fan, C.C. (2006) China's Eleventh Five-Year Plan (2006–2010): From “Getting Rich First” to “Common Prosperity”, *Eurasian Geography and Economics*, 47, No. 6, pp. 708–723.
- Chan, E.H.W., Queena, K., Qian, Q. and Lam, P.T.I. (2009) The market for green building in developed Asian cities—the perspectives of building designers, *Energy Policy* 37, 3061–3070.
- Cheshmehzangi, A. (2014) The Urban and Urbanism: China's New Urbanisation and Approaches towards Comprehensive Development, *The International Journal of Interdisciplinary Environmental Studies*, Vol. 8, Issue 3–4, pp. 1–12.
- China Society for Urban Studies (2012) *China Low Carbon and Ecological Cities Report 2012*. China Building Industry Press, Beijing.
- China Society for Urban Studies (2016) *China Green Building Development Report 2016*. China Building Industry Press, Beijing.
- Deng, W., Yang, T., Tang, L. and Tang, Y. T. (2016) Barriers and policy recommendations for developing green buildings from local government perspective: a case study of Ningbo China, *Intelligent Buildings International*, pp. 1–17, <https://doi.org/10.1080/17508975.2016.1248342>.
- Green, F. and Stern, N. (2015) *Structural change, better growth, and peak emissions*, the Grantham Research Centre on Climate Change and the Environment and the Centre for Economics and Policy.
- Harvey, D. (1985) *The Urbanisation of Capital* (Studies in the history and theory of capitalist Urbanisation), New York: Wiley-Blackwell.
- Harvey, D. (2013) *Rebel Cities: From the Right to the City to the Urban Revolution*, London: Verso Books.
- Hubacek, K., Guan, D.B., Barrett, J. and Wiedmann, T. (2009) “Environmental Implications of Urbanisation and Lifestyle Change in China: Ecological and Water Footprints.” *Journal of Cleaner Production*, 17 (14):1241–1248.
- Jacobs, J. (1961) *The Death and Life of Great American Cities*. New York: Random House.
- Kristof, Nicholas D. (1993) “The Rise of China.” *Foreign Affairs*, 72(5):59–74.
- Li, J. and Shui B. (2015) A comprehensive analysis of building energy efficiency policies in China: status quo and development perspective. *Journal of Cleaner Production*, Vol. 90, pp. 326–344, 2015.
- Lin, J. Y. and Chen, B. (2011) “Urbanisation and urban–rural inequality in china: a new perspective from the government's development strategy”, *Frontiers of Economics in China*, 6(1):1–21.

- Lin, J., Zhou, N., Levine, M.D. and Fridley, D., (2008) Taking out 1 billion tons of CO₂: The magic of China's 11th Five Year Plan? *Energy Policy*, 36, 954–970.
- Ling S. and Ye, Z. (2012) *Study on the Economics of Green Buildings in China*, China Sustainable Energy Programme, Serial No: G-1110 14964.
- Liu, J. Y., Low, S. P. and He, X. (2012) “Green Practices in the Chinese Building Industry: Drivers and Impediments.” *Journal of Technology Management in China* 7 (1): 50–63.
- Lu, D. (2002) “Rural–Urban Income Disparities: Impact of Growth, Allocative Efficiency and Local Growth Welfare.” *China Economic Review*, 13(4):419–429.
- Lu, M. and Chen, Z. (2006) “Urbanisation, Urban-Biased Economic Policies and Urban–Rural Inequality.” *Chinese Economy*, 39(3):42–63.
- McKinsey (2009) *Preparing for China's urban billion*, Report by McKinsey Global Institute, available at: <https://www.mckinsey.com/global-themes/urbanisation/preparing-for-chinas-urban-billion>, accessed on: 23-Jan-2016.
- Nolan, P. and White, G. (1984) “Urban bias, rural bias or state bias? Urban–rural relations in post-revolutionary China.” *The Journal of Development Studies*, Volume 20, 3:52–81.
- Ofori, G. (2006) *Attaining sustainability through construction procurement in Singapore*. In CIB W092–Procurement Systems Conference, November 2006.
- Smith, N. (2010) *Uneven Development: Nature, Capital and the Production of Space*. Georgia: The University of Georgia Press.
- Tollefson, J. (2016) China's carbon emissions could peak sooner than forecast, *Nature News*, 21 March 2016, <http://www.nature.com/news/china-s-carbon-emissions-could-peak-sooner-than-forecast-1.19597>.
- Wan, G., Lu, M. and Chen, Z. (2006) “The inequality–growth nexus in the short and long run: Empirical evidence from China.” *Journal of Comparative Economics*, 34:654–667.
- Wang, S. and Ouyang, Z. (2008) “The Threshold Effect of China's Urban–Rural Income Inequality on Real Economic Growth.” *Social Sciences in China*, 29 (3):39–53.
- Whyte, M.K. (2009) “Paradoxes of China's economic boom.” *Annual Review of Sociology* 35: 371–392.
- Wong, L. (1994) “China's Urban Migrants – The Public Policy Challenge.” *Pacific Affairs* 67(3):335–355.
- Yang, D. and Zhou, H. (1999) “Rural–urban disparity and sectoral labour allocation in China.” *The Journal of Development Studies* 35(3):105–133.
- Yao, Y. (2005) *An Empirical Analysis of Financial Development and Urban–Rural Income Gap in China*, The Study of Finance and Economics, at Tsinghua Tongfang Knowledge Network Technology.
- Ye, L., Cheng, Z., Wang, Q., Lin, W. and Ren, F. (2013) “Overview on Green Building Label in China.” *Renewable Energy*, 53: 220–229.

- Ye Q. (2011) Getting off the roller-coaster, UNEP, http://www.unep.org/pdf/op_dec_2011/EN/OP-2011-12-EN-ARTICLE4.pdf.
- Ye Q. (2013) Annual review of low carbon development in China: 2010, World Scientific Publishing.
- Zhang, D., Aunan, K., Seip, H. M., and Vennemo, H. (2011) The energy intensity target in China's 11th Five-Year Plan period – Local implementation and achievements in Shanxi Province. *Energy Policy*, 39 (7).
- Zhang, K. and Song, S. (2003) "Rural–Urban Migration and Urbanisation in China: Evidence from Time-Series and Cross-Section Analyses." *China Economic Review*, 14(4):386–400.

4.4.3 *Websites*

- China Daily (2015) Available at: http://www.chinadaily.com.cn/china/2015-12/30/content_22863986.htm.
- China Dialogue (2011) Available at: <https://www.chinadialogue.net/blog/4147-What-s-in-China-s-12th-Five-Year-Plan-/en>.
- Elivecity (2015) Available at: <http://www.elivecity.cn/Index.htmln> (Accessed: 15 June 2015).
- Green Building Map (2015) (绿色建筑地图) <http://www.gbmap.org/>.
- MoHURD (2012) The Twelfth Five-Year Special Program for Building Energy Conservation; Available at: http://www.gov.cn/zwggk/2012-05/31/content_2149889.htm.
- NDRC (2006) The 11th Five-Year Plan: Targets, Paths and Policy Orientation, Available at: http://en.ndrc.gov.cn/newsrelease/200603/t20060323_63813.html.
- NDRC (2011) Available at: http://www.gov.cn/jrzq/2011-06/11/content_1881722.htm.
- NDRC (2016) Available at: http://www.ndrc.gov.cn/gzdt/201612/t20161202_829076.html.
- The State Council (2006) Available at: http://www.gov.cn/gongbao/content/2006/content_443285.htm.