CHAPTER 9

Concluding Remarks

9.1 Recapitulation

There is a debate that the recent nationwide environmental campaign, which began in early 2017, may have a negative impact on economic growth and employment. This campaign has led to closure of many factories that violated environmental protection laws and regulations. Li Ganjie, China's minister of Environmental Protection, refuted this claim at a press conference of the 19th National Congress of the party held between 18 and 24 October 2017. Instead of reducing economic development, environmental protection and green development, as the minister emphasised, will further consolidate the economic growth foundation and achieve a much more sustainable development (China Daily 1, October 2017). Addressed by President Xi in the report to the Party Congress, increasing harmony between humans and nature is one of the 14 basic policies underpinning endeavours to develop socialism with Chinese characteristics in the new era (China Daily 2, October 2017). It is expected that current policies, strategies and pilot projects, at both national and local levels, will further address urban environmental constraints. They are expected to be further enhanced in the forthcoming years. One important purpose is to identify an urban development model, which can be replicable in a wide range of contexts in the country. More importantly, however, such a development model can refine a balance between economic development and environmental protection; in other words, the 'harmonious development' that is anticipated.

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This book explores contemporary eco-development projects in the context of China. These project cases were categorised and assessed at three interwoven spatial levels: city; community/neighbourhood; and buildings. A small selection of 21 successful projects at different spatial scales were examined in the earlier chapters (see Chaps. 5, 6, and 7). These case studies provide international readers with a comprehensive and timely picture of current eco-development practices in China. And many of these cases are unfamiliar to readers outside China. These cases also offer a variety of eco-development approaches and strategies that have shaped the first phase of eco- and green projects in China. They are developed in a relatively short timeframe, within which China has taken many initiatives to learn from international examples, adapt and develop new development strategies, and took steps to policy reforms.

Following an evaluation of these case study projects, we then looked into the past and current trends of eco-developments in China. We further argued about the importance of integration in eco-development strategies and planning. This can only occur by consideration of the multiscalar and multidimensional nature of urban sustainability which provides us with models of best practice. We refer to this integration as the interplay between spatial levels of the built environment. It is, therefore, highly important to highlight both the existing gaps and the potential relationships of spatial levels. Moreover, the current construction industry is also being shaped by emerging new technologies, which are able to increase urban efficiency and performance. However, the adoption of new technologies in the construction sector is still relatively slow globally, as suggested by a recent report from the World Economic Forum (2016). In contrast, China has been the largest construction market over the past three decades, which provides an 'experimental platform' for various new urban and building approaches. This experimental phase may have not been very innovative at first, but it has certainly matured in recent times, and particularly in the last two to three years. Furthermore, it is already evident that China has become a global pioneer in eco-city endeavour and that many new technologies are being used experimentally to increase urban and building performance; such as urban-sharing services and 3D printing technology for construction. More emerging technologies are tested and implemented in small-scale projects, providing the opportunity for scaling up cases and success stories that may become widespread. Some of these projects start at a very small scale of micro or meso scale, and are now visible at macro and event larger scales (e.g., the example of the

bicycle-sharing system that has grown from a university campus idea to an international market). In the concluding chapter, we further explore the concept of eco-development in China with a comprehensive strengths, weaknesses, opportunities and threats (SWOT) analysis that highlights what China faces in the current stage of development. These will refer back to some of the ideals of the future that we highlighted in the discussion chapter (see Chap. 8). In this section, we also raise some questions of interest for future research on the matters of sustainable city, sustainable community and green building development in China.

9.2 SWOT ANALYSIS

9.2.1 Strengths

By promoting eco-city projects in recent years, China appears in the front line of reshaping and redeveloping the urban environments. China has initiated new policies, strategies and pilot projects at both national and local levels to address resource and environmental constraints in Chinese cities. These criteria are continuously highlighted in China's five-year plans (i.e., particularly in the 11th, 12th, and 13th FYPs, so far). Conventionally, sustainable city efforts have been focused on individual issues such as urban energy, urban transport, land use, waste, water and urban health. In recent years, there is a growing interest in China to find a new integrated model for urban development as a whole; a method that we define as a comprehensive urban development model. Efforts to create such a new urban development model is manifested in the form of developing eco-cities. In this approach, the emphasis remains on the role of interplay between spatial levels.

Although it is still too early to judge the success of the eco-city concept in new urban development areas in China (i.e., as many projects are still under construction), it is very likely to see significant influence on the planning, design and operation of cities in the future. For example, in the Sino-Singaporean Tianjin Eco-City (SSTEC), the implementation of the eco-city concept has shaped the local construction industry and green building development, from the perspectives of design, material manufacturing and construction through to operational management. Eco-development has also become a valuable contributor to the local economy. Some cases have already offered experimental planning scenarios, some of which that can simply be adapted in any future projects (e.g., the concept of eco-cell in the SSTEC project, see Sect. 5.6).

One significant impact is on the local government to improve urban performance through various methods of integrated planning, design, and management approaches. This is particularly important in the coastal cities in the eastern and southern parts of the country, where the majority of large-scale cities are located. In many cases, the local government has started to look into new ways of urban governance to achieve eco-development (also identified as green development). One example is the New Eastern City in Ningbo Zhejiang Province, which is a new expanded area from the existing city centre with 16 km^2 and is planned to accommodate a population of 170,000 people, including both the existing population and new residents. In the original development plan, the new city was developed with two phases—completing the western part of the city between 2006 and 2014, and the eastern part between 2015 and 2020. The western part was completed as planned in 2014, which was developed with conventional planning and design control criteria, such as building heights, landscape features and infrastructures. Very little considerations were related to eco-development at that time. As eco-development has escalated in recent years and exemplary projects have been widely known, the local government approached the University of Nottingham Ningbo China (UNNC) in 2015 and funded a research project, led by the two authors of this book. The project was initiated with the sole intention of improving ecological performance of the eastern part of the city through the adoption of a new system for urban governance. This also highlights the role of interplay between two of the spatial levels, the meso and micro levels, within which new eco-strategies are proposed and planned for further implementation. The key requirements of this project are:

- Develop a sustainability indicator system for the city as a whole;
- Break down these overall sustainability indicators to all plots of land that will be sold to individual developers through an open bidding process. These plot-level requirements will be incorporated into the tendering document as new planning and design constraints, along with those conventional criteria;
- Develop a technical guidance for various building typologies (e.g., schools, hospitals, offices and residential houses) to achieve green building ratings.

This is the first time a comprehensive system is developed to promote eco-development in the city of Ningbo as part of its urban governance. Based

on the current status and importance of the project, it will have a profound impact on the city's urban development in future. Therefore, we can also potentially see an interplay between the meso and macro levels. A large group of stakeholders from the government, developers and practitioners are incentivised to change their 'business-as-usual' mode of dealing with urban development by considering these new requirements. This already is a step forward, as it enables a variety of stakeholder groups to at least think in a different direction to the current 'business-as-usual' scenarios. This research also provides a new methodology to break down the city-level overall eco-targets to neighbourhood-level (land plot) indicators, and then building-level (building site plot) sub-indicators. Once again, this highlights the importance of interplay between the spatial levels, where we can create potential collaborations between various stakeholder groups of the project. In this project, the key issues considered comprise green building ratings, energy consumption, renewable energies, pre-fabricated building elements and water recycling. All of these issues are penetrated through city, neighbourhood and building levels, and correspond at different spatial levels. By doing this, the three interrelated spatial levels are able to be examined in the same dimension and form a collective effort towards a comprehensive eco-development model.

9.2.2 Weaknesses

China has advanced to a higher level of eco-development through the adoption of new emerging technologies. These new technologies, such as the Internet of Things (IoT), smart cities and 'Big Data', Artificial Intelligence (AI) and sharing services, are able to increase urban efficiency in a variety of ways. However, they also bring new challenges to urban governance in China, which has lagged behind in terms of accommodating these 'changes' or 'transitions' brought about by new technologies. The combined method of *eco- strategies* and smart initiatives is growing rapidly and is already becoming a method of promoting urban innovation in many Chinese cities.

One example of sharing services is the growing dockless shared bike scheme that has flooded the streets of many Chinese cities in the last few years. This initiative is already expanding to other countries, such as Australia and the UK. For instance, since April 2016, just one of the shared bike operators, MoBike, has placed more than 100,000 bikes in Shanghai, Beijing, Shenzhen and Guangzhou (The Guardian 2017). The way the

schemes work is simple—users download an app that informs them about the location of bikes, which they can unlock by scanning a QR code by their phones or using a combination code they have received. Unlike traditional rental services, which require bikes to be returned to a fixed docking station, riders are free to leave the bikes wherever their journey ends. Users pay for using the bikes through online banking systems (ibid.).

The bike-sharing programmes have enabled bikes to return to the streets of China, especially in big cities where private vehicles are the primary means of transportation. However, the rapid expansion in the use of dockless bikes has brought new challenges in terms of urban governance. Users park the bikes wherever they want, causing congestion in pedestrian walking paths and other public spaces, which is considered detrimental to the image of the city. Consequently, some city governments have suspended the growth of shared bikes and many neighbourhoods and public spaces have banned shared bikes from entering (shown in Fig. 9.1). This impairs the use of shared bikes as an efficient means of transport over short distance in Chinese cities. To accommodate these challenges, urban governance in areas such as spatial planning and parking management should be upgraded accordingly (Fig. 9.1).

Fig. 9.1 The view of several shared bikes from various companies left outside the entrance area of the University of Nottingham Ningbo China. These bikes have now been banned from the university campus area (photo taken by the authors)

Another challenge lies in the ways of providing indoor environmental quality (IEQ) within buildings, including thermal, acoustic and lighting comforts, along with indoor air quality. It is recognised that the two main disciplinary perspectives in the IEQ domain are passive approaches and active approaches. To date, building developers and designers in China have opted to adopt more such 'active' measures to achieve higher performance. Equally important, however, is the passive approach to improve indoor environmental quality, with its focus on low-energy and low-cost design strategies. The two approaches can be applied singularly or in carefully-balanced combinations that are appropriate to the external environmental and climatic contexts. However, the passive approach should be maximised before the active approach is utilised.

9.2.3 Opportunities

As discussed earlier, the sustainable built environment is comprised of multiple dimensions (environment, society, economy, and governance). It is also viewed across the lifecycle, and across dozens of subject areas from material manufacturing to building design and engineering, and to indoor environmental quality, community cohesion and urban planning. The foregoing discussions explore the contemporary sustainable built environment research and practice at the three interwoven themes of city, community and individual building—each of them have their specific problems to deal with.

Sustainability efforts will be less effective at the other spatial levels if a spatial level is not properly addressed. For example, the spatial arrangements of neighbourhoods have significant impacts on the environmental performance of buildings and impose direct, as well as indirect, costs on households. Another example is the formation of the urban heat island effect, which is largely affected by the design choices of individual buildings. A summary of pathways to sustainable built environment at the three spatial levels is listed in Table 9.1.

While each of the spatial levels is coupled intrinsically with specific sustainability requirements and solutions, a potentially greater set of performance gains lie in synergies between the interplay of the three spatial levels. In this book, we argue in favour of an effective urban governance system that should be established to integrate the efforts at the three spatial levels of the built environment. The key is to develop a set of urban key performance targets and break them down to different spatial levels

Table 9.1 Summary of pathways to sustainable built environment from the consideration of all three spatial levels in the built environment

Knowledge areas	*Pathways to sustainable built environment*
City level	Policies, master planning, ecology, transportation, wastes, air pollution, and etc.
Neighbourhood/community level	Education, behavioural patterns, open space, health, neighbourhood pattern, walkability, and etc.
Building level	Performance, rating tools, architectural design, indoor comfort, IT technologies, renewable energies, and etc.

(Fig. 9.2). This can provide a common ground to monitor the progress at different levels and form a collective effort to move a city towards sustainability and sustainable development.

9.2.4 Threats

The current eco-city venture have not led to a definitive definition of eco-city as no agreeable definition has emerged to date (de Jong 2015). This is particularly complicated in the context of China, where eco-city projects vary significantly in terms of their size, purpose, development modes and growth. Joss (2015) addresses the plausible reasons for this situation. Firstly, it is suggested that diversity and ideas set in specific locales and are governed by traditions. In addition to this, the competition between various actors has led to a lack of cohesion regarding the vision and roadmap to eco-city development. Secondly, this lack of coherence is simply an inevitable process towards consensus, as the current phase could be seen as the 'experimental phase'. Under such a reading it is anticipated that this phase is then followed by a phase of consolidation, leading to more agreeable international norms. Nonetheless, de Jong (2015), who also identifies the terminological fuzziness and confusion, stresses the need for clarification into distinct categories in relation to specific applications. This argument invariably endorses the context dependency of eco-city and its implementation of its indicators.

Our earlier examination of the key performance indicators (KPI) systems of eight eco-cities in China indicated what has been considered in the planning system as a potential mean to achieve sustainable eco-development (Deng et al. 2017). However, these KPI systems vary greatly in assessment focuses and priorities. This further validates the lack of eco-city definition

Fig. 9.2 Breakdown of urban key performance targets from urban level to community and building levels (image drawn by the authors)

across Chinese projects. Such confusion may lead to a conceptually vacuous principle, i.e., lacking content with a threat of its application being applied for promotional and market-fashionable services. On the other hand, there are still some convergences from the issues commonly addressed by the reviewed KPI systems (ibid.). These issues are mainly environment-related, concerning matters such as energy, water and waste management. We argue that an agreement on eco-city development targets should be established, although the approaches to achieve the targets may vary depending on specific context and its attributes for new development, future growth and expansion. Therefore, future eco-city practices need to address these common targets in the local contexts.

9.3 Final Remarks

This book is the first attempt to highlight and assess a variety of eco-development projects at multiple spatial levels of the built environment in China. It also stresses the importance of interplay between these spatial levels, by addressing the gaps, issues and challenges at each level, and also

between levels. In this book, we have argued that strategies and solutions for eco-development must consider the interplay between various spatial levels, minimise policy conflicts, and support innovative directions of holistic planning and design. Eco-development is highly influenced by policy development, and we urge the need to accelerate policy reforms and transitional cases, which enable some of the existing cities to consider eco- as their main agenda of future development, enhancement and growth. Future eco-development cases may require the inclusion of more comprehensive system thinking approaches, and may also highlight the importance of ecology and nature in the built environment. The future projects should also look into key factors of transitions, such as energy transitions and low-carbon transitions, and find methods of achieving the green economy. Through this thinking, we require to adapt new strategies that enable us to broaden our profitability across various dimensions of sustainability and for various stakeholder constellations. By doing so, we will be in the right direction to change the current behaviours, mindsets and preferences of not only the users, but those of decision makers, governmental authorities, policy makers, developers and the practitioners.

Although we focused on cases, strategies and solutions in China, the ideas that have emerged from this book should be applicable to any other country with a strong green or eco-development agenda. Also in the contexts were institutions for a greener development are weak, or directions are not necessarily eco-friendly, we hope to see immediate changes and new directions other than 'business-as-usual' practices. As it stands, China will set new practices, some of which may become 'best practices', and some of which may become 'new development modes' that may be applied in other regions. In this process, what will remain visible is the growing role of China in this direction of eco-development. In this respect, we anticipate seeing new trends of development, new planning models and new strategies towards the future of eco-development.

References

China Daily 1 (Oct 2017) Environmental Protection Won't Slow Down Economic Growth. Available at: http://www.chinadaily.com.cn/china/19thcpcnationalcongress/2017-10/23/content_33613817.htm.

China Daily 2 (Oct 2017) Highlights of Xi's Report to the Congress. Available at: http://www.chinadaily.com.cn/china/2017-10/19/content_33436874.htm.

de Jong, M., Joss, S., Schraven, D., Zhan C., and Weijnen, M. (2015) Sustainable–smart–resilient–low carbon–eco–knowledge cities; making sense of a multitude of concepts promoting sustainable urbanization, *Journal of Cleaner Production*, 109, pp. 25–38.

Deng, W., Cheshmehzangi, A., Dawodu, A., and Wang, B.Y. (2017) *Comparison study of eco-city key performance indicator systems in China*, Proceedings of World Conference for Sustainable Built Environment 2017, pp. 791–802, 5–7 June 2017, Hong Kong.

Joss, S. (2015) *Sustainable Cities: Governing for Urban Innovation*, London: Palgrave Macmillan.

The Guardian (2017) Uber for bikes: how 'dockless' cycles flooded China – and are heading overseas; Available at: https://www.theguardian.com/cities/2017/mar/22/bike-wars-dockless-china-millions-bicycles-hangzhou.

World Economic Forum (2016) Shaping the future of construction – a breakthrough in mind-set and technology, prepared in collaboration with the Boston Consulting Global, May 2016.