

Urban Planning and Design Strategies under the Concept of Low-Carbon Ecology

YANG Xue

Shanghai Tongji Urban Planning & Design Institute Co. Ltd., Shanghai, China

Abstract: Urban planning and design strategies under the concept of the low-carbon ecology is studied in this paper. In a broad sense, an ecological city is a new cultural concept based on a deeper understanding of the relationship between man and nature, and a new type of social relationship established in accordance with the principles of ecology, in which society, economy and nature develop harmoniously. The concept of the low-carbon urban environmental protection has become the key to reducing carbon emissions. It is essential to study urban low-carbon environmental protection in order to better cope with global warming and energy crisis. This paper gives the novel suggestions for building the better cities.

Keywords: *Low-carbon ecology; urban planning; design strategies; core concept*

I. INTRODUCTION

Problems such as environmental pollution, energy shortage and increasing carbon emission have appeared in people's vision with the process of urbanization. Based on the concept of the low-carbon economy, the construction of ecological civilization has emerged as the requirement of the times. As the core of the social and economic development, cities are indispensable that become the focus of low-carbon economic development. The concept of the low-carbon urban environmental protection has become the key to reducing carbon emissions. It is essential to study urban low-carbon environmental protection in order to better cope with global warming and energy crisis. We must strive to build a low-emission, high-efficiency low-carbon city, through industrial adjustment and development model change, reasonably and effectively promote the development of low-carbon cities. As the reference, in the figure 1, we denote the concept of low-carbon ecology.

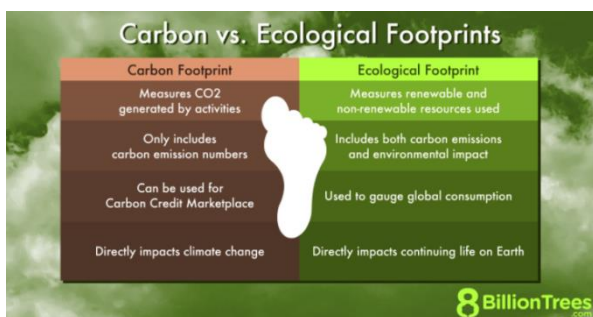


Figure 1. The Concept of Low-carbon Ecology (Image source: <https://8billiontrees.com/carbon-offsets-credits/carbon-ecological-footprint-calculators/globally-green-environment/>)

Existing research shows that the development path we must stick to should be: First, speed up construction of an ecological civilization system and improve the resource and

environment ecological red line control system. Continue to carry out the pilot demonstration of the construction of the main functional areas; second, vigorously promote energy conservation and emission reduction; third, vigorously develop circular economy; fourth, pay close attention to environmental governance; fifth, do a solid job in dealing with climate change. Hence, in the rest of the paper, the details of the urban planning and design strategies under the concept of the low-carbon ecology will be discussed in detail.

II. THE PROPOSED IDEAS

A. The Discussions of Low-carbon Ecology Concept

At present, our country's construction-related energy consumption accounts for a large proportion of the whole society. Every square meter of housing is built, and about 0.9 tons of the carbon are released. The demolition rate of existing buildings in my country accounts for about 40% of the new building area. The average service life of European buildings is nearly a hundred years. The average service life of Chinese buildings is short. Due to the short average service life of buildings, the carbon emissions of the building demolition and construction are increased. Low-carbon eco-city is an intensive mixed urban form with more diverse loads; it is a dense and compact spatial structure that requires integrated use of energy; it is also a variety of low-energy density and low-quality energy (such as the comprehensive use of shallow surface heat storage energy, surface water and also sewage temperature difference energy, solar thermal, solar photovoltaic, etc.). All of these need to be integrated, converted, stored and distributed through an energy hub at the city level. Ecological technology is to use the principle of ecology, consider the problem from the whole, pay attention to the optimization of the whole system, comprehensively utilize resources and energy, reduce waste and loss, and achieve higher goals with less consumption, so as to obtain reasonable resources and energy with the use to promote the sustainable development of the ecological environment.

At present, various social development concepts are actually practicing the "low-carbon" principle, although my country has not yet formulated clear laws and regulations on "low-carbon living". For example, it can be said that the scientific outlook on development is based on China's current national conditions, aims at a series of new problems in the practice of development, and comprehensively analyzes the new contradictions between man and man, man and society, and man and nature. The Low Carbon Life is a simple, easy, and uncomplicated way of life. It achieves the reduction of collective carbon emissions by moderately reducing individual carbon emissions, protects the environment, promotes the development of the ecological civilization, and thus promotes the sustainability of the entire global environment.



B. Urban Planning and Design Strategies under the Concept of Low-carbon Ecology

Some cities that are currently engaged in research and construction of low-carbon ecological cities are in the "generation process" of low-carbon ecological cities. They can't be considered as low-carbon ecological cities. It is scientifically correct to call them "low-carbon ecological cities" to reflect that they are in the process. The question of "how to generate" a low-carbon ecological city will directly affect whether a low-carbon ecological city can be built. The generation of the low-carbon eco-city must be the coexistence and coexistence of each subsystem as a synthetic system of nature, economy and society. Moreover, the generation of this artificially open complex giant system is the co-creation process of "people" in the low-carbon eco-city (embodied as participants in the generation of the low-carbon eco-city), the actual existence or the organism, which constantly absorbs, connects, integrates and creates other actual existence or organism.

Therefore, we have the following suggestions for the planning:

(1) Develop a concentrated and compact urban layout form, which can achieve the least total carbon emissions with the least amount of traffic and the least energy consumption. Increase the green area in the general layout to enhance the effect of the ecological carbon sequestration. Build the comprehensive functional community, organically combine work, residence, shopping and other activities in a relatively compact area, and coordinate the use of the walking, bicycles, public transportation and cars and other means of transportation.

(2) In order to increase the carbon sink capacity, it is necessary to reduce the number of buildings, build more ecological landscapes, and build fewer large plazas and fountains or artificial waterfalls with the high power consumption in urban planning, which is conducive to outdoor activities, oxygenation and fitness. Create more green areas that can effectively reduce the heat island effect, and natural rivers, lakes and mountains must be preserved naturally.

(3) The development strategy and regional layout plan of the first, second and third industries form an industrial structure based on agriculture, guided by high-tech industries, supported by basic industries and manufacturing, and fully developed by the service industry.

THE CONCLUSIONS

Urban planning and design strategies under the concept of the low-carbon ecology is studied in this paper. In the future, urban development must adhere to the low-carbon strategic direction, and low-carbon ecological urban planning should be our common goal. We should strive to develop low-carbon industries, actively promote low-carbon technologies, gradually improve low-carbon urban projects, accelerate the implementation of low-carbon transportation, vigorously develop low-carbon tourism, and transform low-carbon ecological garden areas from various aspects.

References

- [1] Allam, Zaheer, and David S. Jones. "Pandemic stricken cities on lockdown. Where are our planning and design professionals [now, then and into the future]?" *Land use policy* 97 (2020): 104805.
- [2] Lenzholzer, Sanda, Gerrit-Jan Carsjens, Robert D. Brown, Silvia Tavares, Jennifer Vanos, YouJoung Kim, and Kanghyun Lee. "Awareness of urban climate adaptation strategies—an international overview." *Urban Climate* 34 (2020): 100705.
- [3] Megahed, Naglaa A., and Ehab M. Ghoneim. "Indoor Air Quality: Rethinking rules of building design strategies in post-pandemic architecture." *Environmental research* 193 (2021): 110471.
- [4] Kim, Hyung Min, and Anthony Kent. "The emergence of international urban planning and design firms in China from an OLI perspective." *Journal of Regional and City Planning* 30, no. 2 (2019): 123-139.
- [5] Bibri, Simon Elias, John Krogstie, and Mattias Kärrholm. "Compact city planning and development: Emerging practices and strategies for achieving the goals of sustainability." *Developments in the built environment* 4 (2020): 100021.
- [6] Pineda, Victor Santiago, and Jason Corburn. "Disability, urban health equity, and the coronavirus pandemic: promoting cities for all." *Journal of Urban Health* 97 (2020): 336-341.
- [7] Mandeli, Khalid. "Public space and the challenge of urban transformation in cities of emerging economies: Jeddah case study." *Cities* 95 (2019): 102409.
- [8] Pozoukidou, Georgia, and Zoi Chatziyiannaki. "15-Minute City: Decomposing the new urban planning utopia." *Sustainability* 13, no. 2 (2021): 928.
- [9] Capolongo, Stefano, Andrea Rebecchi, Maddalena Buffoli, Letizia Appolloni, Carlo Signorelli, Gaetano Maria Fara, and Daniela D'Alessandro. "COVID-19 and cities: From urban health strategies to the pandemic challenge. A decalogue of public health opportunities." *Acta Bio Medica: Atenei Parmensis* 91, no. 2 (2020): 13.
- [10] Blanco, Eduardo, Maibritt Pedersen Zari, Kalina Raskin, and Philippe Clergeau. "Urban ecosystem-level biomimicry and regenerative design: Linking ecosystem functioning and urban built environments." *Sustainability* 13, no. 1 (2021): 404.
- [11] Yang, Junyan, Beixiang Shi, Yi Shi, Simon Marvin, Yi Zheng, and Geyang Xia. "Air pollution dispersal in high density urban areas: Research on the triadic relation of wind, air pollution, and urban form." *Sustainable Cities and Society* 54 (2020): 101941.
- [12] Nguyen, Thu Thuy, Huu Hao Ngo, Wenshan Guo, Xiaochang C. Wang, Nanqi Ren, Guibai Li, Jie Ding, and Heng Liang. "Implementation of a specific urban water management-Sponge City." *Science of the Total Environment* 652 (2019): 147-162.