

# Research on the Urban Renewal Design Based on the Low-Carbon Concept

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**Abstract:** *With the increasing severity of global climate change, the low-carbon concept is playing an increasingly important role in urban planning and design. Leading with the concept of low carbon, this paper discussed the urban renewal design in reducing carbon emissions, which is helpful for improving the role and significance of urban sustainability. Low carbon concept led by urban renewal design is an important way to promote the sustainable development of the city. It also can help to reduce carbon emissions, improve the quality of urban life, and is worth constantly explore and perfect in practice.*

**Keywords:** *low-carbon concept, urban renewal design, urban sustainability, research strategy*

## 1. Introduction

With the increasingly prominent problem of global climate change, low-carbon urban renewal design will become the mainstream trend of future urban development. In the urban renewal design, energy saving and emission reduction technology will be more widely used, and green building and sustainable transportation system will become the important elements of urban renewal design. Urban landscape design will put more emphasis on the planning and design of ecological landscape and green space system, so as to create a more livable and pleasant urban environment.

## 2. An Overview of the low-carbon concept

### 2.1. Definition and characteristics of the low-carbon concept

Low-carbon concept refers to an environmental protection concept adopted to reduce carbon emissions and reduce the impact on the earth's environment. Its core idea is to achieve the goal of efficient resource use and environmental protection by reducing energy consumption and carbon emissions. The characteristics of low carbon concept include energy conservation and emission reduction, green environmental protection, sustainable development and so on aspects<sup>[1]</sup>. The concept of low-carbon emphasizes the realization of sustainable urban development through technological innovation and behavior change, advocates a green, low-carbon and circular lifestyle, and advocates the harmonious coexistence between people and the environment.

The definition and characteristics of low-carbon concept have a guiding role in urban renewal design, which can guide designers to pay attention to energy conservation and emission reduction, green building design, sustainable transportation system planning and other aspects when planning and construction of urban renewal projects, so as to achieve the goal of low-carbon urban renewal. By integrating the low-carbon concept into the urban renewal design process, the urban ecological environment quality can be effectively improved, the energy consumption and carbon emission can be reduced, and the urban sustainable development can be promoted.

### 2.2. Background and Significance of low-carbon urban renewal

Low-carbon urban renewal refers to the renewal and transformation of urban space, built environment and transportation system in the process of urban development by introducing low-carbon concepts and technologies, with the goal of reducing carbon emissions and resource consumption. The

background of low-carbon urban renewal is that with the increasingly prominent global climate change and environmental problems<sup>[2]</sup>, people gradually realize that the traditional urban development model with high energy consumption and high carbon emission is no longer sustainable, and the shift to low-carbon development has become the trend of global urban development.

The significance of low-carbon urban renewal lies in that it can effectively reduce urban carbon emissions and resource consumption, improve the quality of urban ecological environment, and improve the quality of life of residents. Through low-carbon urban renewal, not only the goal of energy conservation and emission reduction can be achieved, but also can promote the sustainable development of urban economy and increase the competitiveness and attraction of the city. At the same time, low-carbon urban renewal can also promote the innovation of urban planning and construction, promote the sustainable development and ecological balance of cities, and lay a foundation for the long-term development of cities in the future.

### ***2.3. Application of low-carbon concept in urban planning***

As an important part of today's urban renewal design, the low-carbon concept has a crucial application significance in urban planning. First of all, the introduction of low-carbon concept can effectively reduce the carbon emissions of cities, and achieve the goal of energy conservation and emission reduction by optimizing the urban layout and transportation system design. Secondly, the low-carbon concept can promote the development of green buildings and sustainable transportation system in urban planning, and promote the development of urban renewal towards a more environmentally friendly and sustainable direction<sup>[3]</sup>. In addition, the low-carbon concept can also guide the overall planning of urban planning in ecological protection, resource utilization and environmental improvement, so as to achieve sustainable urban development.

## **3. Key elements of low-carbon urban renewal design**

### ***3.1. Application of energy saving and Emission reduction technology in urban renewal***

In the urban renewal design, energy saving and emission reduction technology is one of the important means to realize the low-carbon concept<sup>[4]</sup>. By using energy-saving technologies, such as intelligent lighting systems, efficient HVAC systems, and solar energy utilization, energy consumption and emissions can be effectively reduced. At the same time, the emission reduction technologies include waste gas treatment equipment, sewage treatment system, etc., which can effectively reduce the environmental pollution generated in the process of urban renewal. The application of these technologies can not only improve the sustainability of urban renewal design, but also reduce operating costs and environmental impacts.

### ***3.2. Application of green buildings in urban renewal design***

Green building refers to a building that minimizes the environmental impact and resource consumption in the process of design, construction and use, while improving user comfort and health. The application of green building has become increasingly important in urban renewal design. First, green buildings can improve the energy efficiency of buildings and minimize the energy needs of buildings through the use of energy-saving materials, rational layout and efficient equipment. Secondly, green building can also improve the quality of indoor environment, through natural lighting, ventilation and choose harmless materials, improve the comfort and health level of building users. At the same time, the green building can also promote the ecological balance of the city, and improve the ecological environment quality of the city through the green roof, garden landscape and rainwater collection system.

### ***3.3. Application of sustainable Transportation System in Urban renewal design***

Sustainable transportation systems mainly include public transportation, non-motor vehicles and walking systems, whose rational planning and design can effectively reduce traffic congestion, air pollution and greenhouse gas emissions.

Public transport system is one of the most important modes of transportation in cities. Through rational planning and design, transport efficiency can be improved, reduce the use of private cars and

reduce carbon emissions. Secondly, the setting of non-motorized lanes and pedestrian system can promote urban residents to ride and walk, reduce their dependence on cars, and improve the quality of urban environment and enhance the physical health of urban residents<sup>[5]</sup>.

In addition, sustainable transportation systems also include the application of intelligent traffic management systems and new energy vehicles. By introducing intelligent traffic management system, the efficiency and safety of transportation can be improved, and the promotion of new energy vehicles can reduce the dependence on traditional fossil fuels and reduce carbon emissions.

#### **4. The embodiment of the low-carbon concept in the urban landscape design**

##### ***4.1. Influence of ecological landscape design on urban renewal***

Ecological landscape design can effectively promote the construction of urban green space, increase the area of urban green space, improve the living environment, and improve the quality of life of residents. In addition, the ecological landscape design can also introduce various natural ecological elements, such as wetland, woodland, water body, etc., to create a unique ecological landscape of the city, enhance the landscape quality and attraction of the city, and enhance the image of the city.

##### ***4.2. Planning and design of urban green space system***

In the low-carbon urban renewal design, the planning and design of urban green space system should start from the following aspects<sup>[6]</sup>.

(1) Planners should give full consideration to the spatial layout of urban green space, make rational use of urban space resources, create diversified green landscape, and improve the urban greening rate and ecological landscape quality at the same time,

(2) It is necessary for us to pay attention to the selection and configuration of green vegetation, promote the growth of urban vegetation, increase the diversity of urban ecosystem, and improve the ecological function of urban green space system.

(3) In the planning of urban green space system, we should also pay attention to the combination of green space and water body, create water system landscape, optimize the urban ecological environment, enhance the natural style of the city, and improve the quality of life of urban residents.

(4) It is essential for us to integrate intelligent technology, realize the organic combination of urban green space system and other urban functions, build a green ecosystem of smart city, and provide technical support and guarantee for the low-carbon development of the city.

##### ***4.3. Design principles of urban water system and ecological corridor***

The design of urban water systems and ecological corridors fully considers the rational allocation and utilization of water resources, including the collection and utilization of rainwater and the protection of groundwater resources; In urban planning, attention should be paid to preserving and restoring natural rivers, lakes, and other water bodies, improving the quality of urban water environment, and enhancing urban ecological resilience; The setting of ecological corridors should be fully considered, connecting ecological nodes such as urban green spaces, forests, wetlands, etc., to provide rich natural experiences and ecological services for urban residents; Attention should be paid to the landscape planning of water systems and ecological corridors. Through reasonable vegetation configuration and design of landscape elements, a city landscape with humanistic sentiment and ecological functions should be created to enhance the city's image and the quality of life of residents.

#### **5. Case analysis of low-carbon urban renewal design**

##### ***5.1. Case study of domestic low-carbon urban renewal design***

In China, low-carbon urban renewal design has become an important development goal for many cities. Taking Beijing as an example, it has successfully built the image of "low-carbon capital" by improving the building energy efficiency level, promoting green transportation modes and building ecological landscape. In the urban renewal design, Beijing has adopted a smart energy system to realize

the efficient use of energy and the reduction of carbon emissions. At the same time, through the construction of central heating system and new energy vehicle charging pile, the upgrading of the urban energy structure and the popularization of green travel mode are further promoted. In addition, Beijing also pays attention to the protection and improvement of the ecological environment. Through the construction of urban green space, wetland parks and ecological corridors, the urban air quality and residents' living environment have been effectively improved<sup>[8]</sup>.

In addition, Shanghai is also one of the models of low-carbon urban renewal design in China. Shanghai has paid attention to the integration of the concept of sustainable development in urban planning. Through the research and promotion of energy conservation and emission reduction technologies, it has successfully realized the reduction of carbon emission and urban energy consumption. Shanghai also advocates green building and sustainable construction of urban transportation system, which provides more innovative ideas and practical experience for urban renewal design. It can be said that the domestic low-carbon urban renewal design cases not only provide reference for other cities, but also provide valuable experience for the exploration of low-carbon development path.

### ***5.2. Case study of international low-carbon urban renewal design***

In the international scope, more and more cities begin to pay attention to the application of low-carbon concept in urban renewal design. For example, the city of Copenhagen, Denmark, has become a model of a low-carbon city by using a lot of green buildings and renewable energy. In addition, the American city of San Francisco has successfully achieved the low-carbon goal of urban renewal by implementing strict building energy efficiency standards and developing sustainable transportation systems. Singapore, on the other hand, develops urban green space system and optimizes urban water system, and achieves a good effect of low-carbon urban renewal by combining urban renewal with natural ecology<sup>[9]</sup>.

The successful experience of these international cases provides valuable reference and inspiration for other cities. In the future, with the increasingly serious global climate change, low-carbon urban renewal design will become the key path for sustainable urban development. Therefore, we need more international cooperation and experience exchange, jointly discuss the best practices of low-carbon urban renewal design, and contribute to the construction of a better future city.

## **6. Evaluation and outlook of low-carbon urban renewal design**

### ***6.1. Future development trend of low-carbon urban renewal design***

In the future, the low-carbon urban renewal design will pay more attention to ecological environment protection and resource conservation and utilization, and actively promote the development of cities to a more sustainable and green direction. In the urban renewal design, energy saving and emission reduction technology will be more widely used, and green building and sustainable transportation system will become the important elements of urban renewal design<sup>[10]</sup>. At the same time, the urban landscape design will put more emphasis on the planning and design of ecological landscape and green space system, so as to create a more livable and pleasant urban environment.

In the future, the low-carbon urban renewal design will also pay more attention to the participation of community residents and the integration of community construction. Community energy management and the promotion of a low-carbon lifestyle will become an important task, and the low-carbon strategies for the community public space design will also get more attention. In addition, with the continuous development of urban renewal design, the design concept and practice will be more combined, and the summary and inspiration of practical experience will also provide valuable experience for the future urban renewal design.

### ***6.2. Challenges and countermeasures of low-carbon urban renewal design***

#### ***6.2.1. Challenges faced<sup>[11]</sup>***

(1) Technical problems. How to apply energy saving and emission reduction technologies, green buildings and sustainable transportation systems to urban renewal design requires continuous

exploration and innovation.

(2) Capital problems. The implementation of the low-carbon concept needs a large amount of financial support, and how to finance through government guidance, social capital and other multi-party cooperation is a difficult problem to be solved urgently.

(3) Policy issues. Urban renewal design involves multiple interests, so it is necessary to establish a perfect policy and regulation system, coordinate the interests of all parties, and promote the smooth progress of low-carbon urban renewal.

(3) Social cognition and participation. How to improve the residents' awareness of low carbon and promote the active participation of community residents is the problem that needs to be considered in the design of low-carbon urban renewal.

### 6.2.2. Coping strategies

(1) It is necessary to strengthen scientific research and innovation, promote the research and development and application of low-carbon technologies, and constantly improve the low-carbon level of urban renewal design.

(2) It is needful to establish a diversified financial support system to attract more social capital to participate in the renewal of low-carbon urban development, and jointly promote the implementation of the low-carbon concept.

(3) It is essential to strengthen policy guidance, formulate sound policies and regulations, and provide legal guarantee and policy support for low-carbon urban renewal.

(4) It is indispensable to strengthen social education and publicity, improve residents' awareness of low-carbon development, stimulate the enthusiasm of community residents to participate, and jointly promote the smooth implementation of low-carbon urban renewal.

Through the implementation of these countermeasures, we are confident to overcome various challenges in the design of low-carbon urban renewal and promote the development of cities towards a low-carbon and sustainable direction.

## 7. Conclusions

To sum up, the low-carbon urban renewal design needs to learn from the experience of successful cases at home and abroad, pay attention to the local actual situation, guide the citizens to participate, and emphasize innovation and cooperation, in order to achieve the sustainable development goal of urban renewal. It is hoped that the above suggestions can provide useful reference for low-carbon urban renewal design and promote the development of urban construction to a more environmentally friendly, intelligent and sustainable direction.

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