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Urban Landscaping Design and Carbon Reduction Planning Countermeasures

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Abstract As the most significant green ecological resource in densely populated and economically developed areas, urban landscaping plays a pivotal role in carbon sink value and multiple ecosystem service functions. It is a crucial element in the advancement of green and low-carbon initiatives in China's major cities and the realization of a carbon-neutral vision. By analyzing the relationship between carbon emission reduction and urban landscaping, the paper sorts out and summarizes the basic principles of urban landscaping design, proposes the role of landscape design in urban landscaping, and plans countermeasures for carbon reduction in urban landscaping, with a view to optimizing the construction and management of urban landscaping.

Keywords Landscape architecture, Climate change, Carbon neutral, Carbon source sink, Carbon reduction strategy

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A city is a large human settlement[1]. It can be defined as a permanent, densely populated area with clearly defined administrative boundaries, where the majority of residents are engaged in non-agricultural activities. Cities are characterized by the presence of extensive systems of housing, transportation, sanitation, utilities, land use, commodity production, and communication. The practice of urban landscaping has the potential to enhance the quality of life for humans, offering a multitude of benefits including opportunities for leisure, entertainment, tourism, relaxation, and even residence. Cities represent the primary energy-consuming regions in China, accounting for 85% of the country's CO_2 emissions and exerting a pivotal influence on climate change[2]. The issue of environmental degradation, particularly in the context of climate change, represents a significant global concern. It is becoming increasingly evident that extreme weather phenomena, such as high temperatures, droughts and heavy rains, are occurring with greater frequency in many urban areas as a consequence of global warming. In the absence of effective control measures, greenhouse gas emissions will continue to contribute to the observed trend of global warming, which will in turn result in a range of unpredictable risks for humanity. Consequently, it is of paramount importance that the greening rate of urban gardens should be increased and that more vegetation should be planted in order to mitigate the effects of climate change. This paper presents a summary of the relationship between carbon emission reduction and urban landscaping. It also puts forward the basic principles of urban landscaping design, which is of great significance in improving the green space ratio of urban garden greening[3]. The planning of countermeasures for carbon reduction in urban landscaping plays a pivotal role in the development of green space ratios in urban landscaping. The implementation of urban landscaping initiatives requires the collective effort and support of the human population. The government, as the principal administrative body, should encourage the general public to engage in a wide range of activities that contribute to the advancement of urban landscaping initiatives.

1 Relationship between carbon emission reduction and urban landscaping

Cities are large human settlements. A city can be defined as a permanent, densely populated area with clearly defined administrative boundaries, where the majority of residents engage in non-agricultural activities[4]. Cities are characterized by the presence of extensive housing, transportation, health, utilities, land use, commodity production, and communication systems. The field of urban landscaping plays a pivotal role in shaping the human living environment. Carbon emissions and carbon emission reduction measures play a pivotal role in urban landscaping. Urban landscaping provides people with a suitable location for leisure, relaxation, and play. Additionally, the plant landscape acts as a carbon sink, absorbing CO_2 and releasing O_2, thereby contributing to carbon emission reduction. Carbon emission reduction measures play a pivotal role in the greening of urban gardens.

2 Basic principles of urban landscaping design

2.1 People-oriented design

In the process of urban landscaping design, humans are the primary focus. As a product of society, people play a pivotal role in the continued prosperity of the motherland. As the socialist level of development and the quality of science and technology continue to improve, there is a growing recognition of the importance of green landscape configuration and construction[5]. Whether in a domestic setting or in a public park, people tend to be more drawn to greenery and plants. In urban landscaping, the landscape is the primary focus, and the principle of people-oriented design should be observed. In the design of urban landscaping, it is essential to prioritize the needs of the "people". The shape, type, size, specification, and collocation of plants should be guided by the values of the "people", with the aim of meeting the needs of people for leisure, entertainment, play, and relaxation[6].

2.2 Ecology

The plant landscape represents the primary feature of the park and serves an ecological function. In the process of landscape design, urban landscaping and plants should adhere to the principle of ecology. The plant landscape plays a pivotal role in the absorption of CO_2 and the subsequent release of O_2, which is of significant importance in the context of carbon emissions[7]. The reduction of carbon emissions necessitates the involvement of plant landscapes. In the process of landscaping design, the selection of plant species must adhere to the principle of ecology. This entails identifying suitable plants based on the specific

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soil conditions, hydrology, climate, and other natural environments of the landscape, thereby ensuring the sustainable development of the entire ecological environment. China is a vast country with a large population. Its diverse ecological environments have given rise to a multitude of plant species, which can be found in different regions of the country. Accordingly, the selection of plant species should adhere to the fundamental tenets of plant landscape ecology. It is well established that plants absorb CO_2 from the atmosphere. The formulation of carbon emissions associated with urban landscaping therefore have an important impact on plants[8].

2.3 Diversity

The plant landscape exhibits a high degree of diversity, which is reflected in the selection of plants, species, specifications, size, and plant arrangement. In the design process, it is important to consider the diversity of plants, as this can help to avoid homogeneity and instead achieve a sense of unity and diversity. In the process of selecting a plant landscape, it is essential to consider the diversity of plants, the combination of shrubs and grasses, the integration of high, middle, and low plants, and the mode of plant landscape combination, which is more conducive to highlighting the diversity of plants and satisfying people's aesthetic needs. In the design of urban landscaping, it is essential to consider the diverse needs of plants[9]. Plants serve as the primary body, while other landscapes act as ligands. The diversity of plants can facilitate the achievement of optimal carbon emission standards in urban landscaping. Consequently, the selection of plants and the diversity of plants necessitate the design abilities of landscape designers. It is incumbent upon landscape designers to consider the diverse needs of plants. When landscape designers create urban landscaping, they must consider a multitude of factors, including the selection of plants in terms of texture, specification, type, and size. In order to achieve the optimal standard of urban landscaping design, it is essential to consider these elements holistically.

3 The role of landscape design in urban landscaping

3.1 Helping to satisfy people's aesthetic requirements and pleasure of mind

A well-executed landscape design can fulfill the aesthetic and psychological needs of the public. Humans are driven by a desire for positive experiences and a sense of well-being. Maintaining a positive emotional state can facilitate relaxation[10]. Landscape design is the culmination of the efforts of landscape designers. In the process of urban landscaping, it is necessary for landscape designers and construction parties to collaborate, integrating the designed works with the construction parties, emphasizing the human subject, and aligning with the expectations of the public. Humans have a deep-seated desire for contact with nature, a pursuit of tranquility, an aspiration for aesthetic experiences, and a positive attitude towards new things.

3.2 Helping control carbon emission indices and improve air quality

The atmosphere is replete with CO_2, and a favorable environment is conducive to enhanced air quality and human well-being. In the context of landscape design, it is imperative to implement strategies to mitigate carbon emissions. It is important to be aware of the specific requirements for planning and the specific indices for controlling carbon emissions. It is imperative to be conversant with the pertinent legislation and regulations pertaining to carbon emissions, to be cognizant of the relevant emission indices, and to endeavor to enhance the quality of the air. The acceleration of the social process has led to the establishment of an increasing number of factories, which in turn has resulted in a significant increase in the amount of waste and waste residues emitted by these factories. This has a considerable impact on carbon emissions. In the context of landscape design, it is essential to monitor and regulate the carbon emission indices, thereby enhancing the control power of carbon.

3.3 Helping to change the deficiencies in the development of urban landscaping

In the process of landscape design, the continuous participation of landscape designers is necessary to excavate the connotations associated with urban landscaping. As society and the economy of the motherland continue to develop, so too do the aesthetic needs of the people. This is reflected in the continuous improvement in the quality of landscape design during the process of urban landscaping[11]. In the ongoing process of urban landscaping, landscape designers must continue to develop and refine their skills in order to address the shortcomings inherent in the development of urban landscaping. In the process of developing urban landscaping, the changes in the times will undoubtedly result in a number of shortcomings. Consequently, the advancement of landscape design serves to rectify the shortcomings in the development of urban landscaping.

4 Planning countermeasures for carbon reduction in urban landscaping

In order to achieve the planning goals and countermeasures of urban landscaping carbon reduction, it is necessary to implement an urban landscaping carbon reduction planning system comprising two key elements: control regulation of low carbon indices and revision of low carbon planning. In addition, it is essential to formulate relevant policies and systems of urban landscaping. The formulation of the two aspects provides assistance in the implementation of urban landscaping carbon reduction.

4.1 Constructing a carbon reduction planning system of control regulation of low carbon indices and revision of low carbon planning for urban landscaping

4.1.1 Control regulation level. Control regulation, which may be defined as controlled detailed planning, is the planning of urban and rural planning departments of urban and county people's governments to control the nature, use intensity, and spatial environment of construction land according to the requirements of the overall planning of cities and towns[12]. Control regulation represents the most direct planning level for the control of land development. In urban landscaping, the following parameters are selected for control regulation: green space ratio, green space system, green coverage ratio, and comprehensive species index (Table 1). The control mode encompasses three indices: control index, guiding index, and diversity index. These indices can be employed in a reasonable manner while ensuring that the upper planning constraints are met[13]. The green space ratio should be maximized in accordance with the relevant norms. The green space system should be clarified with respect to the characteristics of different urban gardens, and suggestions that are conducive to the construction of an urban landscaping system should be put forward. It is recommended that the greening area of urban gardens should be enhanced and that the green coverage ratio of urban gardens should be improved to the greatest extent possible. It is essential to integrate the distinctive attributes of various urban environments, enhance the diversity of plant species, and proportionately align the trees, shrubs, and grasses to elevate the comprehensive species index[14].

4.1.2 Revision level. In the process of urban landscaping design, a unified green landscape system should be constructed according to

the characteristics of urban landscaping[15]. A revision plan is a detailed construction plan that is based on the urban master plan, zoning plan, or regulatory detailed plan. It is designed to guide the design and construction of various buildings and engineering facilities. Planning and design of these facilities is a form of urban detailed planning (Tables 2−3). In the design process of urban landscaping, the following principles should be adhered to: the characteristics of different urban landscaping should be combined to build a unified green landscape system; the situation of urban landscaping should be taken into account when adopting a variety of ways to build different landscape systems; an effective ventilation corridor should be formed; summer wind should be reasonably guided and winter wind should be blocked; green space should be arranged to reduce summer solar radiation; summer solar radiation should be avoided; the relevant norms of urban landscaping should be met; functional requirements should be built into the design; and appropriate carbon reduction plans should be put in place according to different green space types[16].

4.2 Formulate policies and systems related to urban landscaping

In the context of urban landscaping, it is imperative that the government and other leading departments develop appropriate policies and systems to achieve the optimal reduction of carbon emissions[17]. The government serves as the primary sector, while the masses serve as the foundation. The formulation of policies aimed at reducing carbon emissions and the design of landscapes contribute to the advancement of landscape architecture.

4.2.1 Relevant laws and regulations. In the context of urban landscaping, it is imperative that the government and higher authorities formulate legislation and regulations with the primary objective of regulating carbon emissions and proposing rational suggestions and references for urban landscaping design[18]. In addition to the aforementioned considerations, urban landscaping is subject to a number of laws, regulations, and rules. The system should be consistent with the overarching planning and master planning requirements. It is necessary to improve the relevant laws and regulations, as well as the need for government departments to constantly make plans and adjustments. Furthermore, it is essential that there are laws to abide by.

4.2.2 Wide mobilization and participation of the government, competent departments, and the general public. In the context of urban landscaping, it is essential that the government, relevant departments, and the general public collaborate in order to achieve successful outcomes[19]. Firstly, it is essential that government departments provide guidance on laws and regulations to facilitate rational layout at the legislative level. Furthermore, the competent departments should implement comprehensive adjustments to relevant policies and systems at the higher level, thereby enabling extensive public participation[20]. The reduction of carbon emissions and the conservation and restoration of plant landscapes all require the active participation of the general public. The people represent a crucial element in the process of urban landscaping, playing a pivotal role in the implementation of such initiatives. It is of the utmost importance that urban landscaping should be cared for and cherished by the users. The government is responsible for formulating policy, while competent departments are tasked with establishing objectives and the general public is expected to implement them[21-27].

5 Conclusions and prospects

The paper introduces the landscape design of urban landscaping and its carbon reduction

Table 1 Low carbon control index of regulatory detailed planning of urban landscaping

Theme	Index	Control method	Note
Landscaping	Green space ratio	Control index, setting minimum values	Maximize green space while meeting relevant codes
	Green space system	Guiding index, illustrations and provisions	Clarify the characteristics of different urban gardens, and put forward suggestions conducive to the construction of urban landscaping systems
	Green coverage ratio	Control index, multiplicity index	Enhance the area of urban landscaping and maximize the green coverage ratio of urban landscaping
	Comprehensive species index	Diversity index, enhancing richness	Improve the diversity index of plant species, and reasonably match the trees, shrubs and grasses in combination with the characteristics of different cities

Table 2 Design principles of urban landscaping carbon reduction construction detailed planning

Theme	Design element	Design principle
Landscaping	Green landscape system	Build a unified green landscape system in combination with the characteristics of different urban landscaping
		Adopt a variety of ways to build different landscape systems according to the situation of urban landscaping
	Green space layout	Form an effective ventilation corridor, reasonably guide the summer wind and block the winter wind
		Use green space layout to reduce solar radiation in summer and avoid blocking sunlight in winter
	Green space type and mode	Comply with the relevant norms of urban landscaping and meet the functional requirements
		Build appropriate carbon reduction plans according to different green space types

Table 3 Urban landscaping low carbon detailed planning and design level

Theme	Design element	Design measure
Landscaping	Morphology and seasonal landscapes	Considering the shape, shape, color and aroma of the plant itself, it is suitable for configuration with other plants
		Considering the four seasons changes of plant groups, the ornamental effect of three seasons with scenery and four seasons with flowers is formed
	Botanical landscaping	Garden plants should be configured organically and reasonably with other elements (terrain, water bodies, buildings, rocks, and animal landscape) for landscaping purposes
		Focus on the combination of evergreen and deciduous plants
	Plant configuration and selection	In accordance with the distinctive attributes of urban gardens, an assortment of native, carbon-sequestration-capable, and diverse flora can be cultivated
		In order to ensure the stability of the natural community structure, it is necessary to consider the specific needs of different cities, as well as the varying characteristics of plants, trees, and grasses, and the integration of high, middle, and low plants

planning countermeasures. It combines urban landscaping with carbon emissions and plans and analyzes carbon emissions through the means of landscape design in order to achieve the purpose of carbon reduction in urban landscaping. The reduction of carbon emissions can be achieved through the implementation of policies, laws, and regulations. The establishment of an urban landscaping carbon reduction planning system of control regulation of low carbon indices and revision of low carbon planning enables the formulation of relevant policies and systems of urban landscaping with the objective of achieving the optimal purpose and standard of carbon emission reduction.

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