

# Collaborative Innovation between Landscape Design and Urban Environment under the Concept of Green Building

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**Abstract:** Under the background of rapid urbanization, the concept of green building has become the key way to promote the sustainable development of cities. This article aims to explore the interactive relationship between green buildings and landscape, as well as their synergistic mechanism in urban environment. By systematically combing the concept of green building, this article analyzes its core values in resource saving and eco-friendliness, and further explains the important role of landscape design in improving urban microclimate, improving livability and promoting ecological restoration. This article puts forward the collaborative path of green building and garden landscape in terms of functional complementarity, technical integration and system management. The integration of the two is conducive to enhancing the stability of urban ecosystem and providing new ideas for future urban space design.

## 1. Introduction

With the rapid progress of global urbanization, the urban population is becoming more and more dense, the land resources are becoming increasingly tense, and the ecological environment is facing severe challenges. In this case, the concept of green building has gradually become a key development direction in the field of architecture and urban planning. Green buildings not only pay attention to their own energy conservation and environmental protection, but also emphasize the integration and interaction with the surrounding environment in order to achieve the goal of harmonious coexistence between man and nature [1]. As a key component of urban ecosystem, garden landscape plays an indispensable role in improving urban microclimate, improving residents' quality of life and enhancing urban resilience [2]. The concept of green building takes sustainable development as its core goal, and with the help of scientific design and technical means, it realizes efficient use of resources and minimal interference to the environment [3]. Landscape design shoulders multiple functions such as ecological restoration, cultural inheritance and social communication, and is an important part of urban green infrastructure [4]. The combination of the two is not only the integration of design concepts, but also the inevitable trend of urban spatial structure and function optimization.

Theoretically, the collaborative innovation of green building and landscape broadens the boundary between traditional architectural design and landscape planning, and promotes the overall optimization of urban ecosystem [5]. It is not only related to the integration of architecture and landscape physical space, but also pays more attention to functional complementarity and resource sharing. For example, green roofs, vertical greening, rain gardens and other facilities are not only important means of building energy conservation, but also important contents of landscape design [6]. This interdisciplinary and interdisciplinary integration is conducive to building a more efficient and sustainable urban ecological environment.

Practically, the achievement of collaborative innovation depends on the joint efforts of policy support, technological progress and public participation. At present, China has made some achievements in green building and ecological landscape construction, but there are still some problems such as backward design concept, immature technology application and imperfect policy implementation [7]. How to realize the deep integration of green buildings and landscape in limited urban space, and how to improve the ecological carrying capacity and livability of cities through

collaborative design are important issues faced by urban planners and designers.

Collaborative innovation of landscape design and urban environment under the concept of green building is an important way to cope with urban ecological crisis and enhance urban sustainable development capacity. It is a change of design method and an upgrade of urban development concept. In the future, with the advancement of technology and social cognition, the synergistic relationship between green buildings and landscape will be closer, which will provide strong support for building an ecologically livable, low-carbon and efficient urban environment.

## **2. Overview of green building concept**

Green building is an architectural design mode with sustainable development as its core concept. Its purpose is to realize the harmonious symbiosis between architecture and nature through scientific design, reasonable material selection, efficient energy utilization and minimal intervention to the environment. It not only pays attention to the energy-saving performance of the building itself, but also emphasizes the conservation of resources and environmental friendliness of the building throughout its life cycle [8].

The connotation of green building is rich, and its core goal can be summarized as "energy saving, emission reduction, environmental protection and health". Energy saving is reflected in the efficient use of energy in architectural design, such as reducing the energy consumption of building operation by means of natural ventilation, lighting design and solar energy utilization; Emission reduction emphasizes reducing the emission of greenhouse gases and pollutants during the construction and use of buildings; Environmental protection emphasizes the renewability and recyclability of building materials and the low impact on the ecological environment; Health pays attention to the positive influence of the internal environment of the building on the physical and mental health of residents, such as indoor air quality, lighting quality and noise control.

The development trend of green buildings presents an extension from single buildings to the whole urban ecosystem. Early green buildings mostly focused on the technical application of single building level, such as energy-saving doors and windows, green roofs, rainwater recovery systems, etc. [9]. With the acceleration of urbanization, the concept of green building has gradually expanded to the level of urban planning and community construction, emphasizing the synergistic relationship between buildings and surrounding environment. This change from "architectural green" to "urban green" marks the deepening and expansion of the concept of green building.

In addition, green buildings are gradually developing in the direction of intelligence and digitalization. With the maturity of Internet of Things, big data, artificial intelligence and other technologies, intelligent building management system, energy consumption monitoring platform, automatic environmental control and other means are widely used in green buildings. This not only improves the efficiency of building operation, but also makes it possible to realize refined management.

The concept of green building is an important strategy for the construction industry to deal with resource shortage and environmental pollution, and it is also the key support for the sustainable development of cities. What it advocates is a brand-new view of architecture and city, that is, to meet the living needs of human beings while minimizing the consumption of natural resources and the destruction of the ecological environment. In the future, with the advancement of technology and the promotion of policies, green buildings will be deeply integrated with landscape and urban environment in a wider scope.

## **3. The role of landscape design in urban environment**

With the continuous advancement of urbanization, urban space is becoming more compact and the pressure on the ecological environment is increasing. In this case, the role of landscape design is not only to beautify the image of the city, but also to gradually expand in ecological restoration, environmental regulation, cultural inheritance and social communication, and become an important way to enhance the livability and sustainable development of the city.

Garden landscape has irreplaceable ecological function in urban ecosystem. The green space system can effectively regulate the urban climate and effectively alleviate the "heat island effect". Vegetation reduces the surrounding temperature by transpiration, at the same time, it absorbs carbon dioxide and releases oxygen, and also has certain adsorption and purification effects on particulate matter and harmful gases in the air. In addition, the garden landscape has the functions of conserving water, reducing surface runoff and alleviating urban waterlogging. Driven by the concept of "sponge city", landscape facilities such as rain garden, sunken green space and ecological revetment are widely used and become an important supplement to urban water system management.

Garden landscape provides important public activity space for urban residents and carries key social functions. Landscape areas such as parks, street greenbelts and waterfront spaces not only provide places for residents to rest, exercise and socialize, but also promote community cohesion and residents' happiness to a certain extent. Especially in the context of high-density urban development, green open space is particularly precious. Excellent landscape design can guide people to get close to nature and relax, which is helpful to relieve the pressure of modern city life and improve the quality of life. Figure 1 shows the framework of synergistic benefits of resources and ecology in sustainable urban development.

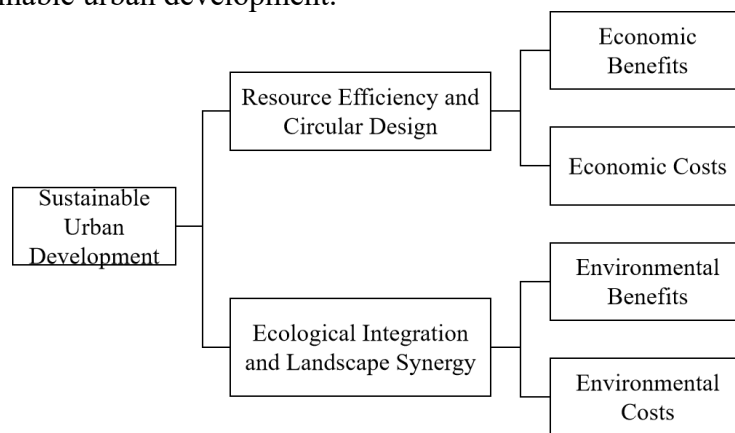


Figure 1 Framework of synergistic benefits of resources and ecology

Garden landscape is also an important carrier of urban culture. Landscape design in different regions often combines local history and culture, regional characteristics and aesthetic orientation, and becomes an important part of urban cultural memory and identity. For example, the traditional gardens in China pay attention to the natural artistic conception of "although they are made by people, they are natural", reflecting profound philosophical thoughts and artistic pursuits; Western city parks pay more attention to functionality and openness of space. Through landscape design, the city can not only show its unique cultural features, but also enhance residents' sense of cultural belonging.

In recent years, landscape design continues to absorb new technologies and new ideas, and develops in the direction of ecology and intelligence. The concepts of low-impact development (LID), biodiversity protection and smart gardens are gradually integrated into the design practice, which improves the ecological benefits and management efficiency of the landscape system. For example, intelligent irrigation system can automatically adjust water consumption according to soil moisture and meteorological data, which not only saves resources but also improves maintenance efficiency; The construction of ecological corridor is helpful to connect urban fragmented green space, provide migration paths for animals and plants, and enhance the stability of the ecosystem.

#### 4. Synergistic mechanism of green building and landscape design

The coordination of green building and landscape design is not a simple spatial superposition, but a systematic integration and functional complementarity to achieve efficient interaction between architecture, landscape and urban environment. From a conceptual perspective, green buildings

emphasize resource conservation and environmental friendliness in the whole life cycle of buildings, while landscape design pays attention to ecological restoration and the diversity of spatial functions. The two are highly compatible with the core concept of "ecological priority and people-oriented".

In terms of technical application, green buildings and landscape can achieve synergy in many ways. For example, roof greening can not only improve the thermal insulation performance of buildings and reduce the energy consumption of air conditioning, but also expand the green space of cities; Vertical greening system can not only beautify the building facade, but also absorb pollutants in the air and improve the local microclimate; Low-impact development (LID) measures such as rain garden and permeable pavement can be linked with the building drainage system to improve the efficiency of rainwater collection and utilization.

Tables 1 and 2 more intuitively show the synergistic relationship between green building and landscape design in terms of function and technology.

Table 1 Functional Complementarity between Green Buildings and Landscape Design

Function Category	In Green Buildings	In Landscape Design	Synergy Description
Energy Saving & Emission Reduction	Natural ventilation, solar power to reduce energy use	Vegetation shading and cooling to regulate microclimate	Enhanced overall energy efficiency
Ecological Restoration	Use of eco-friendly materials and low-impact construction	Air and water purification through plants	Construction of low-impact, sustainable urban ecosystems
Health & Comfort	Indoor air quality control, noise reduction	Provision of open spaces for outdoor activities	Joint creation of healthy and livable environments
Resource Recycling	Wastewater recycling, greywater use	Rainwater collection and infiltration in green areas	Efficient water use and circulation

Table 2 Integration of Green Building and Landscape Technologies

Technology Type	Application in Green Buildings	Application in Landscape Design	Integrated Synergy
Green Roofs	Improve insulation and thermal performance	Increase urban green space and air quality	Dual benefits of energy saving and greening
Vertical Greening	Reduce building surface heat radiation	Enrich spatial layers and purify air	Improve microclimate and visual quality
Rainwater Management	Collect rainwater for flushing and irrigation	Rain gardens and permeable pavements for infiltration and purification	Low-impact urban drainage system
Natural Ventilation Design	Optimize airflow through building orientation and structure	Guide airflow with plant layout	Improve ventilation efficiency and reduce AC use
Smart Management Systems	Monitor and control building energy use	Manage irrigation, lighting, and crowd flow	Intelligent integration of buildings and landscapes

From the perspective of management and implementation, the coordination mechanism between green building and landscape needs the support of policy guidance, interdisciplinary collaboration and public participation. In the design stage, we should strengthen the cooperation of architects, landscape designers and ecological engineers to ensure the consistency of design objectives and the feasibility of implementation. The government should promote the popularization and landing of related technologies by formulating policy standards for the coordinated development of green buildings and landscapes.

## 5. Conclusions

Collaborative innovation of green building concept and landscape design is an important strategy

to cope with the pressure of urban ecological environment and enhance the ability of urban sustainable development. This article combs the development process of green building and its core values in energy saving, emission reduction and resource recycling. On this basis, the collaborative path of green building and garden landscape in design concept, technical application and management mechanism is further put forward.

Green building and garden landscape are not isolated from each other, but can achieve the deep integration of space and function by means of roof greening, vertical greening and rainwater management system. This synergy not only improves the ecological performance of the building itself, but also expands the layout of urban green space and enhances the overall resilience of the urban ecosystem. The realization of the collaborative mechanism needs to rely on policy guidance, interdisciplinary collaboration and public participation to ensure the landing and long-term operation of the design concept. In the future, we should further strengthen systematic thinking, promote multidisciplinary integration, and explore the collaborative innovation model under the goal of smart eco-city and carbon neutrality.

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