Application of Green Building in Landscape Planning of Characteristic Towns

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Abstract. The positive significance of applying green buildings in town landscape planning and design to the development of small towns is discussed. Firstly, the overall classification and functions of small towns with Chinese characteristics are summarized, and the basic principles of its construction are clarified. Secondly, the related theories of green building are introduced, and the application characteristics and ways of green building in landscape design are expounded. It is found that the landscape design of characteristic towns should be based on the unique local ecological environment, material and facility conditions, and make a reasonable analysis from the perspective of topography and terrain, respect people's experience and feelings, fully consider users' physiological, psychological and emotional needs, and create a humanized landscape environment. In addition, people should not blindly pursue economic benefits. It is necessary to make use of recyclable building materials as far as possible on the basis of energy saving and environmental protection, so that economic development and ecological environment can coexist harmoniously.

1. Introduction
In recent years, with the steady improvement of China's national economy, more and more people begin to enjoy the relaxed experience of leisure tourism, which has brought great space for tourism development [1]. In the early stage of tourism development, people prefer to experience modern life with local characteristics in prosperous metropolises. In recent years, more and more people prefer to get rid of the daily fast-paced urban life. They prefer to go to villages and towns, feel the slow-paced life close to nature in different regions, and appreciate the local customs [2]. Therefore, in China, a wave of new ideas for the development of small towns with characteristics has been set off, and it gradually develops in the support and guidance of the government and the promotion of mass consumption [3]. The design and development of characteristic towns will conform to the development direction of social market, form a transitional zone between cities and countryside, and drive the urbanization process of towns and townships.

In the field of tourism, the construction of characteristic towns should be placed in the leading position with the greatest potential and influence, and follow the important concept of appropriate regional characteristics and endless innovation [4]. Local dominant areas are taken as the foundation
of landscape planning, such as agriculture, culture, customs, science and technology, to design a plan that is in line with the steady development of local tourism. While economic development leads the vigorous development of architectural landscape field, the high pollution caused by the consumption of a large number of resources and energy has become a key issue to be paid attention to at the same time [5]. The concept of sustainable development has gradually been attached importance to in various industries in China, and has also been practiced. In the planning of characteristic town landscape, green building, as a new building product under the guidance of the concept of sustainable development, can meet people's requirements for building safety and comfort. At the same time, it can save resources and reduce pollution to the maximum extent in the life cycle of buildings, which is inevitable to achieve the coordination between the development of construction industry and the ecological environment [6].

In this study, the factors that need to be considered in the planning and design of characteristic towns are analyzed, and the relevant theories of landscape design and art design of characteristic towns are realized. Starting from the development trend of green building, the design principles of green ecological building in application are explored, and the advantages of green building in landscape architecture are analyzed. From the perspective of sustainable development, reasonable suggestions on landscape planning of characteristic towns have been put forward. It is hoped that green buildings can be widely used to form a more large-scale, ecological and industrialized development of characteristic towns.

2. Planning and design direction of characteristic towns

2.1. Classification and development direction of characteristic towns
At present, the general recognition of small towns can be understood as including small cities with a non-agricultural population of less than 500,000 people, as well as state-regulated towns and market towns [7]. Among them, market towns are the social production activity centers to realize the integration of urban and rural areas, which is conducive to production and life. They are also the key areas for the future urbanization of rural areas in China. Characteristic town is a part of the region which is located in a relatively superior geographical position and can transit between urban and rural areas. The characteristic towns must be based on the local superior resources, retain the cultural characteristics and architectural style, highlight the regional characteristics as much as possible, and promote the urbanization process of the towns [8]. Regarding the landscape planning of characteristic towns, it is necessary to use the natural landscape and humanistic landscape with aesthetic characteristics in a certain space to create a region with local innovative and unique industries. In the landscape of a characteristic town, cultural connotation is the basis of planning for the local area, and then through the integration of beautification design concept and natural landscape, a small town with both ecological and living characteristics is formed. China's characteristic towns can be classified according to different topography and functions. The classification of characteristic towns based on terrain is shown in table 1, and the classification of characteristic towns based on function is shown in table 2.

| Terrain   | Distribution          | Representative                      |
|-----------|-----------------------|------------------------------------|
| Plain     | Eastern coastal areas | Fenshui Town, Tonglu County, Hangzhou City |
| Hill      | Yangtze river basin   | Dayao Town, Liuyang City, Changsha City |
| Mountainous | Northwest China, Southeast Coast | Tangyu Town, Lantian County, Xi'an City |
Table 2. Classification of characteristic towns based on function

| Function                        | Essential factor                                      |
|---------------------------------|-------------------------------------------------------|
| Agricultural Rural Category     | Farmers, Villages                                     |
| History and Culture             | Cultural Relics, Folk Custom Characteristics and Character Totem |
| Rehabilitation convalescent     | Health, Holiday, Medical and Health Care              |
| New Types of Industry           | Technology, Internet                                  |
| Style Town                      | Natural scenery, ecological environment                |

In the functional classification of characteristic towns, rural towns are still the main ones in China. These towns need to rely on specific ecological environment and agricultural industry characteristics. They are not only agricultural industrial areas, but also tourist attractions [9]. In the process of development, small towns with agricultural characteristics need to ensure the participation of farmers, including animal husbandry, plant cultivation, and residential accommodation, and plan a building image that mainly shows local characteristics. For historic and cultural townships, it is necessary to dig deep into the cultural connotation behind cultural relics. The direction of development must focus on the inheritance of cultural relics, which can promote the spread of agricultural culture [10]. For tourists, the main value of rehabilitation town is that it can bring physical and mental relaxation and health care. Therefore, making full use of the natural resources of the local pastures, lakes, rivers and hot springs, a special town with the theme of health and recuperation can be built. In addition, medical rehabilitation facilities and traditional Chinese medicine therapy can also be introduced to bring integrated rehabilitation and old-age care services to people [11]. At present, with the progress of science and technology, a number of innovative and characteristic towns based on science and technology industry and Internet technology have emerged. Through the combination of agriculture and Internet +, the development of agricultural economy has been driven. The last type is characteristic towns with distinct regional flavor. These towns usually have both historical and cultural background and natural landscape, and can develop in many directions, so they have high value of landscape development.

2.2. Landscape design of characteristic town

Landscape design of characteristic towns is based on the premise of local unique ecological environment, material and facility conditions, and carries out reasonable analysis from the perspective of topography and topography. Aesthetic treatment within the region, including soil, water, buildings, crops, plants and other elements from multiple perspectives, makes people meet the aesthetic requirements of living in the environment of small towns, while attracting tourists to participate [12]. In the planning and design of agricultural landscape, artistic design has important reference value. For example, common terraces are always distributed in strips or blocks, which accords with the regularity and symmetry of aesthetic characteristics.

In landscape planning and design, people should not only grasp the aesthetic requirements, but also follow all aspects of the design principles. Because some developers only pay attention to the commercial benefits brought by regional industries and neglect other cultural values, some folk landscapes are artificially absent. At present, most areas of China have consciously begun to protect folk cultural resources, but still more stay in the protection of a single object, resulting in the lack of inheritance of regional cultural advantages. Landscape is regarded as a form of artistic expression. On the basis of the regional style and ecological balance of the protected area, it is also necessary to consider the social changes and the needs of the public, dig deep into the regional culture and apply it in the landscape design. Therefore, how to plan scientifically and reasonably is an important factor for landscape architects to consider.

In addition, the principle of people-oriented is the backbone of landscape planning and design. The existence of landscape must respect people's experience and feelings, and give full consideration to
users’ physiological, psychological and emotional needs, so as to create a humanized landscape environment. In terms of the security and convenience of the landscape, it is necessary to ensure that there are enough people gathering and distributing sites, and the sites should be broad and flat, so that people can evacuate quickly and orderly. Therefore, for areas with complex topography, such as hills, lakes, wetlands and so on, effective security measures are needed. Landscape sites should ensure convenient transportation, complete service facilities, and reasonable planning in the distribution of scenic spots, so as to achieve the effect of relaxation and enjoyment. Within the scope of landscape building space, the effects of air, temperature and humidity on human senses should be considered in the design, and the direct sensation of hearing and vision should meet the physiological needs of human body.

3. Landscape design strategy of green architecture

3.1. Supporting theory of green architecture

Green architecture means to save natural resources to the greatest extent, reduce pollution to the ecological environment, and provide healthy and comfortable living space and use environment for building users in the whole life cycle of the building. This kind of green building can coexist with nature in harmony, and it is an expression of sustainable development in the field of architecture. Klaus Daniels mentioned in the book Eco-building Technology that " Green building can save energy to the greatest extent, reduce pollution to the ecological environment and construct a building with harmonious development of the ecosystem by actively and reasonably utilizing renewable energy such as solar energy and wind energy to allocate resources efficiently in the whole life cycle of the building. Green architecture system is a comprehensive system formed by the interaction of multiple factors, which include the related factors of technology and society. In the social field, it includes the sociality, culture, applicability, economic development and so on. In the field of technology, it includes building rules and adaptive technology. The characteristics of green architecture theory lie in that it is not an independent system of isolated development, but a comprehensive system of social, economic and cultural factors coexisting harmoniously with the ecological environment by using green building technology and related equipment.

Conservation of resources and environmental protection: Traditional architectural design is more concerned with market consumption demand, thus ignoring the waste of energy and environmental damage in the production process. In the long run, it will inevitably affect the harmonious development of resources, environment and society. On the basis of guaranteeing the economic and social nature of the building, green architecture emphasizes more on environmental factors. Its guiding ideology is to save resources and protect the environment, emphasize people-oriented, and ultimately achieve the coordinated development of human society.

Life cycle of buildings: Compared with traditional buildings, green architecture emphasizes energy conservation and environmental protection in the whole life cycle, and takes this as a starting point to consider the design, operation, cost and benefit of buildings.

Maintenance cost and economic benefit: Green building is based on the use of renewable resources and recyclable environmental protection materials, focusing on the use of high-tech materials according to local conditions. In the initial investment stage of construction, the investment capital will be higher than that of traditional buildings. But in the long run, green building materials can greatly improve the efficiency of building operation, reduce the waste of building energy, and consequently save costs in later maintenance. Compared with traditional buildings, it is a more economical choice and can better achieve the unity of environmental benefits and economic benefits.

Regional adaptability: In terms of planning, green buildings should follow the design principles of adapting measures to local conditions and changing in time, combine with natural environment, cultural background, climate environment and social atmosphere, and take local materials from actual conditions, so as to realize mutual benefit and reciprocity with the surrounding ecological environment as far as possible. Therefore, with the differences of geographical environment and resource
environment between different regions, green buildings provide healthy and comfortable living space for people in different geographical environments, and at the same time give people a more regional architectural style.

3.2. Specific contents of green architectural design

Exterior wall envelope structure of building: Whether the exterior structure of green building is scientific and reasonable will directly affect the energy consumption of building materials and the indoor climate environment of building. In the design, it is necessary to take into account the building shape factor, the air tightness of the windows and the ratio of the switching area, the thermal performance of the wall structure, the overall shape of the building, etc. The structure of planting roof and ventilated roof should be scientifically adopted in the exterior wall part of the building. The ventilated attic floor should be selected for the sloping roof (figure 1), and the planting roof should be set for the buildings below 100m according to different forms. In addition, greening, shading or thermal insulation measures can be used to reduce the impact of light radiation on buildings. In the material selection of enclosure structure, the selection of steel structure can ensure the stability and safety of its main body, and can better connect with the housing structure to form a whole. The energy consumption ratios of light steel structure, reinforced concrete structure and wood structure are shown in Table 3.

![Figure 1. Ventilation roofs of several different building exterior walls](image)

**Table 3. Energy Consumption Comparison of Three External Wall Structures**

| Energy Dissipation Form       | Power Consumption in Construction/kwh | Demolition of Heavy Oil and Electricity Consumption/kg | Demolition of Power Consumption/kwh | Transportation Diesel Consumption/kg | Carbon Emissions from Unit Buildings (kg/m²) |
|------------------------------|--------------------------------------|--------------------------------------------------------|------------------------------------|--------------------------------------|---------------------------------------------|
| Comparatively steel structure| 8702                                 | 17.60                                                  | 3890                               | 197.55                               | 88.2                                        |
| Reinforced concrete structure | 10766                                | 19.90                                                  | 4981                               | 388.9                                | 88.5                                        |
| Wood structure               | 6892                                 | 12.56                                                  | 2887                               | 125.4                                | 73.4                                        |

Building lighting: Good natural lighting directly affects the lighting energy consumption of buildings. In the design of public buildings, attention should be paid to the control of the depth of the building should not be too large. When the depth of entry is 2.5 times higher than the window height above the daylighting plane of the house, artificial lighting facilities beyond the part should be added to compensate for the loss of light. Reflector panels can be arranged above the outer window, as shown in figure 2.
Building ventilation: Good ventilation is a key factor in deciding the living environment. While reducing energy consumption, it also gives people a sense of thermal comfort. In the design of green buildings, it is necessary to choose the design strategy which is beneficial to the layout of indoor ventilation function to ensure the natural ventilation both inside and outside, and at the same time pay attention to the wind protection of buildings in winter. The interior of the house should be planned according to the dominant wind direction in summer, and the cross-hall wind should be used reasonably to achieve good indoor ventilation. In addition, the direction and mode of window opening should be set according to the layout of external wall.

Building shading: The effect of building shading will directly affect the light inside and outside the building, thus determining the overall energy consumption. Considering the factors of thermal radiation, the area of windows on both sides of the east and west should be controlled in planning and design, and artificial adjustable external shading should be adopted as far as possible. The comprehensive sunshade coefficient SCw of the outer window is the product of the sunshade coefficient SC of the outer window and the sunshade coefficient SD of the building.

When there is no external shade:

\[
SC_w = SC
\]  \hspace{1cm} (1)

When there is external shade:

\[
SC_w = SC \times SD
\]  \hspace{1cm} (2)

External shading coefficient should be calculated according to the following formula:

\[
SD = ax^2 + bx + 1
\]  \hspace{1cm} (3)

\[
x = \frac{A}{B}
\]  \hspace{1cm} (4)

In the formula, A and B are the structural dimensions of external shading, a and b are the fitting coefficients. The fitting coefficients for calculating the external shading coefficients of several common shading modes are shown in Table 4. When the window area of high-rise building is large, the built-in hollow louver glass can be selected, and the seasonal plants can be considered for vertical greening. The flourishing plants in summer can shield the strong sunshine effect, as shown in figure 3. The withered plants in winter will not affect the natural lighting.
Building materials: The concept of green architectural design strategy must be closely around building materials, which should be demonstrated in the architectural design. While satisfying the use function of each structure, it is necessary to reduce unnecessary decorative materials from the perspective of economy, high efficiency and energy saving, which can not only avoid the waste of resources, but also reduce the cost of construction. In the design of large space buildings, the flexible partition space, such as glass, which can be reused can be selected to reduce the waste of materials and improve the utilization of space. Building materials are preferred to be ecologically recyclable materials, such as wood, reinforcing bars and recyclable materials such as glass and metal.

Landscape design: In the planning and design of landscape planting, it is suggested that trees and shrubs should be the main part of green buildings, so that the survival rate of plants is high, the scope of greening can be expanded, the utilization rate of green space can be improved, and the limited green space can maximize the landscape benefits. Designers can combine the specific form of the building for vertical greening and roof greening (map), and can carry out comprehensive design according to the functional requirements of the building.
4. Conclusion
In recent years, the construction of characteristic towns in the suburbs of major cities in China is in full swing. The characteristic towns with different features are all over the provinces and cities of China, bringing vigorous vitality to the tourism industry. The construction of characteristic small towns is not only an effective way to promote urbanization, but also an effective measure to build an integrated platform for urban and rural development. The construction of characteristic towns needs to implement the idea of combining reality with innovation. It must be based on the local leading industries, give full play to the most advantageous industrial resources, create influential industrial brands, and then drive economic income. This requires the developers to highlight the regional characteristics of the town, make use of the advantages of agriculture, planting, animal husbandry and other industries, and combine with cultural characteristics. Based on the local characteristics of the building, through the design and planning, characteristic towns are taken as a tourism characteristic landscape to attract tourists to visit and live.

The rapid development of many small towns has brought unprecedented development space to the local economy. However, at the same time, when building characteristic towns, developers only focus on their economic benefits, and do not give too much consideration to the sustainable development of buildings. Therefore, with the increase of characteristic towns, more and more buildings with high pollution and energy consumption will lead to the aggravation of environmental pollution and energy shortage in the long run. In the past 20 years or so, green buildings are being further expanded and optimized as building energy-saving technology, in line with the development of the times and the needs of people's livelihood. Architects are also obliged to promote the development of green buildings, and actively explore the development path of green buildings in line with China’s own development.

Acknowledgments
This work was financially supported by the internal research project of Shaanxi Provincial Land Engineering Construction Group, whose number is DJNY2019-30.

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