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How to Build a Healthy City: Research on Vitality Enhancement in Urban Green Space

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Abstract: With the acceleration of the urbanization process, urban problems become increasingly prominent, such as air pollution, water pollution, noise pollution, etc. These problems not only affect the quality of life of urban residents, but also cause great pressure on the urban ecological environment. In order to cope with these challenges, building a healthy city has become an important goal of urban planning and construction. As an important part of urban ecosystem, urban green space has the characteristics of systematism, integrity, continuity, dynamic stability, versatility and regionalism, which plays an important role in improving urban environmental quality, promoting residents' health and enhancing urban vitality. Therefore, how to build a healthy city by enhancing the vitality of urban green space has become an important issue in current urban planning and construction. This paper first summarizes the classification and planning index of urban green space system, and analyzes the ecological function and value of urban green space. On this basis, the theoretical basis of urban green space vitality enhancement is discussed, including landscape ecology, environmental psychology, urban planning and other related theories. By analyzing the factors that affect the vitality of urban green space, this paper puts forward the strategies and methods for improving the vitality of urban green space, including optimizing the layout of green space, improving the quality and function of green space, improving the accessibility and convenience of green space, strengthening the management and maintenance of green space, etc. The implementation of these measures can effectively improve the vitality of urban green space, which not only contributes to improving the quality of urban environment, but also contributes to improving the quality of urban environment. It can also promote the physical and mental health of residents and enhance the cultural identity and cohesion of the city.

1. Introduction

With the acceleration of the urbanization process and the improvement of the living standards of

urban residents, urban green space plays an increasingly important role in improving the quality of life of urban residents and promoting the sustainable development of cities. However, there are still many problems in the planning and management of green space in many cities, which restrict the effective use of green space and the construction of healthy city. Therefore, this paper aims to explore how to enhance the vitality of urban green space through scientific planning and management, so as to create a healthy and livable urban environment.

2. Overview of urban green space system

2.1 Systematic classification of urban green space

With natural elements as the main body, urban green space provides fresh oxygen, clean water, necessary food and non-staple food supply and outdoor recreation space for human survival in urbanized areas, and plays an important role in carrying, supporting and beautifying human scientific and cultural development and historical landscape protection[1]. According to the basic requirements of urban ecology and urban overall planning, all kinds of urban green Spaces are rationally combined and allocated, which constitutes the urban green space system. Urban green space is systematically classified according to its land use nature and main functions. Urban green space can be roughly divided into five categories: Public green space (G1), production green space (G2), protective green space (G3), attached green space (G4) and other green space (G5), corresponding to the classification of urban land, are applied in three levels: category, medium category and small category, and the categories are represented by a mixed code of English letters and Arabic numerals[2].

(1) Public green space (G1). Public green Spaces are open to the public, with recreation as the main function and ecological, beautifying, disaster prevention and other functions, including comprehensive parks, community parks, special parks, banded parks and roadside green Spaces. Among them, the comprehensive park is a large green park with rich content and corresponding facilities, which is suitable for the public to carry out various outdoor activities. Community park is a centralized green space that serves the residents within a certain range of residential land and has certain activities and facilities. Special parks are green Spaces with specific content or form and certain recreation facilities, including sculpture gardens, bonsai gardens, sports parks, memorial parks, etc. The proportion of green land should be greater than or equal to 65%[3]. Strip park is a narrow and long green space with certain recreational facilities along urban roads, city walls, waterfront, etc. The width of the green space should be greater than or equal to 8m. Street side green space is located in the urban road land, relatively independent of the green space, including street square green space, small street green land, etc., square green space proportion should be greater than or equal to 50%, other street side park area should be greater than or equal to 400m square meters, green area proportion is greater than or equal to 65%.

(2) Production green space (G2). Production green space provides nurseries, flower nurseries, grass nurseries and other nurseries for urban greening. The production green space located within the scope of urban construction land is involved in the balance of urban construction land.

(3) Protected Green space (G3). Protective green space refers to the green space in the city with the functions of health, isolation and safety protection. Including health isolation belt, road protection green belt, urban high pressure corridor green belt, windbreak, urban cluster isolation belt, etc., such green space participates in urban construction land balance.

(4) Attached green space (G4). Accessory green land in all kinds of land other than green land in urban construction land. Including residential land, public facilities land, industrial land, storage land, external traffic land, road square land, municipal facilities land and special land in the green space, such green space does not participate in the urban construction land balance. Among them,

the residential green space is the green space outside the community park in the urban residential land, including the group green space, the house side green space, the supporting public green space, the community road green space, etc. Such green space does not include the residential district park, and does not participate in the urban construction land balance. Public facility green space is the green space within the public facility land. Industrial green space is the green space within the industrial land. Storage green space is the green space within the storage land. External traffic green space is the green space within the external traffic land. Road green space is the green space within the road square land, including street tree green belt, car green belt, traffic island green space, traffic square and parking lot green space. Green space for municipal facilities is the green space within the land for municipal public facilities. Special green space is the green space within the special land.

(5) Other green Spaces (G5). Green space that has a direct impact on urban ecological environment quality, residents' leisure life, urban landscape and biodiversity conservation. Including scenic spots, water conservation areas, country parks, forest parks, nature reserves, scenic forests, urban green isolation zones, wildlife and botanical gardens, wetlands, landfill restoration green space, etc.

2.2 Planning index of urban green space

Since 1992, as the activities of creating gardens have been widely carried out across the country, there has been a trend of positioning green space system planning indicators by referring to the national garden city selection criteria[4]. That is, the urban green coverage rate (refers to the sum of the horizontal projected area of all green plants in the scope of urban construction land and the ratio of construction land area) is not less than 35%, the green land rate of built-up area (refers to the percentage of garden green space in the built-up area of urban construction area) is not less than 30%, and the per capita public green space is not less than 6m square meters.

3. Function and value of urban green space

3.1 Ecological functions of urban green space

(1) Purify the air

The amount of CO2 emitted by the burning of coal and oil in urban environments is far greater than the amount produced by human breathing. On the other hand, plants absorb CO2 and water, release oxygen through photosynthesis, and adjust the proportion balance between CO2 and oxygen, thus avoiding or reducing the harm caused by CO2 to people's body, which cannot be replaced by any advanced scientific means[5]. An average adult exhales 0.9kg of carbon dioxide and inhales 0.75kg of oxygen every day, while each hectare of green space absorbs 900kg of carbon dioxide and produces 700kg of oxygen every day, which can meet the oxygen demand of nearly 1,000 people, that is, each urban resident needs 10m ²of woods or green space to meet the needs of survival. And urban green space is the important carrier to provide this ecological service. In addition, plants in urban green Spaces can also absorb harmful gases in the air, such as sulfur dioxide and nitrogen oxides, reduce air pollution and improve urban environmental quality.

(2) Regulate the climate

Urban green space releases a lot of water vapor through transpiration, which helps to reduce urban temperature and alleviate urban heat island effect. At the same time, vegetation in green space can absorb and store rainwater, reduce surface runoff, increase groundwater recharge, and regulate urban hydrological cycle[6]. These functions are of great significance for alleviating urban climate problems and improving urban flood control and drainage capacity.

(3) Water and soil conservation

Vegetation in urban green space can slow down the erosion of rain on the ground, reduce soil erosion and protect soil fertility. At the same time, green Spaces can also absorb and filter pollutants from rainwater, improving water quality. These functions play an important role in maintaining urban ecological balance and ensuring urban water resources security.

(4) Provide biological habitat

Urban green space is an important habitat for biodiversity in cities. The vegetation, water, soil and other natural elements in the green space provide a space for various organisms to survive and multiply. These organisms not only enrich the diversity of the urban ecosystem, but also provide a variety of values for urban residents, such as viewing, education and scientific research.

3.2 Social value of urban green space

(1) Promoting the physical and mental health of the population

Urban green space is an important place for urban residents to have fun and relax. The natural landscape and human landscape in the green space can stimulate people's aesthetic taste and improve the quality of life. The activity space in the green space can also promote communication and interaction between residents and enhance community cohesion. In addition, the vegetation and air in green Spaces can also improve people's mental state, relieve stress and increase happiness.

(2) Enhance the image of the city

Urban green space is an important part of city image. A city with rich green space resources can often leave a deep impression on people. The natural landscape and cultural landscape in the green space can show the unique charm of the city, improve the visibility and reputation of the city, improve the quality of the ecological environment of the city, attract more tourists and investment, and promote the economic development of the city.

(3) Inherit history and culture

Urban green space often carries rich historical and cultural connotation. Ancient buildings, sculptures, steles and other cultural heritage in the green space can inherit and promote the history and culture of the city, and enhance the cultural identity and pride of urban residents. Green space can also provide urban residents with places and opportunities to understand and learn history and culture, and promote the inheritance and development of urban culture.

4. Theoretical basis for improving the vitality of urban green space

4.1 Landscape ecology theory

Landscape ecology is a comprehensive discipline that studies the type composition, spatial allocation of landscape units and their interaction with ecological processes. In the process of enhancing the vitality of urban green space, landscape ecology theory emphasizes the ecological integrity, connectivity and diversity of green space[7]. By optimizing the layout of green space and improving the design level of green space, the ecological function of green space can be enhanced, and the stability and resistance of urban ecosystem can be improved. The theory of landscape ecology also pays attention to the coordination and integration of green space and surrounding environment in order to realize the sustainable development of urban green space.

4.2 Theories of environmental psychology

Environmental psychology is the study of the interaction between people and the environment. In the process of improving the vitality of urban green space, the environmental psychology theory

emphasizes the influence of green space on people's psychology and behavior. By understanding people's psychological needs and behavior habits, we can design green space that is more in line with people's needs. For example, setting up comfortable seats, shading facilities, etc., can improve people's stay time and activity frequency in green space. The theory of environmental psychology also pays attention to the creation of cultural and social atmosphere in green space to promote people's communication and interaction.

4.3 Urban planning theory

Urban planning is a discipline that studies urban planning, design, implementation and management. In the process of improving the vitality of urban green space, urban planning theory emphasizes the coordination and integration of green space and overall urban development[8]. By making a reasonable urban planning scheme, the layout and scale of green space can be optimized, and the accessibility and utilization of green space can be improved. At the same time, urban planning theory also pays attention to the connection and cooperation between green space and urban transportation, public service facilities and other infrastructure, so as to maximize the comprehensive benefit of urban green space.

5. Factors affecting the vitality of urban green space

5.1 Area and distribution of green space

The area and distribution of green space is one of the key factors affecting the vitality of urban green space. The larger the area of green space, the more evenly distributed, the more able to form a complete ecological network, provide more leisure and sports places for citizens, and enhance the vitality of urban green space.

5.2 Green space quality and function

The quality and function of green space are also important factors affecting the vitality of urban green space. High-quality green space usually has rich vegetation types and ecological diversity, which can provide more ecological services, such as purifying the air and regulating the climate. At the same time, the functional green space can meet the needs of different citizens, such as children's play area, elderly activity area, fitness area, etc., to enhance the attractiveness and vitality of urban green space.

5.3 Accessibility and convenience of green space

The accessibility and convenience of green space are important factors affecting the use of green space by citizens. If the green space is far away from the residents' residence or the transportation is inconvenient, the citizens' willingness to use the green space will be reduced, thus affecting the vitality of the urban green space[9]. Therefore, when planning urban green space, it is necessary to fully consider the travel needs and traffic conditions of citizens, and improve the accessibility and convenience of green space.

5.4 Social and cultural factors

Social and cultural factors also have an important impact on the vitality of urban green space. Citizens' cultural background, living habits and values will affect their use and attitude towards green space. For example, in some cities that pay attention to environmental protection and health,

citizens' demand for and attention to green space will be higher, thus promoting the development of urban green space.

6. Strategies and methods for improving the vitality of urban green space

6.1 Optimize green space layout

Optimizing green space layout is the key to improve the vitality of urban green space. Urban green areas can be increased in a variety of ways, such as the construction of green Spaces such as pocket parks and open recreational woodlands, which can be connected with existing green Spaces and natural areas to form an ecological network (Table 1). At the same time, the layout and scale of green space should be reasonably determined according to the overall urban planning and development direction. In urban central areas and densely populated areas, the number and scale of green space should be appropriately increased to increase the green coverage rate of the city. Attention should also be paid to the connection and cooperation between green space and urban transportation, public service facilities and other infrastructure, so as to form a complete green space network system.

Table 1 Measures for new green space

Measure	Specific content
Create pocket parks	Small parks should be built in urban idle areas, street corners and other areas
Open fallow forest land	The original public welfare forest and other forest land will be built into open leisure forest park
Street greening	Planting street trees and green belts on both sides of urban roads
Vertical greening	Plant on the walls and roofs of buildings

6.2 Improve the quality and function of green space

Improving the quality and function of green space is the key to enhance the vitality of urban green space. Attention should be paid to the vegetation types and ecological diversity of green space, plants suitable for local climate and soil conditions should be selected for planting, and rich plant communities should be formed[10]. At the same time, it is also necessary to design diversified green functional areas according to the needs and interests of the public, such as children's play area, elderly activity area, fitness area, etc., to meet the needs of different citizens. Citizens can also be encouraged to participate in the construction and maintenance of green space through the promotion of community gardening activities. Community gardening activities can not only increase green space, but also enhance community cohesion and raise citizens' awareness of environmental protection.

6.3 Improve the accessibility and convenience of green space

Improving the accessibility and convenience of green space is an important measure to enhance the vitality of urban green space. The travel needs and traffic conditions of citizens should be fully considered, and the layout and traffic routes of green space should be reasonably planned. For example, transportation facilities such as bus stops and bicycle rental points can be set up around green Spaces to facilitate citizens' access to green Spaces. Green Spaces can also be connected with other urban areas through the construction of walking and cycling paths such as greenways to form

a complete walking and cycling network (Table 2).

Table 2 Measures to improve the accessibility and convenience of green space

Measure	Specific content
Set up bus stops	Bus stops are set around the green space to facilitate the public to take public transport
Building bike rental points	Bicycle rental points are built around the green space to provide convenient bicycle rental services
Greenway construction	Create walking and cycling pathways to connect green Spaces with the rest of the city
Optimize traffic routes	Reasonable planning of transportation routes to reduce the transportation time and cost of citizens to green space

6.4 Strengthen green space management and maintenance

Strengthening the management and maintenance of green space is the key to ensure the vitality of urban green space. A sound green space management system and maintenance mechanism should be established, and regular inspection and maintenance of green space should be carried out to ensure that the vegetation in green space is healthy, clean and orderly. It is also necessary to strengthen the maintenance and management of facilities in green space, such as fitness equipment, amusement facilities, etc., to ensure the safety and comfort of citizens when using green space. Social capital can also be attracted to participate in the construction and maintenance of green space through the introduction of market mechanisms. For example, the PPP model can be used to cooperate with the government in the construction and management of green space to improve the construction quality and operational efficiency of green space.

In addition, strengthening publicity and education is also an important means to enhance the vitality of urban green space. Through various channels and forms, the importance and function of green space should be popularized to the public, and the awareness and attention of the public to green space should be improved. Encourage the public to actively participate in the construction and maintenance of green space, through the organization of volunteer activities, environmental education and other ways to improve the public's environmental awareness and participation. Governments can develop policies, such as "most beautiful gardens", to encourage residents to participate in the construction and maintenance of increased green space. Through publicity and promotion, improve the public's awareness of the importance of green space, and form a good atmosphere for the whole society to pay attention to and participate in the construction of urban green space.

7. Conclusion

To sum up, improving the vitality of urban green space is one of the important ways to build a healthy city. By optimizing the layout of green space, improving the quality and function of green space, improving the accessibility and convenience of green space, and strengthening the management and maintenance of green space, we can improve the quality of urban environment, promote the physical and mental health of residents, and enhance the image and cultural connotation of the city. To improve the vitality of urban green space, the government, enterprises and all sectors of society need to work together to strengthen cooperation and coordination mechanism construction, improve technical level and environmental awareness, and promote the

in-depth development of the vitality of urban green space. In the future, the theoretical research and practical exploration of urban green space should be further strengthened, and the system and mechanism of green space planning, design, management and maintenance should be constantly improved to promote the healthy and orderly development of urban green space construction.

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