Road and Landscape Planning and Design of Residential Area Based on Green Ecology

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Abstract: With the rapid development of social economy, the rapid improvement of people's living standards and the increase of car ownership, the problems of residential road traffic and landscape are becoming more and more serious. Residential area is closely related to human health and its development is a symbol of urban progress. The planning and design of green ecological residential area has become the focus of common concern in China and even in the world. Based on the concept of green ecology, this paper discusses how to plan and design residential roads and landscape. At the end of this paper, the design method of road and landscape in residential area is analysed through practical application design. It is hoped to provide some reference ideas for future residential planning and jointly promote the construction of green ecology of residential area.

1. Introduction

1.1 Research Background
With the rapid development of cities in recent years, many problems have arisen in human ecological environment. In the face of the severe situation such as global warming, air pollution and limited urban land, people are facing the pressure of resources, environment and energy. Also, the traditional residential design mode is in urgent need of improvement.

Residential area is an important component unit in a city, which is directly related to people's life. It is very important for people's health and quality of life. The development of residential area is a symbol of the progress of a city, so the planning and design of green ecological residential area has become the focus of our country and even the international community.

1.2 Theoretical Background
With the research of scholars at home and abroad, the concept of ecological residential area has been constantly updated and improved. O.Yanitsky proposed that ecological residential area is a human residential area with social, economic and natural sustainable development, resident satisfaction, economic efficiency and ecological virtuous cycle, which is based on ecological principles, comprehensive study of social, economic and natural compound ecosystem, and construction of modern scientific and technological means. The team of Yuan Yue of Tsinghua University think that Ecological residential area is a building system with reasonable site selection and planning, maintaining the original ecosystem balance as far as possible, realizing the efficient use of resources and energy, reducing the emission of "three wastes", making it harmless and resource-based, ensuring the healthy and comfortable indoor environment quality and realizes the harmonious integration of human, building and...
nature. Miao Luye believes that ecological residential area is a living environment that is planned, designed, built and managed according to the principles of ecology, and has a relatively complete ecological metabolism process and ecological service function. It is harmonious, mutually beneficial and sustainable for human and nature. Tang Zhengmao put forward that the configuration of the plant should develop towards ecology, landscape and function. Plant materials are not only the material for landscape construction, but also belong to ornamental factors. Therefore, scientific selection and reasonable collocation of tree species can really give play to the functionality and ornamental value of plants.

2. Current situation of residential area
However, in recent years, as the development has put more emphasis on speed rather than quality, many problems have arisen in the residential areas. Such as mixed roads, road classification is not clear, people and cars mixed flow; serious traffic noise pollution; parking without adequate parking spaces; the landscape location planning is unreasonable and the design is too simple; ignorance of the people-oriented concept; the hard and soft landscape is seriously unbalanced. There is also the problem of noise pollution in residential areas.

3. Principles and methods of design
Based on the above background and problems, we first put forward the concept of ecological community.

Ecological community, also known as green community or sustainable community, it is a community that integrates society, economy and nature in line with the ecological system. By maintaining the balance of the original community ecosystem, it can realize efficient recycling of resources and energy, reduce waste discharge and achieve community harmony, economic efficiency and ecological virtuous circle.

Ecological community reflects the concept of people-oriented and harmonious coexistence between human and nature. Besides satisfying residents' basic living needs, ecological community also meets needs of residents' medical treatment, entertainment, education, fitness communication and other aspects.

The design of social ecological community can include many aspects such as road design, landscape design and green building design.

Among these designs, road design and landscape design are the most important. The road connects all the elements of the residential area and is also the area that residents use every day, which will have a huge impact on residents' life.

Residential greening landscape is an important part of urban greening landscape, which is closest to residents and has the closest relationship with residents' daily life. It plays a vital role in improving residents' living environment quality and improving residents' physical and mental health. Residential green space is the most widely distributed in the urban garden green space system, which is an important aspect of universal greening and also an important link in the urban ecosystem.

Based on these two points, this paper will discuss the planning and design of residential roads and landscape from the perspective of green ecology.

3.1. The road

3.1.1. Design principles
1. Adhere to the principle of environmental friendliness.
   Combine with the surrounding environment to achieve the harmonious development of human and environment.
2. Principle of efficiency.
   Reduce the area of unnecessary road land as far as possible and use them for landscape environment construction so as to increase the green area.
3.1.2. Design methods
1. The road direction should be in line with the dominant wind direction. The road is a ventilated corridor and a reasonable road skeleton is conducive to creating a good living and health environment. At the same time, it can also influence the arrangement of residential buildings through roads so that the wind can enter the residential area and enhance ventilation.

2. Improving the rationality and continuity of road layout, especially the continuity and accessibility of sidewalks and non-motorized lanes. This way can improve travel efficiency, improve people's willingness to green travel and reduce exhaust emissions.

3. The road system can adopt diversified ecological traffic, the road system based on walking system can be designed through diversified means and ecological methods so as to improve the frequency of residents' trips by walking and rational organize the traffic between walking and vehicle traffic [1].

4. Reserve enough parking spaces in the parking lot to prevent disorderly parking. Reduce the number of surface parking lots and increase green land.

5. The use of pervious materials, such as pervious asphalt and pervious tiles. It can promote the replenishment of rainwater to groundwater.

3.2. Landscape
3.2.1. Design principles
1. Adhere to the principle of "people-oriented" [3].
   From the perspective of human needs, it forms a bond of harmonious coexistence between human and nature.

2. Stick to the principle of regionalism [3].
   Reflect the natural environmental features of the region, create space environment according to local conditions and avoid blind transplantation.

3. Adhere to ecological principles.
   We should try our best to maintain the existing good ecological environment, improve the bad ecological environment and advocate the application of advanced ecological technology to the shaping of environmental landscape.

3.2.2. Design methods
According to the location and organizational structure, the landscape is divided into group landscape, banded public green space landscape and waterfront landscape.

1. Group landscape.
   (1) Study and design plant configuration. Plant community arrangement is the main structure of ecological landscape. Adjust microclimate, improve residents' comfort and health and even eliminate mental fatigue from visual sense and psychology, through the reasonable choice of plant varieties, evergreen and deciduous tree species, and distribution of trees, shrubs and grasses. For example, forming layers in the vertical direction of the plant, the lowest layer is lawn, the second layer is shrubs and the third layer is trees.

   (2) Landscape and facilities suitable for different groups of people should be arranged to increase opportunities for residents to interact with each other and cultural elements should be added to the landscape to improve residents' sense of belonging. For example, add some vegetable fields.

2. Banded public green space landscape
   (1) Reduce noise pollution through planting plants to form the formation of ecological sound wall. And it also has dust removal and sterilization effect.

   (2) Residential areas can use fragrant plants and avoid odorous, smelly and allergenic plants.
   
| types      | Plant species | functions                      |
|------------|---------------|-------------------------------|
| Violet, Rose | Refreshing and pleasant |
| Orchid      | Relieve one's depression and |

Table 1 Recommend plants and their functions
4. Waterfront landscape.

(1) Learn and solve the problem of water pollution from the source. Build an ecological water system so that the water body has its own purification capacity.

(2) Create green and water transition space and wetland space. Enrich regional animal and plant species, make the overall ecological cycle system form a closed loop and achieve sustainable development goals.

(3) Reconstructing the spatial function of the river bank. Use the design to guide the use of residents, so that residential life and river ecosystem harmonious coexistence, such as the restoration of natural meandering river form.

4.1. Ecological design strategies for coordination between road organization and landscape

4.1.1. Dynamic road and landscape coordination

1. Combine the road with activity space, leisure green space, activity square and other facilities around the road, so that it cannot only meet people's traffic needs, but also provide people with outdoor activity space. In this way, it can reduce the uncomfortable feeling brought by the road only as a traffic function. Form a spatial change and enrich the road landscape along the road[2].

2. Avenue can be formed in landscape design for the main road and secondary road of motor vehicles. The starting point of the design is the human's psychological feeling and the design of landscape elements should be based on the human scale. We should improve the amount of greening residential area in order to make the residential area more ecological and livable.

4.1.2. Coordination between static roads and landscape

Static road traffic mainly refers to the parking lot, which is also one of the most influential factors of landscape coordination.

1. Greening of parking Spaces. Every 5 parking Spaces shall be provided with a green divider. In addition, green spaces can be placed in the triangular area at the front of the oblique parking spaces.

2. Road pavement. Increase the water permeability of the ground and increase the green area [3].
3. Other forms. For example, the flower frame is set above the parking space, which is both beautiful and can provide residents with a place for leisure and rest.

5. Application and design
Based on the above summary and thinking, the knowledge of traffic and landscape planning of green ecological residential area is applied to design here.

5.1. Traffic road design
Slow traffic system -- people and cars are separated. After entering the residential gate, vehicles directly enter the underground parking lot and access to the buildings where residents live. The roads are divided into three levels. The first level is for vehicle roads, pedestrian roads and healthy footpath. The second level is for pedestrians and non-motor vehicles. The third level is only for pedestrians. Residents in the living area hardly need to drive private cars and travel conveniently.

![Figure 2 A sectional view of the road](image)

Road direction--the dominant wind directions in Chengdu are the northeast wind in summer and the northwest wind in winter. The roads inside the residential area are mainly arranged along these two directions which can better allow the wind to enter the residential area without being blocked.

![Figure 3 Road direction](image)

Road pavement --permeable colored concrete floors can be used in walking and non-motorized roads and patterns can be designed on them to make them more interesting and beautiful. Also it can play a guiding role.

5.2. Landscape Design
Group landscape--micro public landscape areas are set in each residential group and some Sichuan cultural elements are integrated into the public landscape, such as adding some Sichuan dialects to the pavement. A central square is set up in the center for people to gather for activities and it can also be used as an emergency place.

Banded public green space landscape-plants that can absorb PM2.5, such as camellia and glossy privet, will be planted along the road. Moreover some roadside landscape facilities will be set up, so that
the road can also become a place for leisure

Waterfront landscape area-- set up a linear landscape area along the river, plant different levels of plants on the water.

The waterfront space, the central square of the residential area and the slow traffic system are connected in series to provide a variety of green leisure space for residents.

Figure 4 Landscape Analysis of Residential area

6. Conclusion
With the concept of green ecology gradually gaining popularity, the design of green ecological residential area will be more and more widely applied [4]. It is not only a planning strategy, but also an important step to control urban ecology. It will gradually improve urban air pollution and other current problems through measures such as low pollution, land saving and energy saving, so as to realize the green ecological construction.

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