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Ecological Architecture Design in Urban and Rural Planning Applied Statistical Design

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Abstract. The regional characteristic of China becomes noticeable. Urban and rural planning must consider the factors of ecological environment. Ecological architecture design will become the main direction of urban and rural planning and development, but also meet the requirements of sustainable development in China. In recent years, the status of ecological architecture design in urban and rural planning is gradually increased, and it will become the main force of the development between urban and rural. This paper will analyze the existing problems of ecological architecture in urban and rural planning, and give reasonable application strategies and feasible ecological architecture design.

Keywords: Urban and Rural Planning, Ecological Architecture Design, Problem Analysis, Application Strategy, Architectural Design

1. An Overview of Urban and Rural Planning and Ecological Building Design

1.1. Urban and Rural Planning

In order to promote and coordinate the development between urban and rural, China published the law of the People's Republic of China on urban and rural planning in October 2007. Urban and rural planning is a process of rational development and utilization of resources in urban and rural areas by combining existing resources and technologies, and its content includes the reasonable application of urban and rural land resources, the reasonable division of space structure, and optimization and adjustment of living environment. The purpose is to provide people with better living conditions, and strengthen the coordination between and among people, nature and society development [1].

1.2. Ecological Architecture Design

Ecological architecture is a relatively new concept developed in the long-term cooperation between man and nature. According to the characteristics of the natural ecological environment in the area where the building is located, it uses the principles of building technology, science and ecology to achieve effective integration between the building and the environment, make people to the living comfortable environment, and create a virtuous circulation between and among people, buildings and the natural environment [2]. The concept diagram of ecological architecture is shown in figure 1:





Figure 1. The concept diagram of ecological architecture

1.3. The Importance of Ecological Architecture in Urban and Rural Planning

Ecological environment has a relatively important impact on people's life and urban and rural construction, and it can effectively respond to local characteristics and national traditions. At the same time, people's attitudes towards the ecological environment are also changing and developing. The formation of ecological architecture is inevitable in the development of history. Its main task is to improve the human settlement environment, and the main goal is to carry out the comprehensive benefit thought between the development of natural and economic and social harmony [3]. People pay attention to the environment continually, and the rapid expansion of cities has become increasingly prominent with the development of economy in the development of environmental cognition. However, the existing problem of environmental pollution is more serious, which requires people to constantly pay attention to and solve the environmental problems. We need to use the knowledge content of arcology to effectively cultivate the problem of urban and rural ecological crisis and to effectively study a variety of disciplines.

2. Analysis on the Problems of Ecological Architecture in Urban and Rural Planning and Design

2.1. Lack of Deep Understanding of Ecological Architecture

Through in-depth understanding and analysis of the surrounding natural environment of human life, so as to achieve effective harmonious treatment, we can achieve effective harmonious treatment, promote the improvement of life expectancy, and create a better living environment for human beings [4]. However, most people have a lack of understanding and misunderstanding about ecological architecture. They think that ecological architecture is the planting of plants or greening of the surrounding areas of buildings, which requires a change in design understanding.

2.2. Lacking of the Combination of Theory and Practice

The application of ecological architecture design in urban and rural planning and design is a process of putting architectural design concept into practice. In the practice of urban and rural planning, the development of ecological building design and the application of various design theories have provided strong support for the design. If we want to promote the sustainable development of ecological architecture, we should actively draw lessons from experience, reflect on and optimize, and improve the planning and design, so as to better promote the development of urban and rural planning and design. As far as the ecological architecture in urban and rural planning is concerned, the theory has not been well applied to practice and the application of the theory cannot be directly copied to practice. Theoretical knowledge needs to be applied in combination with the actual situation of local architecture. Otherwise, it will lead to the separation of theory and practice, or the unreasonable construction [5].

2.3. Unreasonable Use of Resources

China is a big country in the use of resources. At present, many engineering and construction units fail

to make rational and efficient use of resources in the process of urban and rural development. There is even the phenomenon of occupying good cultivated land and wasting resources, which is mainly reflected in the following aspects:

(1) In the process of ecological construction and development, each region fails to effectively combine the development factors of each link and blindly carries out planning and design work in accordance with its own thinking mode without overall awareness, which is divorced from the reality and causes serious waste of resources;

(2) When developing real estate, developers fail to realize the seriousness of waste of resources and there is a phenomenon of insufficient supply of related construction resources in the construction stage;

(3) With the continuous expansion of the city, the unreasonable demolition and relocation of large areas have occurred in many areas, resulting in serious waste of resources and declining utilization rate.

2.4. The Application of Modern Technology is not High

At present, the rapid development of the construction industry has led to the wide application of all kinds of science and technology. In the practice of architectural planning and design, the construction of ecological architecture also needs the power of modern technology [5]. The application of information technology can help to enhance the energy conservation of buildings and improve the utilization of resources in urban and rural buildings. However, due to the influence of people's ideas and technologies, modern technology is not well used in the ecological buildings in urban and rural planning, which leads to the low level of modernization of ecological buildings in urban and rural planning, so the promotion and application of technology should be intensified.

3. The Reasonable Application Strategy of Ecological Building Design in Urban and Rural Planning

3.1. We Will Intensify Reform of the Urban and Rural Planning System

It is of great significance to promote the sustainable development of urban and rural planning and intensify the reform of urban and rural planning system. In the process of urban and rural planning and design, the system needs to be innovated and improved in the first place, so as to promote the relevant work quality of the presentation of planning and design and the establishment of efficient and reasonable planning and design system to get the necessary improvement. Secondly, it is necessary to build a scientific and reasonable urban and rural planning system to realize the organic integration of ecological architecture and urban and rural planning and improve people's quality of life [6]. In addition, to promote the system reform, we should do a good job in ecological balance and control of environmental problems, strive to realize the comprehensive conservation of construction resources and improve the utilization of resources.

3.2. Changing Architectural Design Concept and Innovating Design Method

In the process of urban and rural planning and design, it is necessary to constantly innovate the concept and method of planning and design when carrying out the ecological building design. The comprehensive application of more advanced architectural design concepts should not only actively summarize the experience of predecessors, but also design a comprehensive three-dimensional system based on the actual engineering situation, so as to better coordinate the relationship between the current architectural design and the environment. To carry out ecological architecture design, we should pay attention to the innovation of concept and design scheme, so as to realize the benefit goal of ecological architecture and maximize the benefit goal [6].

3.3. The Construction Cost of Ecological Building Should Be Reduced as Much as Possible

At the present stage, it takes a lot of time, manpower and material resources to build a complete

ecological project, which also increases the pressure of urban and rural planning and design. Therefore, it is necessary to use new building materials and new construction technology to improve the utilization of resources as far as possible when carrying out the design of ecological buildings, so as to achieve the purpose of saving the construction cost of ecological buildings. For example, through the use of green plants to cover the walls to enhance the thermal insulation performance of the building, in order to reduce the use of building thermal insulation materials [7].

4. Ecological Architecture Design in Urban and Rural Planning

There are many ecological strategies that can be used in ecological architecture, but not all of them are suitable for the requirements of urban and rural planning. Based on the analysis of the actual situation of urban and rural construction and the study of ecological strategies, the following aspects can be taken into account in the design of ecological buildings:

4.1. Solar Water

The heat-collecting plate was installed on the south-facing roof, and the most favorable roof inclination angle was calculated based on latitude. The optimal inclination angle of the roof in this area was 30°. The use of solar water can provide the building with adequate daily hot water. Through calculation, it can reduce the electricity consumption of 2700kWh every year. If the price of electricity is 0.5 yuan, it can save 1350 yuan of electricity every year. In the design process, the reasonable combination between the building and the solar energy installation should also be fully considered to achieve perfect unification, so as to avoid the impact on the architectural appearance and even become the unique decoration of the building [8].

4.2. The Underground Water Temperature of Air-Conditioning

Groundwater is generally kept at a constant temperature and does not change much [9]. For the water temperature of air-conditioning, it uses groundwater as the main heat exchange medium, which not only has higher energy efficiency than ordinary air conditioning, but also lower operating cost, only 10% of ordinary air conditioning. In addition, it can also avoid the emission of waste gas and other pollutants. The water temperature of air-conditioning can not only avoid waste, but also prevent the pollution of underground water. At present, the air-conditioning system has been used in China, which can be used as an auxiliary cooling system during the extreme high temperature period in summer to reduce the use of traditional air conditioning system.

4.3. Envelope Insulation

As for the building envelope, its thermal performance has a direct impact on building energy consumption. Therefore, the key to reducing energy consumption is for the envelope to meet the requirements of ecological energy conservation. At present, there are many thermal insulation enclosures available for buildings, such as thermal insulation mortar, as shown in figure 2, which shall be selected according to the actual situation and construction conditions [10].

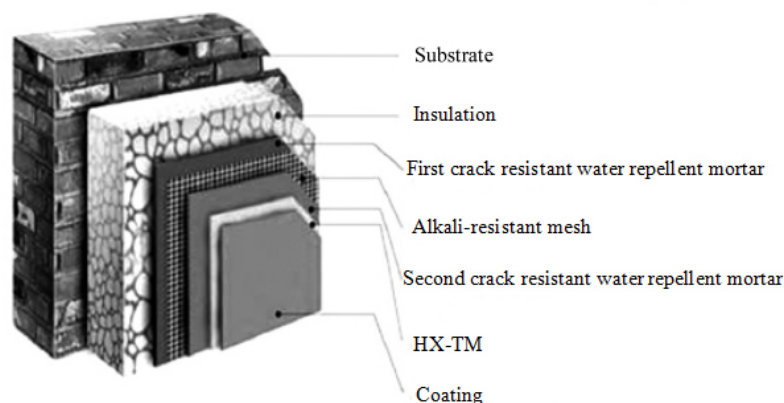


Figure 2. Insulation mortar system**5. Conclusion**

To sum up, there are still many deficiencies in the design of ecological buildings in China's urban and rural planning. Therefore, we should deepen the reform of urban and rural planning system, strengthen the ecological concept, and design ecological buildings according to the actual requirements of urban and rural planning. For ecological architecture, the key to design is the rational application of various ecological technologies, and the reasonable treatment of different parts of the building. At the beginning of the design, we should give full consideration to the energy saving and ecology of buildings, establish a correct ecological concept, tap the potential of nature as much as possible, and make full use of it, and effectively solve technical problems with the help of reasonable and feasible ecological strategies.

References

- [1] Lingxian Kong. Problems and solutions of lands' using in the construction of new urbanization in China [J]. Journal of bohai university (philosophy and social sciences edition),2015,37(01):69-73
- [2] Juncen Guo. Application of eco-architecture concept in eco-architecture design [J]. Residential and real estate,2019(30):56.
- [3] Guanyu Qi. Research on ecological architecture design in urban and rural planning [J]. Urban construction theory research, 2014 (22) : 6-7.
- [4] Yuxian Gao. Ecological architecture design in urban and rural planning and design [J]. Urban construction theory research (electronic edition),2018(30):68.
- [5] Yanjie Ding , Li Guan, Yi Wang, Xuebing Feng. Construction and research of urban and rural planning analysis platform [J]. Urban survey,2019(05):11-13.
- [6] Jing Pu. Analysis of ecological architecture design in urban and rural planning and design from the perspective of new economic geography [J]. Think tank era,2019(24):32-34.
- [7] Xiaocheng Hou. Research on the application of ecological architecture design in urban and rural planning and design [J]. China market,2019(18), 26-27.
- [8] Lei Bai , Junfeng Qiao. On ecological architecture design in urban and rural planning and design [J]. Smart city, 2017 (03) : 195.
- [9] Zhaoyi Wang, Lei Zhao, Chuang Wang. Research on the influence of water temperature changes in hunhe river on the thermal conductivity mechanism of groundwater [J]. Architecture and budget,2017(09):19-24.
- [10] Yan Sun. Ecological architecture design in urban and rural planning [J]. China real estate industry, 2017 (24) : 36-37.