# Application of Green Design Concept in Environmental Art Design

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**Abstract:** The concept of green design is an important part of environmental art design, which mainly aims at ecological sustainable development, focuses on the ecological protection and ecological balance facing the current social development, and emphasizes the rational allocation of all kinds of resources in environmental art design. In recent years, the concept of "carbon peak, carbon synthesis" shows that China attaches more and more importance to green environmental protection design in China, and the concept of green design is more and more important in environmental art design. This paper first analyzes the green design concept in environmental design art concept, summarizes the application direction of green design concept in environmental art design, put forward from the aspects of energy saving effect, resource reuse efficiency of green design concept, provide reference standard for the ecological environmental art design and sustainable.

**Key words:** environmental art design; green design concept; application and development

## 1. Introduction

How to coordinate environmental problems and social development is an important issue in the current social development of our country, and it has a great connection between people's production and life and social and economic development. With the development of The Times and the industry, China's environmental protection department and the design department of environmental protection, in order to further implement the concept of green environmental protection in China, put forward the efficient penetration of the concept of green design in modern environmental art design. It is required to pay attention to the environmental protection problems in the process of later construction and operation in the environmental design, reduce the consumption of non-renewable resources and energy as far as possible, and maintain the sustainable development of the ecological environment. With the publicity and implementation of China's environmental protection policy and green design concept, the connection between environmental art design and green design concept is becoming stronger and stronger. In order to further maintain the balance between ecological environment and social development, in the process of environmental art design, we must take the initiative to optimize the natural environment, improve the utilization efficiency of various resources, implement the goal of harmonious development between man and nature, and continuously promote the sustainable and stable development of China's social economy in the

IDEE 2023, November 24-26, Zhengzhou, People's Republic of China

DOI 10.4108/eai.24-11-2023.2343378

future. Based on this, this paper studies and analyzes the application of the green design concept of environmental art design in environmental art design, in order to provide theoretical reference for promoting the construction of environmental protection in China.

## 2. Research background

As early as the 1980s green design concept has been initially applied to social construction and development, it mainly around the building in the construction process and late put into use in the ecological environmental performance, emphasize energy conservation and emissions reduction and material recycling concept, is a double carbon background of ecological construction and social sustainable development of the important guiding concept, is also the need to build a good social life environment. The main purpose of environmental art design is to bring people more comfortable and environmentally friendly activity space, which is a strong purpose of art design work. Faced with the problems of environmental pollution and energy shortage under the social and economic development and the accelerating process of urbanization, China's environmental art design concept needs to be continuously innovated. At the same time, the western advanced western environmental art design concept also brings a certain impact on the concept of environmental art design. In this context, China's environmental art designers should base on the actual situation of China's construction and development, design more excellent environmental art design works, and constantly promote the deepening reform of China's environmental art design work.

The concept of green environmental protection is contained in the environmental art design, which can create a more ecological, environmental protection and healthy living environment, establish a good awareness of environmental protection for people, and create an ecological, environmental protection and sustainable social development environment [1]. The application of the concept of green environmental protection to environmental art design has become an important development path of double-carbon economic construction and environmental protection construction, which can better realize the full utilization and rational distribution of energy, and improve the environmental protection and scientific nature of project construction. With the continuous development of green environmental protection concept and environmental art design, the current environmental art design has formed the basic principles of green environmental protection concept, respectively is natural, comfort, environmental protection, economical, adjust measures to local conditions, to promote the innovation of green environmental protection concept in our country reform to provide more perfect theoretical support. In the actual construction, the green design concept in environmental art design application includes preliminary design, development and construction of design, realize "energy saving" "low carbon" concept of "environmental protection" concept, to reduce the consumption of resources and the impact on the environment, build the sustainable development of environmental art design project (see figure 1).

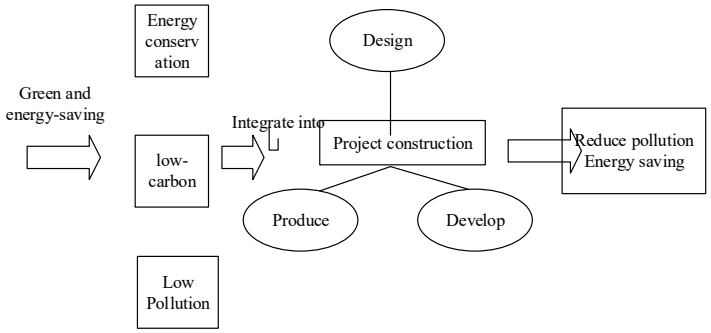


**Figure 1**. Green design concept

## 3. Specific application analysis of green design concept in environmental art design in environmental art design

### 3.1 Scientific assessment of environmental art design life cycle

Assessment of the life cycle of environmental art design mainly refers to the all stages of design project evaluation, including the raw materials involved in the project design, processing, production, sales, use, after-sales link (as shown in figure 2), scientific evaluation of environmental art design life cycle, is conducive to ensure the effective implementation of green design concept in environmental art design, reduce the influence of the late construction on the ecological environment, increase the green environmental protection function of buildings. In general, the assessment of the life cycle is mainly divided into the preparation of environmental emission list and energy and material use list, the assessment of energy input and emissions in building construction, the analysis of emission results and the optimization of project construction list. The life cycle evaluation can analyze the green value of the production, manufacturing, use and treatment of the project, which is an important content of the green design concept into the environmental art design [2].

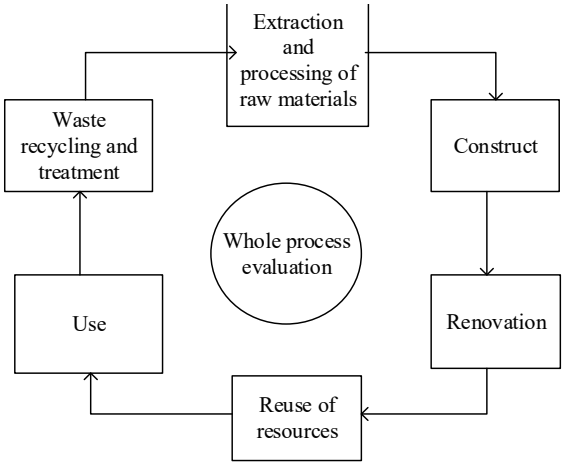


**Figure 2.** Life Cycle assessment process

### 3.2 Green and energy-saving design of the project building

The green and energy-saving design of the project building is mainly carried out from two aspects. The first is to choose the green building materials to improve the utilization efficiency of the materials. In the actual engineering construction, the project construction and the later demolition stage of the project are generally the insufficient use of construction materials and related materials and components, discarded waste and other phenomena. Integrating the concept of green energy saving in the project design stage, we can comprehensively consider the green environmental protection in the construction process, the green environmental protection of the construction application materials and the green environmental protection performance after the construction stage from a more comprehensive perspective[3]. Such as in the design of residential buildings, the green design concept into energy-saving building project planning and design, first need according to the public building green energy-saving design standard, the overall design of energy-saving buildings, such as the proportion between the Windows and walls should be within 0.45, window visible light projection must be greater than 0.4, at the same time the public building green energy-saving design standard also requirements must according to the actual size and function of the corresponding mechanical ventilation equipment, artificial create natural ventilation pattern. Second, in terms of construction materials, taking the design of housing HVAC as an example, the high-performance chiller must be selected in accordance with the Green Energy Saving Design Standard for Public Buildings[4], and the COP value of the chiller should be above 5.1. Meanwhile, the green energy efficiency ratio of the unit should be reduced as far as possible, and the piping of outdoor units and indoor units should be reduced as far as possible. In order to maintain the energy saving effect in the later application of the project, the air volume energy consumption of the air conditioning system should be within 0.42, and the air volume energy consumption of the ventilation system should be within 0.32. In terms of construction technology, the green energy saving standards of external walls, roofs and all kinds of floors in the project construction should be calculated scientifically according to the green energy saving calculation formula, as the basis of technical selection measures [5]:

The green and energy-saving concept in environmental art design is as follows:

$$\sum R\text{-}\delta_i/a\lambda_i\lambda_i \tag{1}$$

Among them, $\sum R$ represents the thermal resistance per square meter, in units of $K/W$; $\delta i$ represents the thickness of the corresponding wall panel, in units of m; $\lambda i$represents the thermal conductivity of the wall panel, in units of $W/(m*K)$;$a\lambda_i\lambda_i$epresents the coefficient corrected for the original thermal conductivity.

The calculation method for total thermal resistance$R_0$is:

$$R0=NI+\sum R+We \tag{2}$$

Among them, N represents the surface heat transfer coefficient of the corresponding maintenance structure, in units of W/($m^2$*K), and W represents the heat transfer coefficient of the external surface of the maintenance structure, in units of W/($m^2$*K).

Assuming that the heat transfer coefficient is *K*:

$$K=1/R \tag{3}$$

### 3.3 Scientific treatment of construction waste

In the construction of environmental projects, construction waste and waste materials after building demolition have become an important source of environmental pollution in China. In order to implement the concept of green design, environmental art design must reasonably plan the production links and reduce the serious impact of construction waste on the environment. According to relevant research, the average annual output of construction waste in China is about 2.4 billion tons, accounting for 40% of the total municipal waste. Generally speaking, construction waste can be divided into two categories: structural waste and decoration waste, among which structural waste is mainly steel bar, waste formwork and concrete debris, etc., produced in construction, and is the main carbon emission materials in building materials (such as Table 1). Decoration garbage appears in the later project decoration stage[6]. Therefore, in the environmental art design, it is necessary to adhere to the principle of large quantity, one is to do a good job in the quantity of materials and environmental protection quality planning, to avoid material waste. Second, the scientific planning of the project construction layout, improve the scientificity of the project construction and decoration links, to avoid the decoration link of the main body of the building changes. At the same time, it is also necessary to plan the energy utilization efficiency of the project construction, do a good job in the recovery of renewable energy, and fully implement the concept of green design. Scientific treatment of recyclable resources (Figure 3), try to use renewable energy as the main application energy of the project construction such as solar energy, wind energy, geothermal energy, gravity, etc., so as to reduce the energy use of buildings and reduce the production cost [7].

**Table 1** Carbon emissions of project construction materials

| product name | Production / ten thousand t | Carbon emission factors $()tCO_2 \cdot t^{-1}$ | carbon emission $()tCO_2$ |
|---|---|---|---|
| iron and steel | 0.57 | 1.7 | 0.97 |
| aggregate | 2.24 | 0.005 | 0.01 |
| Brick block | 14.4 | 1.68 | 24.20 |
| concrete | 120 | 1.17 | 20.09 |
| Inorganic mixture | 20 | 0.05 | 0.93 |

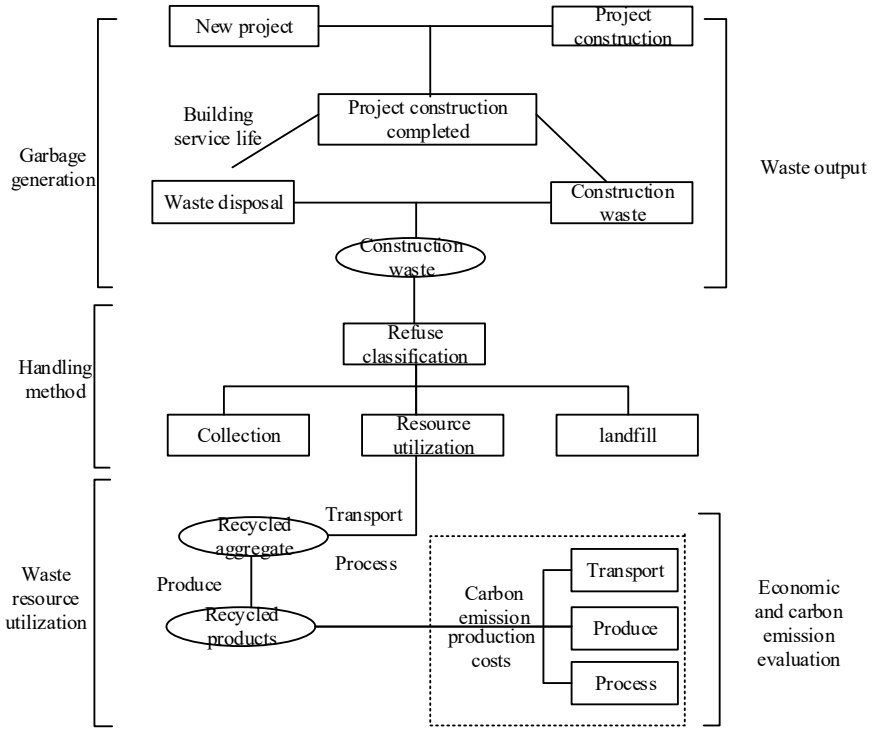


**Figure 3** Construction waste disposal

### 3.4 Adhere to the principle of returning to nature

In environmental art project design, designers can combine the actual needs of the project construction, and so on and so forth design return to natural style, combining their art design and natural style, on the one hand, the implementation of the green design concept, improve the ecology of project design, on the other hand can reduce unnecessary high energy consumption projects, reduce project construction carbon emissions. Secondly, in the space environment design, the construction materials with natural properties should be used as far as possible, highlighting the concept of combining man and nature, combining the related concepts of lighting and air circulation, scientific landscape layout to improve the coordination of the overall environment.

Generally speaking, the lighting coefficient *C* of a certain point in the plane of a building can be calculated according to the following formula:

$$C=EN/EW*100\% \quad (4)$$

Among them, *EN*represents the illuminance generated at this point indoors under cloudy diffuse light, in units of lx. It represents the illuminance generated at the level of outdoor object occlusion corresponding to this point indoors under cloudy diffuse light, in units of lx. Calculating the lighting coefficient is conducive to the rational design of indoor lighting schemes in buildings, improving the adequacy of natural light utilization, and reducing unnecessary waste of lighting materials.

## 4. Evaluation of the green design concept of the environmental art design in the environmental art design

The evaluation of the application effect of green concept in environmental art design can be conducted from two aspects: energy saving effect and resource reuse efficiency[8]. First of all, in terms of the energy saving effect of the project, the green design concept requires the environmental art designers to reduce the energy consumption of the project construction and use link as far as possible on the premise of ensuring that the design project can achieve the expected use effect. To evaluate the impact of green design concept on the ecological and environmental protection of the project, the importance of green design concept in reducing energy consumption can be evaluated through comparison:

$$M=(N0-N1)/N0*100\% \quad (5)$$

Among them, $M$ represents the energy conservation rate, $N_0$represents the energy consumption of the project under traditional building methods, and $N_1$represents the energy consumption of the project under the green design concept.

Rereuse of the resource is subsequently calculated. The reuse of resources is an important point of view of the concept of green design, so designers must consider the reuse of energy, less waste of energy in the later construction of the project, and fully implement the concept of green design[9]. Calculating the reduction rate of waste items after adopting the green design concept is conducive to judge the energy reuse efficiency of the project, so as to judge the implementation of the green design concept in the project design and construction:

$$Q=(P0-P1)/P*100\% \quad (6)$$

Among them,$Q$ represents the efficiency of reducing waste in the project, $P_0$ represents the output of waste under traditional production methods, and$_1$represents the waste in the construction of environmental art design projects that incorporate green design concepts.

For example, in the construction of an office building in a province in southern China, the reflectivity of the window, wall and ceiling is 0.9%, 0.2% and 0.8% respectively. The energy-saving design concept is applied to the building construction, and the preliminary level of the lighting working face is 0.7m, and the double-layer hollow Low-E glass is used. Compared with the buildings under the same environmental conditions, the energy saving effect of the office building design is increased by 5% on the original basis. In the office building project construction, the construction of concrete, inorganic mixture, brick block, brick block, aggregate and other materials according to a certain process for energy saving and recycling [10], in the choice of materials, bamboo, natural raw materials such as wood instead of concrete and steel, through green energy such as solar power instead of fossil fuels. Compared with the construction of the office building under the same construction conditions and the same quality, the energy saving effect of the office building design has been increased by 35% on the original basis.

## 5. Conclusion

In the current social development situation, in order to further improve the quality of environmental design, must be integrated into the green design concept, the comprehensive investigation of the project, from project design to project put into use and even late project recycling into the green design concept, according to the relevant standards using green materials, reduce energy consumption and adhere to the concept of harmony between man and nature, realize the green environmental protection concept, low carbon project construction and sustainable development, create more safe and healthy construction projects, form the common development of social and economic development and environmental protection.

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