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Particle Swarm Optimization Algorithm to Correlation Analysis of Green Ecological Buildings and Natural Environment Protection

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Abstract: With the acceleration of urbanization, urban environmental problems are becoming more and more serious. Particle swarm optimization algorithm has unique advantages in solving the problems of green ecological buildings and urban environmental development. In order to clarify the relationship between green ecological buildings and environmental protection, this paper uses particle swarm optimization algorithm to explore the relationship between the two. In this paper, the investigation and comparison methods are mainly used to study the correlation between green ecological buildings and natural environment protection. The survey results show that the incremental cost of water saving accounts for 5.8% of the total cost. Therefore, in green buildings, we need to focus on the construction of water to reduce water pollution and waste.

1. Introduction

People began to pursue the quality of life, and environmental issues have also received increasing attention. In order to solve this series of problems, particle swarm optimization algorithm is proposed. This method takes green ecological buildings as the optimization object. In Particle Swarm Optimization (PSO) algorithm, individuals compete and cooperate with each other by simulating the behavior of nature and selecting randomly. Build a green ecological optimization model based on particle swarm optimization algorithm. The model improves the traditional genetic algorithm to obtain a new green building community structure. Green ecological buildings and natural environment protection are essentially the same, both of which are effective use of

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environmental resources.

There are many theories to study particle swarm optimization algorithm and green building and environmental protection. For example, some scholars said that landscaping construction is one of the means to achieve ecological environment protection [1-2]. Some scholars also believe that the greening project is an important project in urban construction, which plays a very important role in improving the living environment of residents, purifying urban air and improving the quality of urban living [3-4]. In addition, some scholars discussed the feasibility and reliability of an improved particle swarm optimization algorithm to solve constrained optimization problems in environmental planning and management [5-6]. In the planning of green ecological buildings and natural environment protection, particle swarm optimization (PSO), as a new optimization method, is widely used in various systems. In green ecological buildings and natural environment protection, we should apply particle swarm optimization algorithm to it, so as to better play its due role and provide more help for building an environment-friendly society.

This paper first studies the relevant theory of particle swarm optimization algorithm, and then expounds green ecological buildings and natural environment protection in two aspects, and discusses their relationship. Then the measurement methods of incremental cost and benefit of green buildings are discussed. Finally, the economic and ecological benefits of green buildings are analyzed through the calculation results, and relevant conclusions are drawn.

2. Green Ecological Buildings and Natural Environment Protection Based on Particle Swarm Optimization

2.1. Particle Swarm Optimization Algorithm

In the process of evolution, each individual has its own similarity from the group itself, and the groups are interrelated and interact with each other. There will be new individuals and positions among populations due to genetic or other external factors. Therefore, the optimization problem is to maximize the probability of each particle and find the global optimal solution. And apply it to the algorithm to achieve the best results. At the same time, we can also change the differences in fitness of each individual in the evolution process to make the whole population become a "group", so that we can get better convergence speed and learning ability [7-8]. In the optimization process of particle swarm optimization, its population is composed of several individuals, each of which has its own unique information flow and behavior characteristics.

In the optimization algorithm, we can get the optimal solution by calculating the average speed of each particle and then arranging all particles. Genetic algorithm and simulated annealing search are randomized evolutionary methods based on the survival theory of "survival of the fittest" [9]. In the optimization algorithm, a series of parameters with different characteristics are formed through random search of particle swarm. In the optimization algorithm, particle swarm optimization is random and has the characteristics of self-organization, colony and dynamic factors. It obtains the optimal solution after selecting each individual. Therefore, the conflict between green ecological buildings and natural ecological environment can be effectively solved by particle swarm optimization algorithm.

All aspects need to be considered in the optimization process of the algorithm. Particle swarm optimization is applied to green ecological buildings and natural environment protection. Its goal is to form a multi-dimensional parameter combination optimization model by quantifying the relationship between individuals in the system. Dynamic selection mechanism is introduced in the process of genetic operation [101]. This solves the problem that the traditional optimization method is only applicable to the local optimum, and improves the efficiency and convergence probability of

the algorithm.

2.2. Green Ecological Building

The purpose of green ecological building is to save resources and protect the environment, and minimize the adverse impact on the natural environment during the design, construction and operation of the building. During the construction process, the damage to the environment should be reduced as much as possible, and the efficiency of resource utilization should be improved through scientific and reasonable planning and design. Take the building as a whole, make it coordinate with the surrounding space and form a harmonious relationship. Use ecological principles to solve urban problems or improve human settlements. The green environmental protection design mode combining economy and practical performance is built and operated in buildings based on the principles of energy conservation, high efficiency and low pollution [11]. In architectural design, green ecological buildings of various types, specifications and styles are designed according to different functional requirements.

The characteristics of green ecological buildings are to adopt scientific and reasonable planning and design in the construction process, systematize and standardize them, and strictly control the construction cost. Green ecological buildings have good environmental benefits, social effects and economic benefits. It can fully and effectively use energy resources and natural resources to reduce energy consumption and reduce pollution emissions. It can also improve production efficiency through technological innovation to achieve the goal of energy conservation and emission reduction. The construction of green ecological buildings is integrated. In the design of buildings, pollution and destruction should be avoided as much as possible to achieve sustainable development. This also means that if we want to achieve this goal, we must start from two aspects. On the one hand, the reasonable selection and utilization of materials. Reduce energy consumption and resource waste through scientific and effective treatment of building materials and construction technology. On the other hand, it is required to have equipment and facilities with high environmental protection standards and strong energy conservation and emission reduction capabilities.

The construction of green ecological buildings should be based on scientific theory and make full use of scientific technology and advanced equipment when selecting architectural design. In the process of architectural design, the impact of natural environment on people should be fully considered. The architectural design should be based on the local environment and social status. At the same time, attention should be paid to protecting the surrounding ecological environment [12]. During construction, it is necessary to consider whether the existing forms of various natural resources and the use methods meet the national standards. In addition, it is also necessary to consider the interference and damage caused by the climate environment to the building performance. It should also be noted whether the building materials meet the living standards.

2.3. Natural Environment Protection

The relationship between green ecological buildings and natural environment protection is mutual influence, complement and promote each other. Certain principles must be followed in the interaction between the two. The construction of green ecological buildings needs to be based on scientific, advanced and reasonable technologies. Therefore, when designing them, we should take into account the local regional climate and environmental characteristics, economic development level and social needs and other factors. At the same time, the bearing capacity of the natural environment should be fully considered. There is a certain correlation between green ecological buildings and natural environment protection. In the process of construction, we should combine the

two. The architectural design under the concept of green ecology will inevitably bring great pressure and challenges to the environment. On the one hand, whether the building itself meets the environmental protection standards. On the other hand, it is mainly reflected in whether to protect the natural ecological environment in the design.

In the construction industry, green ecological technology is a very important means. It can make people more consciously use some environmental protection materials to reduce the harmful impact on the environment. The design of green ecological buildings is based on the full utilization of natural ecological environment and social environmental resources to save energy, reduce pollution, protect natural environment and achieve economic benefits. Recycled building materials or new building materials shall be selected as much as possible during construction. Adopt new technology with low energy consumption to reduce the cost of construction and maintenance; Try to choose non-toxic and harmless green building raw materials and waste recycling treatment. In order to achieve harmonious coexistence between society and environment, reasonable planning should be carried out on the basis of people-oriented in architectural design. Through scientific and effective analysis and research of the natural ecological environment system, it can be used again.

3. Incremental Cost and Benefit Measurement of Green Buildings

3.1. Incremental Cost

All kinds of projects participating in the investment decision evaluation of green building projects must first conform to the traditional building standards and general building indicators and specifications. On this basis, the additional cost paid to obtain more economic and environmental benefits is also the green building cost we are discussing, which is basically the additional cost of the construction project. The design and planning of green buildings are based on reference buildings. The formula IC of incremental cost is as follows:

$$IC = GBC - TBC \tag{1}$$

GBC is the cost of green buildings, while TBC is the cost of traditional buildings. The incremental cost of green buildings is calculated based on the incremental cost, such as energy conservation and energy use, landscape and external environmental protection, material protection and material resource use, water conservation and recovery, operation management, etc.

The main purpose of saving land during construction is to reduce the floor area while preserving the original green space. At present, the common method is to increase the land use in urban construction, reduce the building density, and increase the proportion of plots. This paper uses the following formula to calculate the benefits of natural conservation:

$$S_l = P_l + U_l \tag{2}$$

Among them, S_l is the benefit of saving land in the whole life cycle, P_l is the cost of land acquisition, and U_l is the benefit of underground utilization. The use of walls, renewable energy and efficient lighting are the embodiment of energy-saving green building technology. The use of water-saving devices reduces the water consumption of green buildings and helps to recover natural precipitation. The rainwater collector is used to collect natural precipitation or pave soil with permeable materials so that rainwater can enter the soil and maintain water circulation.

The calculation formula of water-saving benefit is as follows:

$$S_w = \sum_{q=1}^{Q} p * V_w \tag{3}$$

Where, S_w is the water saving benefit, q is the water price, and V_w is the volume of water saving.

The material saving of green buildings is mainly realized through the application of high strength and high performance building material technology, the technology of improving the service life of materials, and the technology of ecological materials.

3.2. Incremental Environmental Benefits of Green Buildings

Carbon dioxide activities exist in the whole life cycle of buildings: from the production and manufacture of building materials to energy consumption, from the maintenance and renewal during the operation of green buildings to the demolition and reuse, it generates and emits carbon dioxide. This paper measures the ecological benefits of green buildings in improving the regional ecological environment, mainly in waste recycling and greening. A good recycling and waste treatment system can create a good environment. The green system has also brought huge ecological benefits.

3.3. Main Technical Features and Indicators of the Project

In terms of landscape protection, Project A makes full use of the existing soil resources in mountain areas. After planning and planning, the topsoil collected at the beginning of the project will be used for the project. After the completion of the main works of the building, the surface layer collected at the beginning of the project will be reused. Most of the topsoil is used for landscaping and planting plants suitable for soil quality. In terms of energy conservation, Project A adopts external thermal insulation technology to improve indoor natural temperature, save coal resource consumption and create a good environment. In terms of water conservation, A makes full use of its geographical location and advanced and proven water treatment technology to collect and make full use of groundwater and natural precipitation, and converts them into reusable circulating water through technical treatment. In terms of ecology, Project A has improved the living environment of the residential area in terms of pollution, space saving and greening.

4. Analysis of Survey Results

4.1. Project Incremental Cost Analysis

This paper selects three phases of the project for analysis. Phase X III is another low-carbon residence carefully designed according to Phase X I and Phase II. The project applies new and deeper diagnostic technology and explains the green connotation. By performing control calculations based on the data elements available in the project, the additional benefits of the project's additional costs can be realized. The incremental investment and proportion of surface land collection, solar water heater and peripheral thermal insulation are shown in Table 1:

Table 1. Incremental investment and proportion of surface land collection, solar water heater and peripheral thermal insulation

	Incremental investment (w)	Proportion in single item (%)	Proportion in total (%)
Surface land collection	11	0.01	0.2
Solar heater	1900	49.4	41.3
Peripheral insulation	1950	50.7	42.4

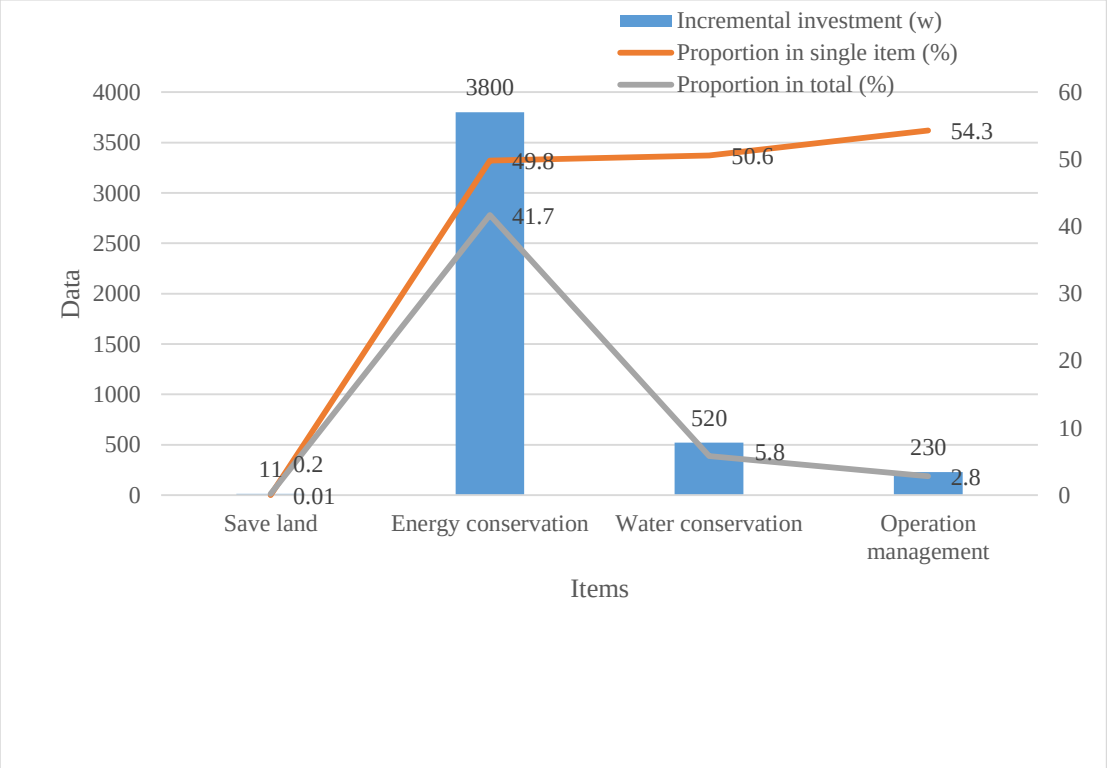

Figure 1. Project incremental cost data

As shown in Figure 1, according to the above calculation results, the additional costs of the project are listed in the order of energy saving, water saving, operation and land saving. At the same time, the project is costly in energy conservation. The additional cost of water saving accounts for 5.8% of the total cost. Therefore, the additional cost of green buildings should be controlled, especially the energy-saving and water-saving technologies.

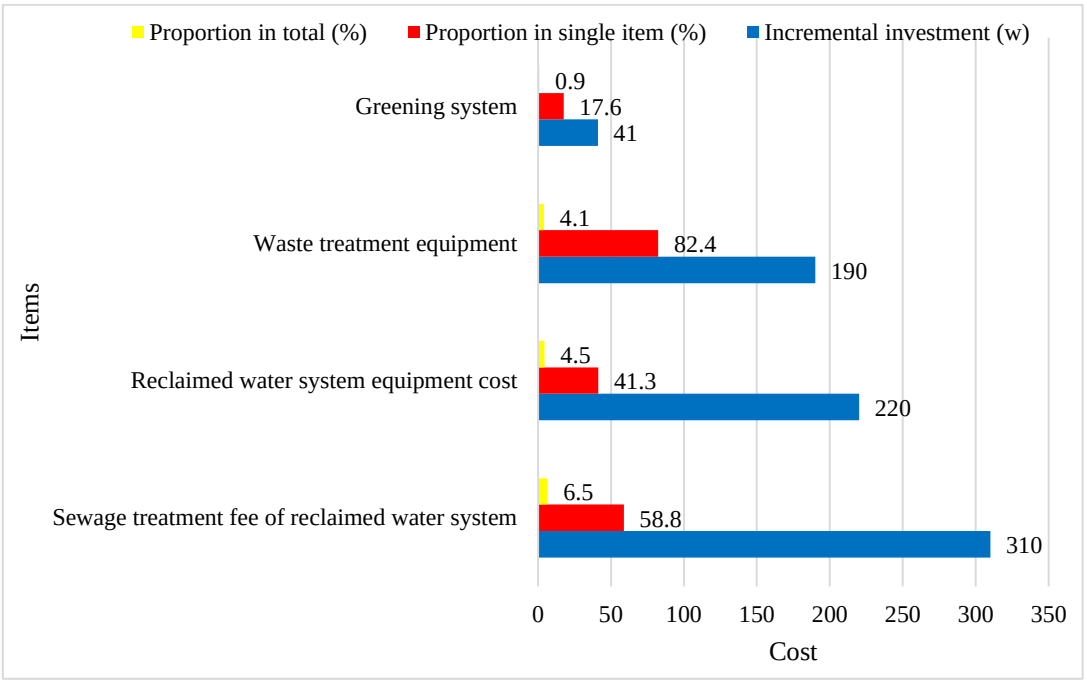

Figure 2. Incremental cost of specific aspects of water saving and operation management

As shown in Figure 2, it can be found that the sewage treatment fee for water-saving projects that improve the indoor environment accounts for 6.5% of the total cost, and the equipment fee accounts for 4.5%. Secondly, in terms of operation and management, the cost of garbage treatment equipment also accounts for 4.1% of the total cost, and the cost of greening system accounts for 0.9%.

4.2. Incremental Benefit of the Whole Life Cycle of the Project

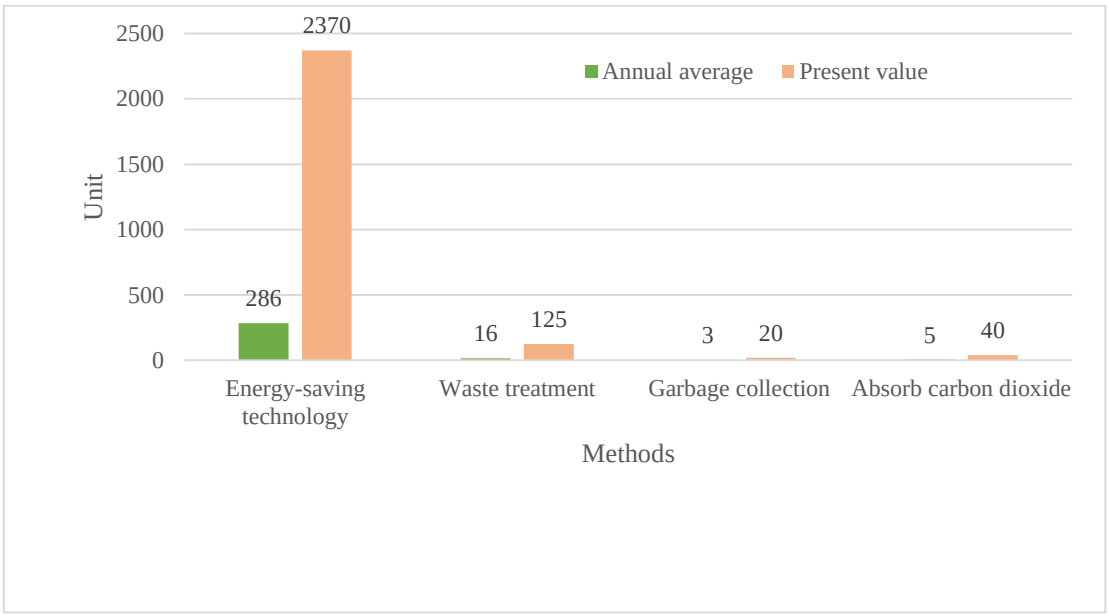

Figure 3. Increment of environmental benefits

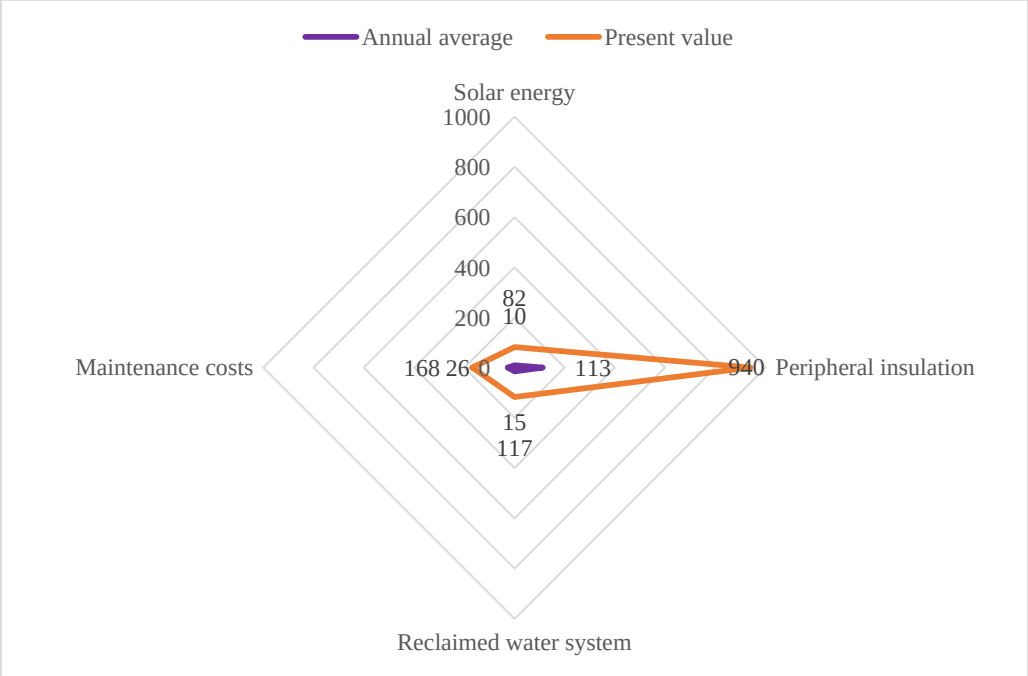

Figure 4. Economic benefit increment

As shown in Figure 3 and Figure 4, we can see that the environmental benefits of the project will continue to play an important role. The cost of energy conservation accounts for a large part of the cost of green building projects, which also conforms to the connotation of energy-saving and low-carbon green buildings. Energy-saving technology has greatly reduced the emission of carbon dioxide and other harmful gases, and the ultimate environmental benefits are also very significant.

5. Conclusion

This paper mainly studies the application of particle swarm optimization in green ecological buildings and natural environment protection, and briefly introduces genetic algorithm and its principle. This paper briefly introduces the development and application of particle swarm optimization, and analyzes its advantages in green ecological buildings and natural environment protection. When solving the optimal solution, it is considered that there is a certain degree of interdependence between different objective functions. Therefore, we can use a global minimum variable to replace the global maximum evolution variable. Based on particle swarm optimization algorithm model, genetic algorithm is used to solve the correlation between green ecological buildings and natural environment protection. From the results, we can see that the essence between ecological architecture and environmental protection is consistent, ecological architecture is the way, and environmental protection is the goal.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this

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Conflict of Interest

The author states that this article has no conflict of interest.

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