

## LETTER TO THE EDITOR

# Modeling and Simulation of the Relationship between Green Building and Living Environment

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In order to coordinate the relationship between human life and ecological environment, the relationship modeling between green building and living environment is proposed. Combining green building design, ecological environment, application of green building and green building and ecological environment, ecological footprint analysis method is adopted to evaluate green building and build ecological footprint analysis model. The results show that if we want to control the ecological footprint, we need to reduce the consumption of building materials and improve the utilization efficiency of building materials.

Green buildings; Living environment; modeling

### 1 Introduction

Resources and growing energy demand, so as to turn into a sacrifice the ecological environment around to meet our never-ending nature resources access: the domestic numerous factories discharge a lot of carbon dioxide gas into the air, contributing to the greenhouse effect and global warming, melting glaciers, rising sea levels, causing a new round of human survival crisis. A large number of facts prove that the ecological environment we live in has reached the point of fragmentation, the balance is about to be broken, it can be said that has been broken. For this reason, the central government has put forward the strategy of sustainable development, which can not only meet the needs of the current generation, but also leave a blessing for the future generations. In the mode of future development, the implementation of green building is the trend of The Times to coordinate human life and ecological environment (Balaban and Puppim De Oliveira 2017, Islami et al. 2017).

Rui Wang published a paper titled "Livability Design of Residential Building Environment Space" in Ekoloji Issue 107, 2019. With the rapid development of urbanization, the amount of soil erosion and soil erosion in the surrounding ecological environment is increasing (Wang 2019). The influence of urban construction planning Wu Rongkui made an in-depth analysis of soil erosion in the surrounding ecological environment. The rainfall data, land use status data and land use planning data of the project area were collected, and the SLE model of soil erosion equation was established to analyze the soil in the project area. According to the results of erosion change, the influence of urban construction planning on ecological environment is analyzed. Soil environmental erosion was studied. It is concluded that before the construction of low hills and gentle slopes, the erosion

modulus of the project area is 3391 t/km<sup>2</sup>, which belongs to moderate erosion. After construction, the average erosion modulus of the project area is 31.89 t/km<sup>2</sup>. Soil erosion in the project area has been significantly improved. The comprehensive evaluation of the ecological environment shows that the quality level of the ecological environment in this area is a safe and ideal safety index. The main conclusion is that the method is effective and has certain practical application value. On the basis of soil erosion, the relationship between green building and urban living environment is analyzed.

On the surface, our ecological environment is being destroyed and the balance between man and nature is being disturbed. For this reason, we put forward the theory of sustainable development, which can meet the needs of the current generation without compromising the ability of future generations to meet their needs (Huang and Mou 2017). Under this economic growth model that pays attention to long-term development, in the construction industry, we put forward and promote the development of green building accordingly, and make efforts to coordinate the harmonious development of human life and ecological environment. Thus, this paper introduced the ecological footprint analysis method to evaluate the green building, expounds the ecological footprint analysis model, based on the ecological footprint analysis model of whole life cycle of green building, according to the characteristics of the engineering construction projects, each of the green building construction phase, operation and demolition of the ecological footprint.

## **2 Idea description**

### **2.1 Green building design**

From the macro point of view, the concept of green building is embodied in how to carry out the word “green”. Modern architects should not only focus on individual buildings, but also on the whole. Starting from the whole and combining with all buildings, they aim to put green ideas into all the buildings that can be involved in China, with innovative and green new planning. For example, most of the new ideas have been incorporated into the architecture, and some new technologies have been applied to the architecture to create the ideal green building (Yan et al. 2017). For example, the collection and application of solar energy, wind energy and nuclear energy. However, the technical requirements cannot be combined with the construction industry casually, which requires architects to abandon their own knowledge framework and combine with more irrelevant or even unknown knowledge categories, so as to understand and be familiar with them, and then combine with their own experience to “soil” them and improve their technical level. After improving my professional level, I will discuss and communicate in various aspects to jointly improve the new ideas and technologies of green building of domestic architects and jointly complete the great goal of the development and rise of green building (Yang and Yang 2017).

### **2.2 The ecological environment**

We should treat natural and ecological resources correctly and implement green economy. Establish a suitable management system for the current ecological environment. Advocate green consumption, economize material resources. We should fully consider the necessity of ecological environment construction and environmental pollution control, and fully consider the relationship between the two. We should maintain a unified planning, be down-to-earth, and fully link environmental protection and pollution prevention, so as to eventually realize the transition from green building to green China.

### **2.3 The application of green building**

Building green building is not high input some imagination, and the concept of green building is just beginning, not all people can cognitive, so, some people often is generally accepted that to build some involving the word “green” products must be high or high cost, think “green” stands for a lot of money into building exquisite product, actually this kind of idea is wrong (Li and Li 2017). The result is not only high consumption, but also short life and low self - value. The advantage of green building lies in the use of cost-effective building materials in the early stage, but the effect presented in the later stage is very good. Therefore, it is inevitable to adopt low energy consumption “green” building materials to ensure the construction quality and improve the construction life. Green building is not only suitable for new buildings, but also can transform old buildings to meet the standard of green building through corresponding environmental protection measures, so as to achieve the purpose of energy conservation and environmental protection and create comfortable space.

#### 2.4 Green building and ecological environment

Human health is largely limited by the quality of the ecological environment, if our environment is damaged, life will be greatly affected. So, to the green building and ecological environment, we must build residential, save resources and to strictly control the loss of land in the construction, let the energy saving technology into the door to door, according to the requirements and bear ability of natural resource comprehensive use and sustainable development strategy, from the truly green building and ecological environment, the combination of the concept of green building to meet the new era. Ecological environment is closely related to everyone. It is incumbent on us to protect nature. As teenagers in the new era, we have promoted the green building, so that the green concept is deeply rooted in the hearts of the people, so that everyone is always concerned about green, environmental protection, health, and comfort. The relationship between green building and ecological environment also requires us to adopt scientific and reasonable methods, so as to create a representative green building in the ecological environment.

#### 2.5 Ecological footprint analysis model

According to the above, the ecological footprint analysis theory is based on a number of assumptions. Meanwhile, in the calculation of ecological footprint index, productive land is divided into six categories: arable land, forest land, fossil energy land, grassland, building land and water area(Zhao et al. 2017), the general formula for calculating ecological footprint can be expressed as follows:

$$EF = N \cdot ef = N \cdot r_j \cdot \sum_{i=1}^n (aa_i) = N \cdot r_j \cdot \sum_{i=1}^n (C_i / p_i)$$

In the above equation,  $i$  is the type of consumption item,  $j$  is the type of ecological productive land, and  $r_j$  is the equilibrium factor,  $C_i$  is the annual per capita consumption of item  $i$  (t/person a), and  $p_i$  is the annual average productivity of item  $i$  of ecological productive land production (t/hm<sup>2</sup>),  $aa_i$  is the biological production area (hm<sup>2</sup>/ person) converted into per capita consumption item  $i$ ,  $N$  is the population,  $ef$  is the per capita ecological footprint (hm<sup>2</sup>/ person),  $EF$  is the total ecological footprint.

The calculation principle of green building ecological footprint is similar to that of traditional ecological footprint measurement, but it has unique characteristics. Green building belong to the category of the engineering construction project, according to the basic principle of ecological footprint analysis, project resources consumption and environmental pollution caused by construction activities can be layered decomposition step by step, as each kind of resources consumption, on the basis of general consumption of resources in accordance with

the corresponding land ecological productivity respectively convert into ecological productive land area (Huang 2017).

### 3 Results

In order to verify the feasibility of the ecological footprint model, the ecological footprint was calculated according to the no. 88 building of the residential community “green homeland, heaven and earth”. “Green homes, made in heaven” residential district is developed by Hainan Jia Yuan real estate development co, in accordance with the “green building evaluation standard in our country to carry on the design and construction, the guidance of the residential buildings, a total of 18 families, about 105 residents to provide a place to live, the building a total height of 21.35 m, a total construction area 1783.34 m<sup>2</sup>, 30% green area surrounding the consumption of resources such as shown in Table 1.

**Table 1 Resource consumption for building 88**

material	C25 concrete	C30concret e	Cement mortar	Glass	Steel	Wood
consumption	334.02m <sup>3</sup>	182.25m <sup>3</sup>	144.8m <sup>3</sup>	2t	98.522t	24.2t

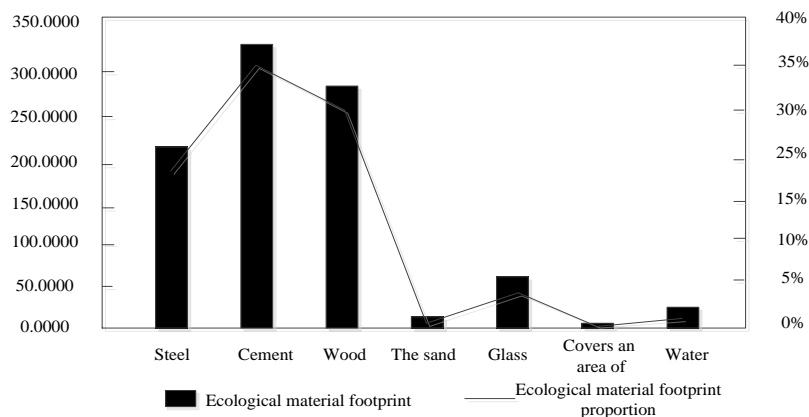


Figure 1 Ecological footprint of building materials

As can be clearly seen from Figure 1, the three major building materials, steel, cement and wood, occupy the majority of the ecological footprint of building materials. Therefore, to control the ecological footprint, it is necessary to reduce the consumption of building materials and improve the utilization efficiency of building materials.

### 4 Discussion

Building materials accounted for 83.74% of the ecological footprint at the construction stage. It can be seen that in order to control the ecological footprint, it is necessary to reduce the consumption of building materials and improve the utilization efficiency of building materials at the micro level, and improve the output value of various ecological productive lands at the macro level.

### 5 Conclusion

It is the fundamental task of the construction industry to transform the natural environment and build artificial environment that can meet the needs of both material and spiritual life. Green building is the only way to complete the fundamental task of the construction industry, but also the construction industry to fully implement the scientific concept of development, the inevitable way to achieve sustainable development. In this paper, the ecological footprint analysis model is analyzed in detail. According to the characteristics of engineering construction projects, the ecological footprint analysis model of the whole life cycle of green buildings is established, and the ecological footprint of the construction, operation and demolition stages of green buildings is studied one by one. Limited by the author's level and other reasons, the paper still has the following problems to be further studied and solved: at present, researchers mainly focus on the evaluation method and technology, but do not have too much in-depth research on the market promotion of the evaluation system.

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