

Research Article

Ecological Village Planning and Green Building Design from the Perspective of Rural Environmental Aesthetics

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The society is making continuous progress, and the results of urban planning and construction are obvious to all. However, there are still many problems in the planning and construction of villages and towns, resulting in relatively backward development. The purpose of this article is to study the planning of ecological villages and towns and the design of green buildings from the perspective of rural environmental aesthetics. This article briefly introduces the principles and problems of ecological village planning through literature research and investigation and puts forward some suggestions on ecological village planning. Through investigation and experiment, the energy problem, structural material problem, and planning problem in green building design are analyzed. The results show that due to various limitations, the use and promotion of solar energy are blocked. Only by helping farmers solve their difficulties can clean energy be used in green buildings and the burning of straw be reduced. Nationwide, the proportion of brick-concrete structures, brick-wood structures, and reinforced concrete structures in rural housing reached 57.2%, 26%, and 12.5%, respectively. Many rural buildings pursue reinforced concrete structures, but brick and wood structures may be more suitable for most rural areas.

1. Introduction

With China's rapid economic development and scientific and technological progress, China's ecological civilization construction and environmental protection have also been further strengthened [1]. The main structural units in China's rural areas are towns and villages. Towns and villages are closer to the natural ecological environment. In the process of ecological civilization construction, villages and towns are the main construction subjects of ecological civilization [2]. In the development process of rural human settlement environment construction, not only the horizontal development of human settlement environment but also the vertical development of rural human settlement environment should be considered [3]. However, the current rural construction, especially the housing construction, has many problems and often does not meet the ecological requirements. Housing construction faces problems such as farmers' wishes and funds.

The basic workflow of township planning and construction mainly includes four stages. The first stage is preliminary communication. Early exchanges were mostly conducted in the form of meetings, at which the working ideas, materials to be investigated, work schedule, and other issues should be put forward [4]. The second stage is on-site investigation. An on-site survey requires the preparation of paper topographic maps and digital cameras in the form of on-site communication. The purpose of the site survey is to be familiar with the local environment, topography, and local development and clarifying basic information such as road name and site width and layout of important infrastructure [5]. The third stage is the current investigation stage. The on-site investigation stage is mainly to submit the on-site investigation report, mainly including the summary of relevant plans and targeted analysis, population status, social and economic environment analysis, etc. The fourth stage is the planning stage. At this stage, it is necessary to submit a plan statement. The content of the planning

description includes basic planning concepts, regional development goals, analysis of important factors affecting regional planning, and planning evaluation [6]. After the plan is completed, the plan shall be submitted [7].

There have been many scholars who have conducted research on environmental aesthetics, ecological research, urban planning, and green buildings. Almeida studied the issues of education and promotion in rural planning and put forward suggestions for rural planning with family farms as the mainstay [8]. Wang selected Hongjie town, Changwon County, as a case study, discussed the background of local rural transformation and related environmental factors, and investigated the income and quality of life of local farmers [9]. Li's research found that the interaction between agricultural structure adjustment based on market demand and rural transformation is a modern transformation to improve the quality and efficiency of agricultural products [10]. Joan found that since the second half of the 20th century, the farming and grazing patterns of Spanish rural buildings have changed. Due to economic needs, they have made great changes to the countryside. From the petrification or destruction of assets to the harmony and coexistence between tradition and modernity in the heritage, it reflects the contemporary nature of Spanish rural architecture [11]. Naohiko conducted a study on the planning and layout of rural buildings in historical landscape reserves [12]. Taking the town to the west of Shi as an example, based on the framework of ground feature ecology, this article constructs the temporary land use planning in rural-urban fringe and discusses the importance and challenges of integrating sensory information into the process of rural and urban ecological planning [13]. The data of these studies are not comprehensive, and the results of the studies are still open to question, so they cannot be recognized by the public and thus cannot be popularized and applied.

This article is organized as follows: Section 1 systematically summarizes the main research contents of this study. Section 2 introduces the principles and problems of ecological town planning and puts forward relevant suggestions. Section 3 introduces the design principles and concepts of green buildings. Section 4 is related research, which analyzes the use of energy in rural housing through data query and related experiments. Section 5 is the analysis of the data. Through the specific survey data and research results, the energy problems, structural materials problems, and planning problems in green building design are analyzed. The results show that due to various limitations, the use and promotion of solar energy are blocked. Only by helping farmers solve their difficulties can clean energy be used in green buildings and the burning of straw be reduced. Nationwide, the proportion of brick-concrete structures, brick-wood structures, and reinforced concrete structures in rural housing reached 57.2%, 26%, and 12.5%, respectively. Many rural buildings pursue reinforced concrete structures, but brick and wood structures may be more suitable for most rural areas. The most common type of roads in rural areas is cement roads, accounting for 80.9%, but there are still many roads covered with silt and stones. Most of these roads are roads in front of farmers' homes. The reason is that there are

contradictions between town planning and rural residential design, which do not match well with each other. Section 6 is the summary and suggestion of this article, which is the summary and prospect of the article's achievements.

2. Principles and Problems of Ecological Village and Town Planning

2.1. Ecological Planning Principles

2.1.1. Protect the Environment. Poor environmental conditions will pose a threat to the physical health of the human body. In an uncomfortable ecological environment, people's life and health will be impossible to talk about. We look up the history of China and the world and find that the opposition between man and nature is the main relationship in each historical period. There is a cycle that is often repeated in history. First, the natural environment is damaged and uncontrolled. To a certain extent, many disasters will occur in nature, damaging human life. Especially in agricultural production, this kind of confrontation is most obvious. The influence of nature on human production and life is first reflected in agriculture. If we do not find a way to live in harmony with nature, then one day human beings will be unable to resist the retaliation of nature. Therefore, the protection of villages and towns is the basis for the smooth progress of ecological civilization.

2.1.2. Respect Residents' Living Customs. China has a very large number of ethnic groups. Besides the Han nationality, there are also 55 ethnic groups. Many ethnic groups have their own living habits and customs. The lives of many ethnic minorities are somewhat different from those of the Han nationality, and the proportion of the Han nationality is very large. The relevant construction personnel in many places are mainly Han nationality. Therefore, misunderstanding caused by improper understanding may occur. In order to avoid this situation, we must know the local people's life and customs in advance and invite them to participate in the local construction as much as possible. After all, the local people have a deeper understanding of the local culture. If we ignore or copy the same plan, it will probably make the local people feel uncomfortable and hinder the construction of villages and towns.

2.1.3. Ensuring Infrastructure Construction. Ensuring infrastructure construction sounds easy, but it is actually a very difficult thing. First of all, infrastructure construction requires a large amount of funds, and development varies from place to place. It is not easy to fully guarantee infrastructure construction. Second, infrastructure construction must take ecological environment protection as the theme. Many people regard ecology as a primitive environment and greening, which is very wrong. The construction of an ecological environment requires a lot of science and technology and design concepts. In the process of construction, the effective use of space, the convenience of residents, and the cooperation between production must be considered. If

the construction process has adverse effects on production and life, it may be unqualified. At the same time, the construction of infrastructure also requires certain high and new technologies.

2.2. Problems in Village and Town Planning

2.2.1. The Lack of Planning for Rural Housing Renovation.

In the planning process of villages and towns in our country, the characteristics of different rural areas or the characteristics of rural infrastructure are often ignored. Therefore, the planning and model of villages and towns in China are similar, and it is difficult to highlight the characteristics of villages and towns in different regions. Meeting the wishes and needs of local rural areas has gradually reduced the traditional factors and characteristics of our villages and towns. For example, cave dwelling and semi-cave dwelling in the central and western regions of China are very characteristic buildings with great representativeness. These ancient and traditional farmhouses are permeated with scientific principles and make effective use of surface heat energy. They are relatively warm in winter and relatively cool in summer. They have the basic characteristics of energy conservation and comfort and have unique shapes and beautiful appearance.

2.2.2. Lack of Purposiveness in Urban and Rural Energy Construction. The State Grid Corporation of China has invested 30 billion yuan to allow remote and poor rural areas to use high-quality electricity. Even if the actual situation is different, the amount of investment may still be exceeded, which also means that each farmer can enjoy an investment of about 30,000 yuan. However, the same amount can be used to install a solar photovoltaic cell system for each rural resident, or to raise funds for the construction of a wind power plant, so as to realize the green power consumption of rural residents and can also greatly save the state's consumption in power grid construction [14]. Due to practical considerations, on the basis of the existing, if you want to apply the urban power supply mode to remote mountainous villages, it will inevitably consume a large amount of energy.

2.2.3. Rural Ecological Environment Pollution. The overall ecological environment in our country is not good, and the pollution in many places is a bit serious. The ecological environment in rural areas should have been much better than that in cities, but this is not the case. Some pollution in rural areas may be more serious than that in cities. The most common pollution in rural areas is mainly water pollution, soil pollution, and air pollution. These three kinds of pollution directly affect people's health. Some investigations show that unclean drinking water and harmful substances in the air are the main causes of many diseases. Water pollution in rural areas not only affects people's drinking water health and safety, but also affects the irrigation of fruits and vegetables. This is very similar to soil pollution, which brings hazardous substances into the human body through people's

diet. Water pollution is mainly caused by the random discharge of pollutants from factories, many of which are deliberately built in remote places [15]. On the one hand, because the rural labor force is cheaper, and, on the other hand, because remote places are often difficult to supervise, they can take this opportunity to secretly discharge sewage into rivers. In addition to pollution from factories, there is also the problem of fertilization in the process of farmers' planting. Many farmers feel that fertilization can increase production and make more money, so they apply fertilizer in large quantities, resulting in soil pollution. During irrigation or on rainy days, these pollutants will enter the water bodies. The pollution of water bodies will cause the pollution of other lands and turn into a vicious circle. Air pollution is also mainly caused by the random emission from factories, which requires strong supervision.

3. Green Building Design Principles and Concepts

3.1. Design Principles

3.1.1. The Principle of Keeping the Nature of the Countryside Unchanged. The purpose of building new rural houses is to make the countryside look brand-new, not to turn the countryside into non-countryside. The construction of new rural housing is based on the original rural housing. New rural housing construction is different from small town construction, and urbanization. The construction of new rural housing pays attention to the fact that the house can be changed, but the nature of the house cannot be changed.

3.1.2. The Principle of Protecting Farmers' Rights and Interests as the Center. In our country's new rural housing construction, the fundamental goal is to improve the rural economic and social conditions, better protect the rights and interests of farmers, and continuously improve the interests of farmers. Whether it is conducive to promoting the legitimate rights and interests of farmers is an important criterion to measure the construction of new rural housing. As long as it is the new rural housing construction that cannot promote the rights and interests of farmers, it must be stopped. In the new rural construction, we must ensure the farmers' production and living conditions.

3.1.3. The Principle of Ecological Planning First. The planning of new rural housing construction should take the protection of the original rural ecology as the standard, and the planning should not damage the original rural ecology. The new rural housing construction planning must follow the principle of protecting the rights and interests of farmers. The new rural housing construction plan cannot change the current situation of farmers' use of housing. The scope of the plan is limited to houses that farmers do not use, dilapidated and uninhabited houses, and idle houses. The houses that farmers need to live are the foundation of their lives. When building new rural houses, farmers cannot dispose of them without providing them with existing alternative housing.

3.2. Design Concept

3.2.1. Rational Use of Space. Excellent planning and architectural design programs play an important leading role in improving the appearance of villages. They also play a positive role in improving the status quo of random construction and imitation in the process of new rural construction, changing the appearance of villages and improving the living conditions of farmers. As a nonrenewable resource, land is in short supply. New rural planning should aim at intensive use of land, save land as much as possible, and leave enough space for long-term rural development.

3.2.2. Considering Individual Differences. Due to the particularity of rural domestic farming and the relatively large building area, courtyards are usually built in rural self-built houses to facilitate clothes drying, livestock raising, storage of farm tools, firewood, etc., and even to build melon sheds and grow vegetables. Common courtyard forms include a front courtyard, backyard, side courtyard, vestibule backyard, and front courtyard with side courtyard, while the form to be adopted should refer to natural conditions, local customs, area size, and economic situation.

3.2.3. Protecting Cultural Traditions. The design of rural housing should continue to maintain its tradition and beauty. In today's flood of traditional culture and modern civilization, we should maintain the essence of traditional culture, innovate in inheritance, and maintain characteristics in innovation. Traditional dwellings have many distinctive local features. The harmonious coordination between the rural settlements and the natural environment forms a beautiful rural landscape, which is very attractive. Whether in layout, structure, or plastic arts, traditional Chinese dwellings have condensed the wisdom of previous generations to adapt to and transform nature.

3.2.4. Adjust Measures to Local Conditions. Local materials and local conditions are direct and effective ways to reflect the region. Most of the local materials are simple and elegant, and the combination with traditional methods can reflect the rich rural flavor and the life flavor of rural dwellings. For example, local specialty bamboo products are used to make blinds and bamboo curtains. Bamboo is cool, low in heat, and low in water absorption. It is very suitable for rainy and hot weather in the south.

4. Experiments

4.1. Object of Investigation. In order to understand the current situation of China's rural development as comprehensively as possible, we have separately selected some villages in several cities in the four major regions of China for investigation. China's economic region is divided into four major regions: the east, the middle, the west, and the northeast. The eastern region includes Beijing, Tianjin, Shanghai, Hebei, Shandong, Jiangsu, Zhejiang, Fujian,

Taiwan, Guangdong, Hong Kong Special Administrative Region, Macao Special Administrative Region, and Hainan. The central region includes Shanxi, Henan, Hubei, Anhui, Hunan, and Jiangxi provinces. The western region includes Inner Mongolia Autonomous Region, Xinjiang Uygur Autonomous Region, Ningxia Hui Autonomous Region, Shaanxi Province, Gansu Province, Qinghai Province, Chongqing City, Sichuan Province, Tibet Autonomous Region, Guangxi Zhuang Autonomous Region, Guizhou Province, and Yunnan Province. The northeast China includes Heilongjiang Province, Jilin Province, and Liaoning Province.

As there is a certain gap between the economic development of various provinces and cities, it is necessary to have certain pertinence when choosing. The specific options are as follows: The survey objects in the eastern region are Baoding City in Hebei Province and Shantou City in Guangdong Province. Baoding was chosen because Baoding has a large population and its economic development in Hebei province is on the middle level, which is typical. Shantou was chosen because Guangdong's economic development is among the best in China, while Shantou's economic ranking in Guangdong province is at a medium level. Shantou is more suitable as a research city for urban and rural development in the eastern region. The choice of cities in other regions is basically based on the development of urban and rural areas and the level of economic development. The survey objects in the central region are Xicheng City in Henan Province and A Qing City in Anhui Province. The survey objects in the western region are Yan'a City in Shaanxi Province and Nanchong City in Sichuan Province. The objects of investigation in the northeast region are Liaoyang City in Liaoning Province and Tong Hua City in Jilin Province.

4.2. Contents and Steps of Investigation. In this article, the research on green buildings mainly starts with the use of various energy sources in rural buildings and the proportion of structural materials in rural housing. The study of ecological town planning mainly starts with road traffic.

4.2.1. Energy Investigation and Analysis. The core of the green building is not the neat appearance, but the use of energy in the building. The energy survey is mainly divided into three parts. The first part is to ask the relevant departments about the use of rural energy and obtain relevant data from the third national agricultural census. The second part is on-the-spot investigation to understand the energy usage in each village and to conduct a questionnaire survey on farmers' friends. From the relevant departments, we know that straw and solar energy are currently a controversial item in rural energy, so the survey mainly focuses on straw and solar energy, including the usage and the advantages and disadvantages of straw and solar energy in the eyes of farmers. The third part is a survey of the solar energy industry. The industry survey selected five-star solar energy manufacturers in Guangdong and Sang Le.

4.2.2. Investigation and Analysis of Structural Materials.

For the investigation of rural housing, the method of on-the-spot investigation is mainly adopted, and the structure and materials of rural housing are counted through shooting, observation, recording, and other methods. During the investigation, we found that there are mainly four kinds of structural materials for rural housing, including reinforced concrete, brick and concrete, brick (stone) wood, bamboo, and grass adobe. Although the proportion is very small, there are also housing forms such as basements and caves. Due to the different sizes of housing areas, we have divided all kinds of housing into three groups from small to large according to their areas and floors, with corresponding scores of 1, 2, and 3, respectively. The survey shows that the reinforced concrete construction area and floors are often relatively large, mostly belonging to the 3-point group. According to the corresponding scores, the sum of the scores is obtained, and then the percentage is calculated to obtain the rural housing structural materials.

4.2.3. Road Traffic Investigation and Analysis. In the field investigation, we also investigated the road traffic. The main methods are shooting, observation, measurement, drawing, and recording. During the field investigation, it was found that the rural roads are mainly cement roads, asphalt roads, and sand roads, and there are also few yellow mud roads and roads covered with weeds. For the statistics of pavement, the length is mainly recorded, and the length of various pavements is recorded to obtain the total length of each pavement, thus calculating the percentage. In addition, the distribution of pavement types was recorded.

Due to the difficulty of measurement in the process of investigation, the method of combining the existing data and observation data is adopted. For example, in the road traffic investigation and analysis, the data of the length of the main roads are available, and the measurement data are mainly village roads. Statistical results are obtained by combining the two data .

4.3. Survey Results. The main uses of energy in rural buildings are firewood, coal, combustible gas, methane, electricity, solar energy, etc. The data obtained from the field survey of energy use are generally similar to those from the third national agricultural census. As the data given by relevant departments are more comprehensive and authoritative, we have collated the data of the third national agricultural census. According to the instructions of relevant departments, each household can choose 2 items for this content, thus the sum of percentages exceeds 100%. Because the data source is authoritative and the calculation method is special, some data are too small to study and compare after conversion, so the conversion is not carried out and the original data are retained. The collation results of the survey data are shown in Table 1.

Nationwide, the use of firewood is 44.2%, with the highest proportion reaching 84.5% in the northeast and the lowest in the east, with only 27.4%. The use of coal nationwide was 23.9%, with the highest rate in the eastern

TABLE 1: Various types of energy use in rural buildings (%).

Area	Nationwide	Eastern	Midland	Western	Northeast
Firewood	44.2	27.4	40.1	58.6	84.5
Coal	23.9	29.4	16.3	24.8	27.4
Gas	49.3	69.5	58.2	24.5	20.3
Biogas	0.7	0.3	0.7	1.2	0.1
Electricity	58.6	57.2	59.3	59.5	58.7
Solar energy	0.2	0.2	0.3	0.3	0.1
Other	0.5	0.2	0.2	1.3	0.1

region reaching 29.4%. The use of combustible gas in the whole country was 49.3%, reaching a maximum of 69.5% in the eastern region. The use of biogas in the whole country is 0.7%, and the highest in the western region is 1.2%. The use of electricity in the whole country is 58.6%, similar in all regions, exceeding 57%, and slightly higher in the western region. The use of solar energy is 0.2% in the whole country and is relatively low in all regions, with a maximum of 0.3%.

Protecting the environment can be said to be the most important task premise at present. The design of green buildings should follow the principle of ecological planning first, thus increasing the use of renewable energy sources, such as biogas and solar energy. At the same time, we should reduce the use of nonrenewable energy or more polluting energy, such as firewood and coal. However, we should also follow the principle of protecting the rights and interests of farmers as the center. We should not ignore the interests of farmers for the sake of environmental protection. We need to solve the difficulties of farmers in the process of ecological construction. Only by adhering to the concept of ecological environment protection to build villages and towns and adopting new methods, new technologies and advanced concepts can high-yield and high-efficiency economic production be maintained without damaging the environment.

5. Discussion

5.1. Analysis of Green Building Energy Problems. Many researches on green buildings have ignored the energy problem, but if we only look for green environmental protection in appearance, but ignore the long-term energy problem, it will inevitably be lacking. The energy use of rural buildings largely reflects the development trend in green buildings. In order to facilitate research, we draw the relevant data into a bar graph, as shown in Figure 1.

From the data in the above figure, it can be seen that the use of electricity in rural buildings is the most common nationwide, reaching 58.6%, and the use of electricity in various regions has exceeded 55%, which is also the result of China's vigorous development of electricity for many years. Due to the authority of the data source and the special calculation method, the original data are not processed for the accuracy and convenience of experimental research, and the sum of percentages is more than 100%. However, firewood is also widely used. From a local perspective, the use of firewood is less in the eastern region, and the northeast

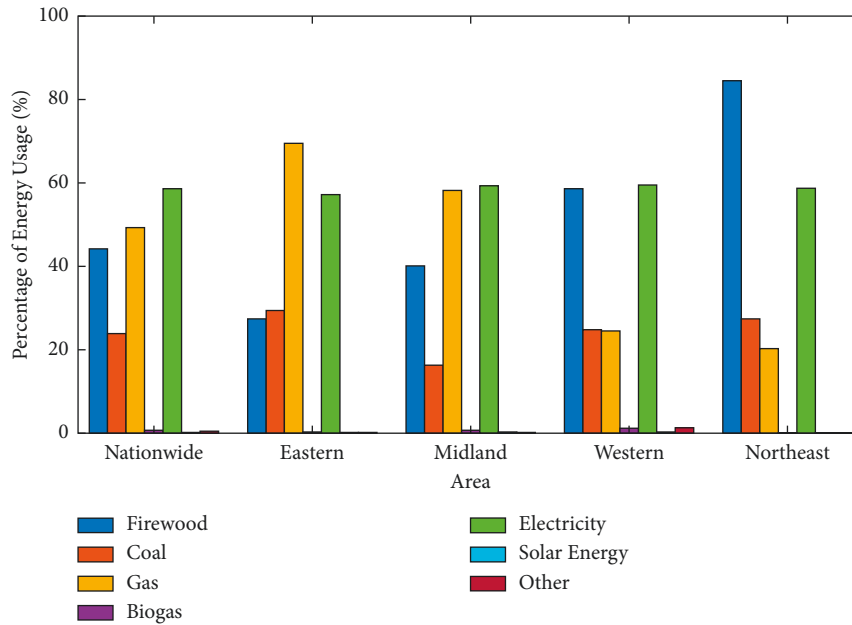


FIGURE 1: Various types of energy use in rural buildings.

region is extremely dependent on firewood, with 84.5% of the total energy being firewood. The extensive use of firewood is extremely unfavorable to the rural ecological environment.

The use of solar energy in rural areas is rare, with only 0.2% nationwide. A large part of the reason is that many people in the countryside have moved out, and the rest are mainly elderly children. They do not know much about the use of water heaters, and they have poor safety awareness. It is difficult to use solar water heaters. In order to explore the specific use of solar energy, we made a line chart of the growth rate of solar water heaters and solar stoves in recent years, as shown in Figure 2.

The annual growth rate of solar water heaters and solar stoves generally shows a downward trend, and the decline rate is relatively fast. According to a survey, the use area of solar water heaters in 2018 was about 88.054 million square meters, which was an increase of only 0.94% compared with the use area of 87.235 million square meters in 2017, the lowest growth rate for the year. In 2018, the number of solar stoves used was about 2.136 million units, which was not only not increased compared to 2.223 million units used in 2017, but decreased by 3.91%. In fact, since 2016, the number of solar cookers has been growing negatively. Earlier we analyzed the reasons why solar water heaters are no longer hot. So, what is the reason why the solar stove was eliminated?

We visited the manufacturers of solar stove products and the friends of farmers who use solar stoves and found that the reasons are like the reasons for solar water heaters. There are roughly the following three points: First, it is because of cost issues. When using solar energy, if you want to get a certain conversion power, you often need a large area of collection and conversion equipment, which is relatively expensive. The second is instability. Due to the limitations of natural conditions such as day and night,

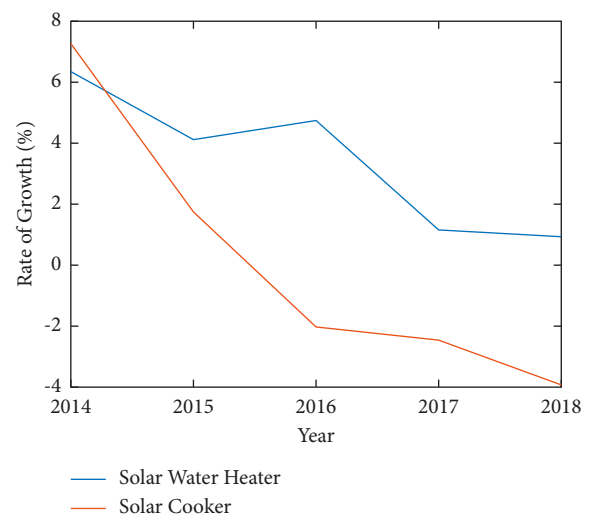


FIGURE 2: Annual growth rate of solar products.

season, geographical latitude and altitude, and the influence of random factors such as sunny, cloudy, cloud, rain, etc., the solar irradiance reaching a certain ground are intermittent. It is also extremely unstable, which adds difficulty to the large-scale application of solar energy. In order to make solar energy a continuous and stable energy source, and eventually become an alternative energy source that can compete with conventional energy sources, it is necessary to solve the energy storage problem well, that is, the solar radiation energy is stored in clear daytime as much as possible for night or rainy days, but current energy storage is also one of the weaker links in solar energy utilization. However, green buildings in rural areas cannot avoid the problem of solar energy. If there is no clean energy, green buildings will be impossible to talk about. However, subject to the development of technology and economy, it is not

feasible to completely rely on solar energy. Although, at present, power assist methods can be used for solar water heaters, the utilization rate of solar energy is still not high enough, especially when the solar energy is enough in summer, a lot of solar energy is still wasted. Therefore, when designing green buildings, attention should be paid to the collection and storage of solar energy. When building green buildings, the use of solar energy and electrical energy should be designed together to make solar energy and the building itself more closely integrated. This can not only reduce the trouble of subsequent construction and save costs, but also greatly enhance the aesthetics of the building.

5.2. Analysis of Green Building Structural Materials. During the production and use of buildings, a large amount of energy consumption and environmental pollution may also occur. Nowadays, most cities have reinforced concrete structures. With the economic development, there are more and more reinforced concrete buildings in rural areas. However, these reinforced concrete buildings have met with opposition and condemnation from some people. For subsequent research and analysis, we first make statistics on the structural materials of the current rural buildings, and the results are shown in Table 2.

In order to facilitate research, we draw the relevant data into a bar graph, as shown in Figure 3.

As can be seen from the data in the above figure, the most common rural area is still the brick-concrete structures. Nationwide, the proportion of rural housing brick-concrete structures reached 57.2%, and the highest proportion in the central region reached 65.3%. The generality of the brick-concrete structures is expected, because the brick is the smallest standardized component and has low requirements on the construction site and construction technology. It can be built into walls of various shapes and can be produced everywhere and has good durability, chemical stability, and atmospheric stability. It can save cement, steel, and wood, no formwork is needed, and the cost is low. The construction technology and construction equipment are simple.

The utilization rate of brick-timber structures ranks second. Nationwide, the proportion of rural housing brick-timber structures reached 26%, and the highest proportion in the northeast region reached 42.5%. This was followed by reinforced concrete structures, which accounted for 12.5% of the total nationwide and 15.7% in the eastern regions. At present, many rural buildings are aligned with the city and pursue reinforced concrete structures. People generally think that reinforced concrete structures are better, but this

is not the case. Reinforced concrete naturally has its advantages: it can be designed and made into various shapes and sizes according to needs; it has good integrity, good resistance to shock, explosion, and vibration; at the same time, it has good durability, normal use conditions, and good fire resistance. It does not require frequent maintenance and repair.

However, during the construction of reinforced concrete housing, a lot of environmental pollution is prone to occur and excessive energy is consumed. In contrast, the brick-wood structure is more suitable for rural areas. However, the brick-wood structure is often misunderstood. Many people think that wood construction is not durable. In fact, building standard wood is a very stable and durable material. In addition, the brick-wood structure has many unparalleled advantages. Such as diversified design styles, thermal insulation and sound insulation, energy saving, best seismic resistance, green environmental protection, comfortable living, etc. Therefore, one should not choose reinforced concrete material blindly, the best material is the best, and it is very important to choose the right building material according to the local situation and the situation of farmers. However, most of the current rural houses are built by the farmers themselves. Therefore, construction materials suitable for local houses should be selected, and then the relevant knowledge should be popularized for the farmers to let them choose.

5.3. Analysis of Village Planning and Housing Design. We mentioned the problems and points of attention of village and town planning in the previous article, in which road traffic is a very important part. Most of the houses in rural areas are privately constructed, which does not seem to have much connection with the planning of villages and towns. In fact, this is not the case. If the construction of housing in rural areas does not match the main roads in the village, farmers need to pave their own roads. Due to the differences between farmers, the appearance of the road is often different, which seriously affects the appearance. To this end, we investigated the types of roads in rural areas and plotted them into a fan-shaped diagram, as shown in Figure 4.

The most common type of rural roads is cement roads, accounting for 80.9%, followed by asphalt roads accounting for 8.6%. But we also found that many roads are still silt and stones, and most of these roads are the roads in front of the farmers' own houses. The reason is that there are contradictions in township planning and rural housing design, and they are not well matched with each other.

TABLE 2: Proportion of rural housing structure materials (%).

Area	Nationwide	Eastern	Midland	Western	Northeast
Reinforced concrete	12.5	15.7	13.5	9.5	5.3
Brick-concrete	57.2	57.9	65.3	50.6	47.8
Brick (stone) wood	26.0	25.1	18.9	30.9	42.5
Bamboo and grass adobe	2.8	0.9	1.5	5.9	3.6
Other	1.5	0.4	0.8	3.1	0.8

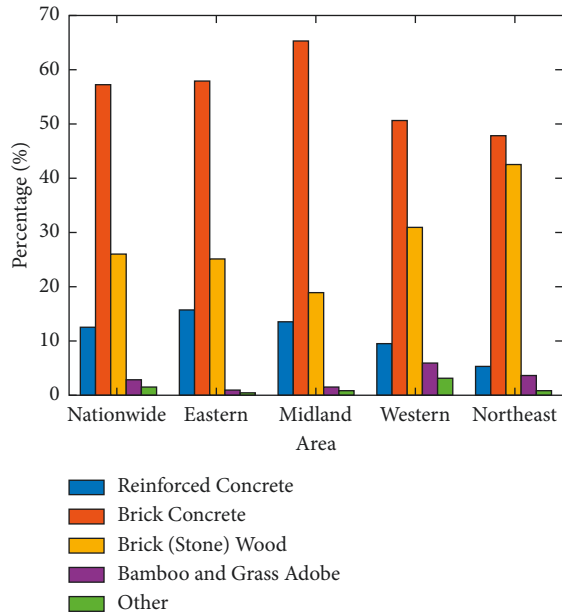


FIGURE 3: Proportion of rural housing structure materials.

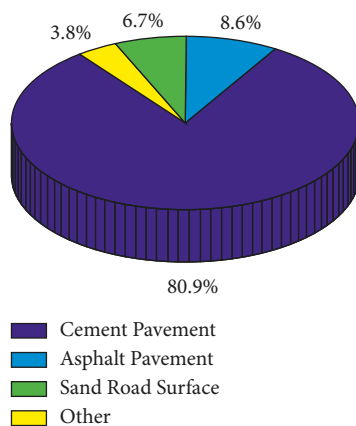


FIGURE 4: Rural road pavement type.

6. Conclusions

This paper introduces the principles and problems of ecological village and town planning, explains the purpose and significance of the research and the current situation of the research, and puts forward suggestions for ecological village and town planning. The main problems in village and town planning are: lack of planning in rural housing reform; lack of purpose in urban and rural energy construction; and

serious pollution of rural ecological environment. The suggestions for village and town planning include: planning the urban system and setting up functional zoning; protecting the environment and coordinating development; deepening reform to promote the overall development of towns and villages; and strengthening the construction of township infrastructure.

Through literature research and survey, the principles and concepts of green building design are introduced. Design principles: the principle of keeping the nature of the countryside unchanged; the principle of protecting farmers' rights and interests as the central principle; the principle of prioritization of ecological planning. Design concept: rational use of space; consideration of individual differences; protection of cultural traditions; adaptation to local conditions, etc.

Carrying out experiments and data analysis, the results show that due to various limitations, the use of solar energy is hindered, helping farmers solve difficulties in order to use clean energy in green buildings and reduce the burning of firewood straw. Nationwide, the proportion of brick-concrete structures in rural housing reached 57.2%, the proportion of brick-wood structures reached 26%, and the proportion of reinforced concrete structures was 12.5%. Many rural buildings pursue reinforced concrete structures, but brick-wood structures may be more suitable for most rural areas. The most common type of rural roads is cement roads, accounting for 80.9%, but there are still many pavements made of silt and stones. Most of these roads are roads in front of the farmers' houses. The reason is that there are contradictions in township planning and rural housing design, and they are not well matched with each other.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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