

# Green Building Assessment of the Desertification Rural Area in Northwest China

Rui LIANG<sup>1,2, a \*</sup>, Bo Wen ZHANG<sup>2, b</sup> and Qun ZHANG<sup>2, c</sup>

<sup>1</sup>Department of Environment Design, Xi'an Academy of Fine Art, Xi'an, China

<sup>2</sup>Shool of Architecture, Xi'an University of Architecture & Technology, Xi'an, China.

<sup>a</sup>793591446@qq.com, <sup>b</sup>764164875@qq.com, <sup>c</sup>zhangqun029@126.com

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**Abstract.** Taking the rural green building assessment system of the Northwest China as the research object, the paper would discuss regional adaptability of the green building assessment system. The paper puts forward the assessment target facing the dilemma with the development of the desertification of rural buildings in Northwest China. It presents seven assessment items such as the energy, land resources, water resources, material resources, living quality, environmental load and social effect through the methods of expert consultation, survey and technology information analysis and so on. On the above basis, assessment index system of desertification of rural green buildings in Northwest China would be put forward.

## Introduction

The Desertification, which mostly refers to the ecological and land degradation resulting from man-made destruction, climate change and other factors, is defined basically as drought, semi-arid and land degradation of dry sub humid areas resulting from various factors including climate variability and human activities <sup>[1]</sup>.

Northwest China is the main desertification distribution land of in our country. According to the statistics, more than half of the land areas of five Northwest Provinces (Xinjiang, Gansu, Qinghai, Ningxia, Shaanxi) are in the state of desertification, covering an area of approximately 56% of the total area of the desertification land <sup>[2]</sup>. (Table 1)

Typical environment characteristics of Northwest desertification area are the fragile ecological system, poor natural conditions, backward economy and social development in low level. The interconnections of backward social situation and harsh natural conditions seriously hinder the development of living environment in Northwest desertification area. More than 60% of the agricultural population of our country lives in desertification areas. Under the background of limited social natural resources, the realization of low energy consumption and high quality of rural living environment play a pivotal role for the strategy of sustainable development of our country.

Northwest desertification rural architectures are folk spontaneous buildings mostly for a long time. Although lots of experience has been accumulated and many outstanding residential types of making full use of natural resources and adapting to the natural environment have come into being, the quality of living is always difficult to meet the needs of modern life. In recent years, the Northwest desertification rural residential demand is rising with the development of society. However, a lot of construction is short of scientific and effective guidance. This not only deviates from the excellent traditional construction mode but also the quality of rural construction is low and

energy consumption and pollution are serious, so current development of the desertification of rural green buildings in Northwest China is slow. Facing the limited resources carrying capacity of the region, the energy-efficient ecological road of the development of rural areas in Northwest China is a historical necessity. What's more, scientific and effective norms are also needed.

Table1. Desertification Area in Northwest China (Unit: million square meters)

Provinces	Shaanxi	Gansu	Ningxia	Qinghai	Xinjiang	Countrywide
Area	3.0	19.9	2.9	16.7	104.4	263.62
Proportion	1.14%	7.55%	1.1%	6.33%	39.6%	55.72%

### **Purpose and Significance of The Desertification of Rural Green Buildings in Northwest China**

Scientific reasonable construction assessment system is the important condition for the construction and development of rural areas in Northwest China. Rural construction can be regulated through industry system and appropriate measures encouraging the implementation of building assessment to avoid random constructive behavior in the development of rural construction of desertification region of Northwest China<sup>[3]</sup>. At the same time, it can make the study of rural construction from qualify and quantify to provide useful feedback information for builders and users by encouraging outstanding folk buildings.

The desertification area in Northwest China is vast. The geographical environment and natural climate conditions are complicated. What's more, the regional culture is also very distinct as the multi nationality region. Under different social and natural background, rich types of traditional rural residential houses have been produced, which shows different technical and cultural characteristics. Therefore, we need to make assessment system adapting to local condition and study the green building assessment system which is suitable for the Northwest of China<sup>[4]</sup>.

### **Research on The Desertification of Rural Green Buildings in Northwest China**

Green building has a variety of means of expression, of which is closely related to the evaluation system of green building assessment system.

The green building assessment target is closely related to the promotion mode of the system. The energy use, land system and construction way of rural construction are different from them of urban construction at the present stage of our country.

Therefore, Northwest desertification rural building assessment system design should be in the following assessment objectives. Assessment target of the desertification of rural green buildings in Northwest China has two aspects. Firstly, improve the quality of living to ensure the safe and healthy living environment<sup>[5]</sup>; secondly, encourage building technology strategy adapting to local conditions in Northwest desertification area through the design of the assessment system and the building mode should be easily in the local promotion; thirdly, encourage flexible approach to construction technology and pursue the best balance point between economic input and building performance through a combination of different economic cost of the scheme<sup>[6-7]</sup>.

### **Assessment Hierarchy and Standards of Rural Desertification Green Building in North China**

In order to fully realize the assessment objectives of the rural green building in desertification area of Northwest China, through the analysis and comparison of expert technical advice and

technical information, combining with the actual situation in Northwest desertification countryside, the assessment system will evaluate Northwest desertification rural dwellings from seven aspects such as energy, land resources, water resources, material resources, living quality, environmental load and social effect and so on, and on this basis, assessment index system will be established<sup>[8]</sup>. From the following tables, we can conclude that the assessment of rural green building in Northwest desertification area can not directly use the existing assessment system of green building of China. (Table 2-6 assessment standards of rural desertification green building in North China)

Table2. Assessment objective B1 Energy

Objectives	Rules	Index Interpretation
Energy use	Utilization of renewable resources	Develop renewable resources according to local conditions
	Energy structure	Use various energy forms and establish rational use of energy structure
Way of energy use	Passive energy use	Reduce the use of energy consumption through rational planning, architectural design and construction plan
	Active energy saving	Save the consumption of conventional energy by using the "energy saving equipment"

Table3. Assessment objective B2 Land resources

Objectives	Rules	Index Interpretation
Construction site	Site environment	Protect natural ecological environment
	Site choice of safety	Safety and health of living environment
Design and Plan	Overall layout	Effective and rational use of land
	Site greening	Greening rate is guaranteed
	elevation planning	Site is safe and stable complying with the terrain

Table4. Assessment objective B3 Water resources

Objectives	Rules	Index Interpretation
water saving	Water saving management	Establish a system to ensure the long-term effect of water resources utilization
	Water saving management	Use of water-saving facilities and water-saving appliances
	Water saving rate	Use recycled water and rain water to reduce the supply of water
Drainage	Sewage treatment	Village sewage treatment facilities
	Drainage system	To avoid any discharge of sewage
	Drainage collection	Rain and sewage diversion with uniform emission
Water resource utilization	Water use planning	Comprehensive consideration of water-saving plan in the planning and design stage
	Rainwater utilization	Economic and technical comparison is carried out combining with the climatic conditions to determine the water use plan
	reclaimed water reuse	Choose recycled water use aiming at the village water target
	Non conventional water use	Use non conventional water sources to improve the efficiency of water use and improve water recycling rate
	Drinking water safety	To ensure the safety of drinking water and to protect people's health of drinking water

Table5. Assessment objective B4 Material resources

Objectives	Rules	Index Interpretation
Material saving	Material saving rate	Control the ratio of actual building material consumption and computer consumption
	Consumption control	To achieve material saving, and control material consumption during the design construction
Material reuse	Material waste disposal	Classify the construction waste to continue to use
	Available material usage rate	Prolong the service life of building materials, and control the total amount of building materials
Material selection	obtain raw material locally	Reduce material transportation, reduce on-site processing and encourage local building materials
	Material properties	Control material selection and reduce resource and energy consumption

Table6. Assessment objective B5 Residential quality

Objectives	Rules	Index Interpretation
Comfort and health	Indoor acoustic environment	Insulate and reduce noise to ease the adverse impact on the occupants
	Indoor light environment	Ensure light environment comfortable and healthy
	Indoor thermal environment	Maintain reasonable structure, reasonable room design and interior design temperature
	Indoor Air Quality	For the use of rural areas, ensure good indoor ventilation environment and air quality to meet the relevant standards and regulations
Safety	Construction quality safety	Ensure construction quality safety
	Building disaster prevention	To protect rural life and property safety and avoid natural disasters and fire.
Reasonable convenience	Space layout	Rationally use building space to reduce the waste of space
	Use function	Combined with the characteristics of rural production and life to ensure the comfort and health

## Conclusions

The complexity and regional sensitivity of the rural building in Northwest desertification area make the green building assessment master the development mode and the operating law of the rural green building. Therefore, the green building assessment research of the rural building in Northwest desertification area should fully consider the effect of rich natural environment, social resources, production and life style of building in Northwest China and explore the synergistic interaction between building index, and on this basis, study the assessment system with high suitability and strong operability.

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