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Research on the Characteristics of Karst Tourism Geological Resources and Environmental Protection in China Southwest Region

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Abstract: The eco-geological environment of the Southwest Karst area is rich in water and heat, mineral resources, and rich in tourism resources. However, it has the dual characteristics of above-ground and underground double-layer karst spatial structure, high mountains and deep water, steep terrain, and poor soil quality. It is easily disturbed by human activities. Ecological degradation has caused ecological and environmental problems such as soil erosion and rocky desertification. On the basis of fully discussing the characteristics of the eco-geological environment in the karst areas in Southwest China, through the analysis of the mechanism of the ecosystem degradation process, it is proposed that the degradation of the karst ecosystem is the cause of the fragile karst eco-geological environment and human activities. On the premise of restricting human activities within the allowable range of the karst ecological environment, develop water resources according to local conditions, rationally use land resources, develop three-dimensional ecological agriculture, tap local economic growth potential, and improve rural ecological restoration and reconstruction based on engineering measures such as energy structure and ecological migration Strategy.

1. Introduction

The southwestern karst area is located in the upper reaches of the Yangtze River and the Pearl River basin, with Guizhou as the center, consisting of Yunnan, Sichuan, Guangxi, Hunan, Hubei, and Chongqing. It is the largest exposed karst contiguous area in the world, covering an area of approximately 620,000 square kilometers. Since the 1980s, with the rapid population growth and continuous development of water and soil resources, soil erosion has intensified, ecological degradation has been serious, and droughts and floods have occurred frequently, which has severely restricted the development of local and national economies in the middle and lower reaches. Therefore, carrying out research on the ecological environment of the karst areas in Southwest China and exploring suitable and effective ways of ecological reconstruction have very important practical and theoretical significance for realizing the sustainable development of the social economy in the west and even the whole country. Based on the existing research, this paper attempts to explore ways of ecological reconstruction through the analysis of the ecological geological environment, especially the mechanism of ecological degradation, to provide a certain

theoretical basis for the control of rocky desertification in the Southwestern Karst area.

2. Characteristics of Karst Ecological Geological Environment

The karst area in southwest my country is the area with the most concentrated carbonate rock distribution and the most developed karst in China. Carbonate rocks are mainly composed of hard and compact limestone and dolomite formed before the Indosinian movement. The climate in the area is hot and humid, sunshine is abundant, groundwater and mineral resources are abundant, but the terrain is rugged, the rocks are exposed, the soil is barren, the disasters are serious, and the socio-economic development is slow. The southwest karst area is located in the subtropical humid monsoon climate zone. The annual total solar radiation is 376.8×103~544.2×103J/cm2·m, the annual average sunshine is more than 1000-2400h; the annual average temperature is 16~22℃ for many years. The average precipitation is 1200~1800mm, and the karst groundwater resources are 1807.9×108m3/a; the content of non-ferrous metals, ferrous metals, and rare metals is abundant, of which lead, zinc, tungsten, tin, mercury and other non-ferrous metals account for 24% of the country's reserves of similar minerals 68 %, iron ore accounts for 13% of the country's reserves, manganese ore accounts for 77%; tourism resources are also very rich, Guilin landscape, Lunan Stone Forest, Guizhou Huangguoshu Waterfall, Sichuan Jiuzhaigou, Sichuan Furong Cave, etc. are all world-famous karst tourist attractions.

The southwestern karst area is mainly located in the Yangtze Paraplatform and the South China Fold System structural unit. Carbonate rocks such as limestone and dolomite are widely distributed and exposed from the Pre-Sinian to Triassic. Mountain peaks, peaks, forests, depressions and other valleys can be seen everywhere on the ground. Underground caves, shafts and underground rivers are very developed. The fissures and pipelines are interlaced with each other, forming a complex and changeable double karst space structure above and below ground. The karst areas in Southwest China are rich in water resources, but Yunnan, Guizhou, Guangxi, and Hunan have a total of 2,836 underground rivers with a total flow of 467×108m3/a (17), but the terrain is higher and the river valleys are deeper. The spring is exposed on the surface to make it easier to use. In most areas, the groundwater depth is 50-100m. The karst slopes in the mountainous areas on both sides of the Yangtze River and the Three Gorges are as deep as 100-200 meters. It's more difficult.

3. Analysis of the Causes of Karst Ecosystem Degradation

One of the biggest features of the ecological geological environment in the Southwestern Karst area is calcium-rich. The chemical elements of the calcareous environment supporting the ecosystem are mainly silicon, manganese, zinc, carbon, iron, aluminum, mercury, arsenic, hydrogen, oxygen, etc. However, due to the relatively simple mineral structure of the parent rock, the weathering and leaching effect is slow, and the nutrient element N , P, K, Na and I that enter or transform and store in the habitat are relatively lacking. The soil is usually slightly alkaline or neutral, with a pH of 7.5 to 8.5. This geochemical characteristic of the soil causes many moist, acid-loving plants to decay or grow poorly. Only some cypresses, Nandia bamboo, Ma sang, Huaxiang, Schistosoma, Yueqing, Zhuyejiao, Xuanjun, etc. grow calcium-loving plants cacti, cacti, rock cowpea, and roses. In the native environment, forest systems with complex community structures, rich plant species and composition are rare. Under the influence of human activities, it degenerates into a vegetation community with few plant species and simple structure. Severe rocky desertification, frequent droughts and floods, barren land, deep mountains and valleys, and rugged terrain have severely restricted the socio-economic development of the Southwest Karst region. Although the Party and the government have given strong support to improving the living environment of the karst areas in Southwest China, due to the complex geological conditions and

harsh natural conditions, the socio-economic situation in the karst areas in the Southwest after the "August 7th" poverty alleviation is still relatively backward. 10 million, the per capita grain is only 200-250 kg, and the annual per capita income is 1,200 yuan.

The karst area has steep peaks and mountains, deep ravines, double-layer karst space structure above and below ground, and relatively concentrated precipitation, which objectively provides important conditions for the generation of soil erosion, soil erosion and drought and water shortage. It strongly restricts the growth of vegetation. But despite this, the fragile karst ecological environment cannot be a sufficient condition for the degradation of the karst ecosystem. It can only be superimposed on the impact of human activities, such as deforestation for reclamation, steep slope reclamation, over-logging, burning of ash and fertilizer, barren slope grazing, and mining. Only after infrastructure and infrastructure project activities, it is possible to cause changes in the internal structure of the ecosystem. Only when this change exceeds the threshold of ecosystem stability, the ecosystem begins to be destroyed and degraded. It is located in the slope zone from the Guizhou Plateau to the hilly area of Guangxi. The annual average temperature is 15.3℃° C and the annual average precipitation is 1752mm. The parent rock is mainly the upper Paleozoic Carboniferous Baizuo Formation (C1b) Fengcong depression dolomite. In the orchid area, the soil is also very barren; the mountain is steep, with a difference of 100-250 meters between peaks and valleys; the distribution of precipitation is also very uneven, with precipitation accounting for 81% of the annual precipitation from April to September; but this is the case. Under ecological and geological environmental conditions, it can grow and preserve the most complete and abundant species in the world today. The Karst forest vascular plant system has 154 families, 514 genera and 1203 species. Maolan has many similar forest ecosystems, such as Qianling Mountain Forest Park in the northwest of Guiyang City, Wolong Nature Reserve in Sichuan, Jiuzhaigou Nature Reserve in Sichuan, Wulingyuan Nature Reserve in Hunan, Shennongjia Nature Reserve in Hubei, etc. . Their existence fully proves that the above-mentioned fragile karst ecological environment only provides preconditions for karst ecological degradation. For ecological degradation to occur, human activities must be intervened.

4. Reconstruction of Karst Ecosystem

The degradation of ecosystems in the karst areas of southwestern China is the result of the combined effects of karst eco-geological environment and human activities. Although the karst environment is fragile, without the participation of human activities, the ecosystem will not undergo qualitative degradation. Therefore, the primary task of the restoration and reconstruction of the karst ecosystem is to limit human activities within the allowable range of the environmental carrying capacity of the karst ecosystem; secondly, since the karst ecosystem has generally been severely damaged, it is necessary to take a variety of measures. Take engineering measures that are conducive to the restoration of the ecosystem to speed up the process of karst ecological restoration. The main measures are:

Extensive development and utilization of karst water is an important way to improve the ecological environment of karst areas and promote economic development. The average annual precipitation in the southwest karst area is as high as 1200~1800mm, and the water resources are very rich, but the current recycling rate is still very low. The development utilization rate in Guizhou is only 5.6%, 8.57% in Guangxi is 8.57%, and the utilization rate in Yunnan is only 5.6%. Only 5% to 10%. Therefore, there is still great potential for development and utilization. Summarizing past experience, water resources development should adhere to the principle of "rich, shallow, near, and easy" priority development, focusing on the development of peaks, forests, valleys, and plains with relatively abundant water sources, relatively shallow water levels, and

concentrated arable land. The development method is mainly to use underground river skylight water to lift water, wellbore pumping, construction of mountain pond reservoirs and underground river outlet water diversion projects. However, in Fengcongwa area, due to steep mountains and deep groundwater, reservoirs and pools should be constructed mainly from spring water in the surface karst zone or the upper stagnant water outlet.

The degradation of the ecosystem in the Southwestern Karst area is the result of the combined effects of the karst eco-geological environment and human activities. Although the karst environment is fragile, without the participation of human activities, the ecosystem will not be qualitatively degraded. Therefore, for the restoration and reconstruction of karst ecosystems, the first priority is to restrict human activities within the allowable range of the karst ecosystem's environmental carrying capacity; secondly, because the current karst ecosystem has generally been severely damaged, it is necessary to impose several measures. Engineering measures conducive to ecosystem restoration to speed up the process of karst ecological restoration. The main measures are:

Extensive development and utilization of karst water is an important way to improve the ecological environment of karst areas and promote economic development. The annual average precipitation in the southwest karst area is as high as 1200~1800mm, and the water resources are very rich, but the current recovery utilization rate is still very low, and the development utilization rate in Guizhou is only 5.6%, Guangxi the rate of 8.57% is 8.57%, and the rate of Yunnan is only 5%-10%. Therefore, there is still great potential for further development and utilization. Summarizing past experience, water resources development should adhere to the principle of “rich, shallow, near, and easy” priority development, with emphasis on peaks, forests, valleys, and plains where water sources are relatively abundant, water levels are relatively shallow, and farmland is concentrated. The way of development is mainly to use underground river skylight water to lift water, well hole pumping, build mountain pond reservoir and water diversion project at the exit of underground river. However, in the Fengcongwa area, due to the steep mountain and the deep underground water, the surface karst zone spring or the upper stagnant water outlet point should be mainly used to build reservoirs and water tanks.

To make rational use of land resources, the most fundamental thing is to adapt measures to local conditions. The karst areas in southwest my country have large terrain and complex habitats. Subalpine depressions tend to have thicker soils, more continuous distribution, abundant water sources, large mountainside slopes, and scattered soil distribution. The top of the mountain is steep, with lack of water and soil, and poor agricultural conditions. Therefore, a single agricultural planting model is often difficult to achieve good economic benefits. Develop production according to different topography and landforms and water and soil conditions, develop production according to local conditions, and develop agriculture, forestry, animal husbandry and sideline fishery simultaneously to establish a composite and efficient three-dimensional ecological agricultural system. In the Houzhai River Basin, Puding, Guizhou, the exposed rocks and slopes are enclosed and afforested on slopes above 35 degrees°. Eucommia, Italian poplar and other medicinal materials are planted on slopes with a slope of 25°~35°, at the age of 25 Crops are grown in the following areas°. The three-dimensional ecological agricultural structure of wearing hats, belts, and boots has achieved good results. Guangxi Huanjiang Maonan Autonomous County made full use of the land resources of karst rocky mountains and established production bases for silkworms and commercial cattle, which not only provided a large number of agricultural and sideline products to the society, but also greatly increased farmers' income.

Cultivating new economic growth points and improving people's material and cultural living standards play a decisive role in improving and protecting the karst ecological environment. Practice has proved that places with high material and cultural levels have a better ecological

environment; on the contrary, during the “Seventh Five-Year Plan” and “Eighth Five-Year Plan” period, the state and local governments implemented subsidies for returning farmland to forests, and the ecological environment was once improved. However, in some areas where no new economic growth point has been found, people have to plunder and mine because development work cannot keep up, causing a rebound in the ecological environment. The Southwest Karst region is rich in land and biological germplasm resources, among which there are many popular and precious medicinal materials and local products for earning foreign exchange; tourism and folk culture are also very attractive. Their excavation is expected to become a new growth point for the economic development of the karst areas in Southwest China, thereby effectively promoting the restoration and reconstruction of karst ecology. For example, the Zhenfeng Dingtan area in Guizhou, located on the south bank of the Huajiang River in the Big Gorge of the Beipan River, has a total area of 28.68 square kilometers. It is a typical karst low-heat valley area with severe rocky desertification and extreme water shortage. By the 1980s, the per capita grain of farmers was only over 30 kilograms, and the per capita income was only a few dozen yuan. In 1991, the people of Dingtan began to use pepper as a planting industry. Among them, Chaeryan Village only surveyed the income of peppercorns, and the per capita annual income reached 2,600 yuan; the vegetation coverage rate of Yundong Village surveyed in 1990 was 7%. In 2001, the control rate of rocky desertification increased by 91%, and the control rate of rocky desertification reached 80%. Another example is Furong Cave in Wulong County, Sichuan. The secondary chemical deposits in the cave are rich and colorful, with novel and magnificent individual shapes, perfect mineral crystals, pure texture, large quantity and wide distribution, which are rare at home and abroad. Since the official opening to the outside world in 1994, tourists have been in an endless stream and have become a growth point for local economic development. Of course, different regions have different natural geological conditions and their resource composition is also different. The types of resources that can become support points for economic development are also different. The key is to be good at discovering and nurturing.

5. Conclusion

The southwestern karst area is not only broken and rugged, with deep groundwater and thin soil layers, but also developed karst. Aboveground and underground caverns are crisscrossed with poor water and soil conservation capabilities. However, this is not a sufficient condition for ecological degradation in karst areas. The formation of ecological degradation in the karst areas of southwestern China is the result of the combined effects of the natural geological environment and unreasonable human activities. Therefore, the restoration and reconstruction of the karst ecosystem in southwest my country must first limit human activities to the limit that the karst ecosystem can withstand, and at the same time adjust measures to local conditions, supplemented by certain biological and engineering measures, and implement multi-directionality. After many years of multi-level, Long-term and continuous comprehensive development and management, only in this way, can create an ecosystem with rich biodiversity and complex community structure in the past karst areas, and realize the coordinated development of man and nature.

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