

## Research on Ecological Planning Strategy of Resettlement Areas in Southern Shaanxi

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**Abstract.** The relocation and resettlement project in Southern Shaanxi has a large scale and involves many aspects. This project brings new problems to the ecological environment of the region, such as lacking ecological planning and copying the pattern of urban residential district in the planning and construction of immigrant resettlement areas. Based on perspective of ecology, the planning strategy and design method are explored in the resettlement area. And site selection, ecological environment construction and the layout pattern of the resettlement area are studied from the macro regional ecological environment to the micro community residential environment. It is proposed to promote entire ecological construction of the resettlement areas, improve the pattern of spatial layout and strengthen the protection and use of the natural environment around resettlement areas, so as to provide a reasonable planning method for the formation of new communities and construct ecological pattern of the resettlement areas suitable for the regional environment.

### Introduction

Located in the Qinling and Ta-pa Mountains, Southern Shaanxi is a geological and flood disaster-prone area with complicated landforms and fragile geological conditions. Meanwhile, due to a large population in the mountains with poor living conditions, Southern Shaanxi is one of continuous pieces of poverty areas in China. Furthermore, Qinling Mountains is the ecological security of Shaanxi area, while pressure by poverty population in the mountains caused the destruction of the fragile environment, resulting in a great influence on regional ecological safety. In order to cope with natural disasters, promote poverty alleviation and protect the ecological environment, the Shaanxi provincial government set up the Southern Shaanxi relocation and resettlement project in 2011. According to *Southern Shaanxi Relocation and Resettlement Overall Plan (2011-2020)*, about 600 thousand households of 2.4 million people will relocate in 28 counties of the 3 cities, Hanzhong, Ankang and Shangluo in 10 years [1].

The large scale of migration involves resource recombination, industrial restructuring and social reconstruction, and causes negative effects on the ecological environment in the resettlement areas at the same time. In the immigrant villages and resettlement communities built in recent years, unreasonable land use and project construction cause environment destruction, and have restricted the sustainable development of the resettlement area. It is urgent to re-examine the realities in the planning and construction of the resettlement areas in the perspective of ecology, and propose scientific planning strategy and method to guide the construction of the resettlement project in the future.

### Situation and Problems of Planning and Construction in Resettlement Areas

**Basic Types of Immigrant Resettlement.** From the viewpoint of the resettlement site, the immigrant resettlement in Southern Shaanxi can be divided into go-into-city resettlement, in-the-township resettlement and emigration resettlement. Go-into-city resettlement is defined as moving part of capable peasants to the county town or city where they can work and live. In-the-township

resettlement means to settle peasants in the domain of township. Emigration resettlement means the peasants will move to other counties, cities or provinces. According to different supportive conditions, in-the-township resettlement can be classified into town resettlement which relies on the centre town, relatively independent community resettlement, move-to-central-village resettlement and park resettlement which relies on the industrial park [2].

Overall, in-the-township resettlement has the largest scale which involves a wide range of aspects. As an example, the immigration in Ankang covers 10 counties or districts involving 195 towns [2], among which in the 30 towns of Hanbin District, 161 resettlement sites with about 60 thousand households in total are under planning [3]. Plenty of new immigrant villages (or resettlement community, relocation site, are collectively called immigrant resettlement areas in this paper) in the domain of township are closely related to new-type urbanization and new countryside construction, which affect the overall ecological environment and sustainable development of the region. Therefore, it is worth to pay attention in the planning and construction.

**Analysis of Situation and Problems in Resettlement Areas from an Ecological Perspective.** Hanbin District in Ankang is the key resettlement area in Southern Shaanxi immigration project. And Hengkou Town is the starting point and the key town of resettlement, located in the west of Hanbin District and at the confluence of Heng River and Yue River. According to *Relocation and Resettlement Layout Planning in Hanbin District (2011-2020)*, Hengkou Town plans to set up 12 immigrant resettlement areas, including 1 high-quality community, 7 key communities, 1 regular community, 1 key resettlement site and 2 regular resettlement sites, settling 6459 households of 24063 people [3].

Among these resettlement areas, Fenghuang Community is the high-quality and the largest resettlement community of Hengkou Town, which relies on the industrial park. This community is situated on the south bank of Yue River, west of the Provincial Highway 310, east of the leading road of Shi-Tian Expressway, and an industrial park in the west is in construction. According to investigation, residential buildings are being built less than 20 meters away from the Yue River, separated from the industrial park by planned road and also close to the leading road of expressway. Some residential buildings are townhouses arranged along the Yue River while other parts are mainly high-rise buildings arranged in parallel layout.

Hengyue Garden Community is a regular resettlement site which belongs to the town resettlement, located at the confluence of Heng River and Yue River and close to Hengkou Town. The community is mainly composed of mid-rise and high-rise buildings, arranged in parallel layout. Xinhe Community is a key community which relies on the central village, Xinhe Village, south of the Henghui Canal which is the largest artesian diversion irrigation work in Ankang. The residential buildings circle around a center group and are arranged in parallel, the first period mainly composed of multi-storey buildings while the second period of high-rise buildings.

There are some general problems in the planning and construction of the resettlement areas above. Firstly, most of them adopt the planning pattern of urban residential communities, lacking characteristics of the spatial layout which is dominated by function. Secondly, the built-up area doesn't fit well with the natural landscape, lacking corresponding ecological land use planning and the penetration of natural elements. Thirdly, ecological resources and advantages like rivers and farmland near the resettlement area are not effectively protected and fully used, and even the household garbage brings new pollution to rivers and canals.

From the perspective of landscape and ecology in a wider range, it is inevitable that the resettlement area construction will transfer the natural landscape into town constructive land. The integrant parts like woodland, grassland and farmland in the original landscape pattern have reduced constantly, leading to the decline of the landscape diversity and the damage of the stability of ecological structure and function. Consequently, the planning and construction of the resettlement area is definitely not an issue about the planning and design of a single residential area. Instead, it is in connection with the transformation of the regional ecological pattern and in need of research from macro to micro level in an ecological perspective to solve the ecology reconstruction problem brought by the resettlement area construction.

## **Planning Strategy of Resettlement Areas in an Ecological Perspective**

**Basic Concept of Ecological Construction in Resettlement Areas.** As an artificial constructive unit, the Southern Shaanxi immigrant resettlement area is one of the integrant parts of the regional landscape pattern and an essential factor that influences the regional ecological system. The planning and layout of resettlement area are related to the stability of the overall ecological environment and the sustainability development in the region. Landscape ecology and ecological planning methods should be applied into the planning of resettlement area. The site selection, ecological environment construction and the layout pattern should be systematically researched to coordinate the relationship between the built resettlement area and the natural environment, and form an ecological pattern suitable for the regional environment.

**Site Selection of Resettlement Areas Based on the Evaluation of Land Suitability.** With variable types of landforms, Southern Shaanxi region can be divided into three geographical units, Qinling Mountains in the north, Ta-pa Mountains in the south and Han River Valley, Dan River Plain in the middle part. In the domain of city or county, the ecological planning is the precondition of urban and rural construction planning including the resettlement area construction. The ecological planning aims at protecting and restoring the overall ecological environment and making rational use of ecological resources. It is based on the analysis of the ecology suitability, ensuring the suitability and limitation of regional ecological types for the resource development through ecological factors like landform, geology, soil, hydrology and vegetation. And then different types of ecological land and preserve can be designated, used as the limited frame for artificial construction.

In terms of local landforms in the scope of township, it is composed of mountains, hills and a small quantity of river basin. The first principle of the resettlement site selection is the ecological safety, which needs to take factors like slope, geology, rivers and wetland, animals and plants protection and present situation of land use into consideration. Then the suitability of construction should be evaluated, dividing the appropriate resettlement area, moderate resettlement area and unsuitable resettlement area, and the scope of development and construction and the zone that needs protection would be limited. On the basis of ecological safety, social and economical factors like traffic, public facilities, population distribution and industry planning should also be considered. The site should be as close as possible to the town, main roads, central villages, river plain and industrial zones which helps make use of better land-use conditions, traffic conditions and service facilities, and provide employment for immigrants.

**Protection and Use of the Surrounding Ecological Environment of the Resettlement Area.** Since there are always natural elements like mountains and rivers surrounding the resettlement area, the land use and road plan should be integrated with the landform. Natural conditions should be made use to create a living environment that is more suitable for living and working, so as to reach a harmonious relationship between the built area and the surrounding environment.

Maintenance and restoration of the natural mountain-river pattern are the preconditions of the planning and construction of the resettlement area. It is proposed to improve forestation on the hills around the constructive land and conserve soil and water of rivers and slopes. The ecological system of the rivers near the resettlement area should be protected and retorted in priority. The ecological corridor of rivers should be under protection and the construction should be controlled along the bank. Moreover, it is suggested that flood control planning should be combined with the local water conservancy construction, soil and water conservation, mountain torrents control and forestation.

More efforts should be put on improving the environmental protection facilities, carrying out the project of detoxification processing of garbage and wastewater. As for neighboring industrial park, emphasis should be put on controlling the water environment, improving the recycling rate of water and reducing water pollution to reach the standard of discharge.

**Spatial Layout of the Resettlement Area that Reflects Territorial Characteristics.** The spatial layout of the resettlement area should reflect the specific characteristics of landscape, humanity and

climate in Southern Shaanxi, applying mountain-river elements into residential area, integrating folk culture into the landscape design, connecting the climate characteristics with the house layout, and then the modern communities with the suitability of geography, humanity and climate can be created [4].

The planning structure of the resettlement area should correspond to the natural environment including nearby farmland, mountains and water systems, setting open space and sight corridor to introduce the outer natural landscape. Besides, the community public space for neighborhood communication should be created to strengthen the mutual penetration and connection between the inner and outer space of the community and exhibit the landscape of local culture. Green space should be increased to play an active part in improving the micro-climate.

Under the principle of economical and intensive land use, the limited planning land always sets a higher standard for volume ratio. Thus, the layout of the buildings should allocate detached houses, row houses and apartment buildings properly in accordance with the community types, making full use of slopes and platforms, organizing the space to local conditions with scattered building volumes, adopting flexible layout on the premise of meeting the needs of ventilation and sunshine to harmonize with the mountain shape and river bank in the environment.

**Guidance for Eco-sustainable Industry in Resettlement Areas.** The development of follow-up industry which needs synchronize planning is the guarantee for the sustainable development of immigrants' long-term livelihood and the resettlement project. As agriculture is the advantage and backbone industry of Southern Shaanxi, in addition to guiding talented immigrants to develop the secondary and tertiary industries, it will be an important choice for the industry of resettlement to develop the featured products of breeding, fruit and tea industry, promote the labor-intensive agricultural products of scale production and eco-tourism development [5].

The industry guidance for resettlement should be combined with the adjustment of local industrial structure. It needs to strengthen the production of rice, rape and other major agricultural products, promote the production of tea, walnut, chestnut, taro, edible fungus on a large scale and build the modern agricultural industrial park and the organic, green, pollution-free agricultural products base including special breeding base, the vegetable base, tea base, sericulture base, fruit base etc. Through developing characteristic and dominant industries of planting and breeding and the deep processing of agricultural and forestry products, the agricultural industry chain can be extended and the technology content and added value of agricultural products are increased [6].

Immigrants should be encouraged to develop eco-friendly industries and develop agricultural ecological tourism based on ecological agriculture and combined with sightseeing agriculture, leisure agriculture and experience agriculture. The local natural landscape and regional cultural advantages should be used to develop ecological sightseeing and cultural tourism industry, to form a new pattern of industrial structure which consists of agriculture, forestry, fruit and ecological tourism.

## **Ecological Planning Method for the Resettlement Community**

### **Overall Ecosystem Construction.**

**Pattern of Landscape Ecology within the Town.** On a macro level within the town , according to the matrix-corridor-patch theory of landscape construction, the landscape of mountain, agriculture and forestry is matrix, and the village and the resettlement community are units of patch. The different landscape elements should be connected by the corridors like roads, rivers, shelter belts to enhance the connectivity of the regional landscape function and the space. It is proposed to ensure the security of basic farmland and ecological security pattern, maintain the integrity of the structure and process of ecosystem, construct the ecological network and coordinate the urban and rural construction space.

**Agro forestry Landscape Ecosystem.** The land for agriculture and forestry around the resettlement communities is partially barren or abandoned affected by the development and construction. Since the agriculture and forestry land is the matrix element of the landscape pattern, it is suggested that the ecological system of agro forestry landscape should be reconstructed on the basis of ecological protection planning of the town area to combine the natural ecosystem, agricultural

ecosystem and artificial ecosystem, and create a healthy ecological environment for the resettlement community.

**Road and River Ecosystem.** The roads and rivers around the resettlement community are the interfaces between the artificial construction area and the natural environment. It is suggested forming the penetration and connection between the community and external ecological landscape by constructing ecological corridors of shelter belts and river protection belts. In particular, it is necessary to improve the construction of ecological protection zone along the river adjacent to the resettlement community. As for common branches around the resettlement community, the ecological embankment form is advocated, the range of 50m~100m on both sides of the river channel should be set as the river protection belt, supplemented by the artificial wetland technology to improve the purification capacity of domestic wastewater. The vegetation buffer belt, which is in the range of 50 m ~100m on the outer side of the river protection belt, is mainly composed of shelter belt, combined with the riverside greenland to set up some small-scale landscape and recreation facilities, forming the riparian ecological landscape area.

**Spatial Layout of the Resettlement Community.** Taking the planning of the Fenghuang Community in Hanbin District, Ankang as an example, the spatial optimization method and layout is put forward as follows.

It needs to establish the ecological corridor along the Yue River. 50m wide river wetland protection belt and 50m wide vegetation buffer belt should be arranged on both sides of river to strengthen the protection and restoration of water ecosystem. Waterside facilities like plank road, veranda and viewing platforms can be set in the greenland of riverside to provide residents with viewing leisure area, shaping the regional environmental characteristics combined with the natural landscape space.

Setting the ventilation corridor which is roughly vertical to the Yue River through the planning structure and road system, waterfront local wind can be introduced into the community, creating a good microclimate of the living environment, and developing the view corridor which links the southern slope and northern waterfront landscape.

Residential buildings adopt the layout which combines the low, middle and high stories, arranging mid and low-rise buildings along the Yue River with a few high-rise buildings, guiding the direction of the wind and helping form the waterfront skyline. High-rise residential buildings are arranged mainly on both sides of the east and west to form interfaces between the residential area and the external main road by commercial buildings of lower stories connecting the gables.

Green open space is created within the community to form an extension and penetration of the external natural landscape. It forms different spatial levels by use of local tree species and arrangement of trees, shrubs and herbaceous plants. The construction of green space around the residence needs to be improved to create a good living space in the neighborhood.

It is necessary to form a green screen for shielding noise and air pollution by planting shelterbelts along the main roads on the east and west sides of the community, and setting the buffer belt at least 30m wide between the community and the industrial park.

It is proposed to set moderate amount of business service and recreation facilities in the waterfront space, which not only serve the community, attract the surrounding people but also provide jobs for immigrants.

## Conclusions

Southern Shaanxi relocation and resettlement involves complex social, economic, cultural, and environmental and resource issues. This paper mainly explores the planning strategies and methods of resettlement areas in the perspective of ecology. It integrates the ecological concept of sustainable development into the planning of the immigrant resettlement area in Southern Shaanxi, proposing the ecological planning strategy and design method of the resettlement area. From a macro regional ecological environment to the micro living environment of community, it is proposed carrying on the ecological construction and the spatial layout optimization of the resettlement area, strengthening the

protection and utilization of natural environment around the resettlement area and providing a reasonable spatial planning for the formation of new villages and new communities, to promote the harmonious development between resettlement areas and regional ecological environment.

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