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Research on Comprehensive Land Improvement Strategies under the Background of National Spatial Planning

-- Taking the Shichuan River Project in Fuping as an Example

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Abstract: The middle reaches of the Yellow River, as the region with the most severe soil erosion and pollution in the entire basin, face severe challenges in ecological protection and economic development. Due to the constraints of arid and semi-arid climate conditions, the problem of soil erosion is severe, and the ecological quality is severely degraded; With the rapid expansion of urban areas and continuous adjustment of industrial structure, land consolidation has become fragmented and spatial layout has become disorderly; The accumulation of domestic and production wastes has made the land pollution problem more serious. The average GDP of construction land and the intensity of fixed assets investment are significantly lower than the national average, and the overall land use efficiency is low. Comprehensive land consolidation is an important way to solve the contradiction between human and land. It can comprehensively plan various elements such as mountains, rivers, forests, fields, lakes, and grass, not only supplementing urban functions, but also improving the quality of living environment.

Keywords: Yellow River; Comprehensive Land Improvement; Spatial Planning; Living Environment.

1. Introduction

Protecting the ecological environment is protecting productivity, and improving the ecological environment is developing productivity. Building green ecological urban areas is not only a major issue facing the transformation of China's urban-rural construction model, but also directly related to the immediate interests of the people and the long-term interests of the country [1-2]. In March 2013, the Chinese government announced that it would establish around 100 urban ecological new areas of no less than 1.5 km2 nationwide. This marks that China has officially entered a development and construction model guided by the ecological environment. Compared to large and medium-sized cities, China has a large number of small towns, which are the focus of China's new urbanization. However, compared to medium to large cities, the central radiation range of small towns has relatively weaker driving capacity for surrounding areas, as well as production and consumption capabilities. At present, the construction of ecological new areas in the edge areas of small towns is still in a long-term blank stage [3].

In the 2016 Urban Master Plan of Fuping County (2011-2030), the urban hierarchical structure of "one main, two sub centers, and three centers" was clearly defined. Among them, the central urban area of Fuping is the main development center, which is connected to Zhuangli Town and Xue Town respectively, and radiates to 14 other general towns, forming a comprehensive spatial layout network. In the overall layout, the central urban area is located in the southern part of Fuping County, while the Shichuan River is located on the southern side of the central urban area, near the border of Fuping County and Yanliang District, and is a typical urban fringe area (Figure 1).

As the central urban area of Fuping County, we fully consider the natural environment and geographical characteristics, and plan an urban spatial structure layout with "two rivers, two plateaus, and four areas". The Wenquan River runs parallel to the Shichuan River, and the Xiyu Expressway intersects with the Shichuan River, forming the main four areas of the central urban area. The Wenquan River flows through the main functional areas of the city and develops into the main commercial and residential center of the city between the Wenquan River and the Ishikawa River. The Nanyuan area on the southeast side of the Shichuan River only has a small number of residential and small-scale commercial centers, while the southwest side is connected to the natural green space and Nanyuan (Jingshan Yuan), which is an important link between urban functions and natural environmental resources.

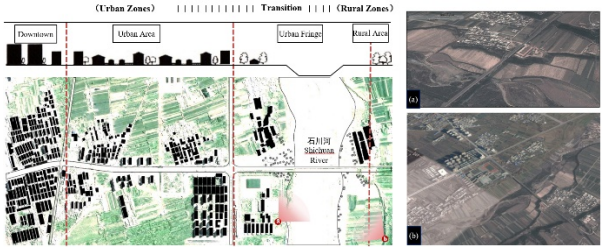


Figure 1. Project location and its spatial interpretation

2. Research Area and Development Situation

Fuping County covers an area of 1242 km2, with 24

townships, 337 administrative villages, and 2018 village groups. According to the annual report at the end of 2012, the total population of the county was about 810,000, including 680,000 rural residents, with a natural population growth rate of 3.73 ‰. In 2012, the national GDP of the entire county was 10.01 billion yuan, an annual growth of 16%. Among them, the agricultural output value was 2.302 billion yuan, the industrial output value was 4.485 billion yuan, and the tertiary industry output value was 3.223 billion yuan. The fiscal revenue was 273 million yuan, a year-on-year increase of 28%, the per capita disposable income of urban residents was 21,660 yuan, an increase of 16%, and the per capita net income of farmers reached 6680 yuan, an increase of 21%. Fuping County is mainly engaged in agricultural economy and is one of the main grain and cotton bases in Shaanxi Province. Grain crops are mainly wheat and corn, while economic crops are mainly cotton, vegetables, and fruit trees [4]. Fuping County's industry is mainly supported by machinery, electronics, building materials, food, and chemical industries.

The Shichuan River (urban section) comprehensive renovation project is located in the southern part of Fuping County, on both sides of the Jinlong Bridge, covering a total area of about 1480 acres. The Shichuan River project passes through the land. The left and right banks of the Shichuan River in Fuping are loess plateaus, and the riverbed is basically a natural channel without any control engineering such as bank protection or spur dikes. The riverbed is generally 0.3-1.0 km wide, and the main channel is 50-70m wide. The average slope of the riverbed is about 6%, and the lithology of the stratum is mainly alluvial sand and gravel; The floodplain is 2-3 m higher than the riverbed, with a surface layer of alluvial loam and a soil layer thickness of 3-5 m. The village names are all planting crops. Convenient transportation, good riverside environment, and superior geographical location. At present, due to the long-term interruption caused by upstream water storage, illegal sand and stone excavation is severe in the shoals and farmland of the Shichuan River and its ancient riverbanks. The riverbed is riddled with holes, and the sand and stones in the river are piled up like mountains. It is difficult to discharge floodwater during the rainy season, and the sewage in the river flows horizontally. The surrounding construction waste and household waste are piled up in mountains. The beautiful scenery under the rice, lotus, and water bridge of the past no longer exists.

Fuping County belongs to a warm temperate continental semi humid and semi-arid monsoon climate, with a large temperature difference between day and night, and distinct dry, wet, cold and warm seasons. Due to the influence of terrain, there are significant differences in climate. The annual average temperature is 13.3 ℃, with an extreme maximum temperature of 41.0 ℃ and an extreme minimum temperature of -18.7 ℃. The average annual rainfall is 513.5 mm, with uneven rainfall. The annual rainfall is mostly concentrated in July, August, and September, with frequent showers and high intensity. The average frost-free period is 223 days. The maximum permafrost is 32 cm, and the maximum snow cover is 14 cm. The annual average sunshine hours are 2352.3 hours, and the annual average total solar radiation is 123.9 kcal/cm2. The overall climate characteristics of Fuping County are: sufficient sunlight, mild climate, moderate precipitation, simultaneous rainfall and heat, and distinct four seasons. Specifically, it is cold in winter and hot in summer; In spring, the temperature rises rapidly and is unstable, while in autumn, the temperature drops rapidly and cold air activities are frequent; The dry and wet seasons are distinct, with less rain and dryness in winter and spring, and more humid rain in summer and autumn; The precipitation variability is high, and drought often occurs; In spring, there are many cold waves and sandstorms, and in summer, there are many thunderstorms and hail; In spring and summer, there are more northeast winds, and in autumn and winter, there are more northwest winds.

3. County-Level Spatial Planning

The overall planning concept of the project is to "shape the source of health, establish the meaning of health, weave the dream of health, paint the scenery of health, and build a city of health". The planning goal is to create a new urban business card for Fuping, improve the urban ecological environment, fully utilize the properties of land parcels to create more value, and stimulate regional vitality. On a macro level, we will illuminate the northwest region of China's ecological new city network and work together with domestic ecological new cities to create a new urban landscape in China. At the meso level, it has become an important component of the puzzle of economic development in Xi'an. Regional demonstration sites for low-carbon communities. At the micro level, the positive new city style has injected new development vitality into Fuping, which can express future development expectations with the Four Seasons Health City, achieve the connection between the new and old centers of Fuping, and jointly create urban prosperity.

Based on the planning concept of "network ecology, aggregation development, health and elderly care, and perspective of the future" in four aspects of ecology, industry, life, and development, integrating the endowment elements of Shichuan River in Fuping County, integrating innovative elements, and through the overall analysis of the development trend of the Greater Xi'an metropolitan area, the expansion of Fuping economic space, and the Shichuan River area in Fuping County, a practical and forward-looking system planning is formed. The goal is to create an open urban waterfront space that integrates water conservancy, flood control, ecology, leisure, commerce, landscape, sightseeing, and other functions, and to become a brand new, beautiful, and iconic urban network ecological axis in Fuping.

From the road traffic planning map of the central urban area from 2011 to 2030, it can be seen that the urban expressway connects the Wenbei area on the north side of Shichuan River and the edge of the central area, forming a ring road. Within the two areas, there are planned urban main roads and secondary roads in a chessboard shape. The road system on the south side of Shichuan River is different from other areas, mainly composed of urban main roads and secondary roads, forming a small-scale closed loop of secondary roads. This is also the characteristic of road planning formed by the design of regional environmental characteristics and urban functional characteristics.

According to the 2017 Fuping County City Green Line Map, the location of the park green line in the central urban area of Fuping County was clearly defined. The Shichuan River Basin Comprehensive Improvement Project is located at the southern gateway of Fuping County, on both sides of the Jinlong Bridge, in the transitional zone between urban and rural areas. It not only supports urban functions but also infiltrates ecological resources. The land use type is gradually

shifting from construction land to agricultural land, belonging to the urban fringe area. The project area is a transitional area between the contiguous small town built-up area and the pure agricultural hinterland, influenced by both urban and rural development forces. The rural settlements in urban fringe areas have gradually shifted from agricultural production and residential functions to multiple composite functions such as integrated production, processing, commerce, agricultural experience, ecological conservation, sightseeing and leisure, recuperation and vacation, and second residence for citizens. The situation of villagers engaging in part-time work is obvious, and their income has increased. However, at the same time, there are also problems such as disorderly and scattered development of villages, scattered overall spatial layout, poor ecological environment quality, and low land efficiency There are many problems such as mixed population, weak infrastructure, chaotic rural landscapes, and the disappearance of traditional rural culture. Before the project was launched, the Shichuan River Basin had already experienced flow interruption, exposed riverbed, and overgrown rocks and weeds, even becoming a site for garbage disposal in the surrounding area. The Shichuan River Basin has not only not become a continuation of urban functions, but also a natural barrier between urban and rural landscapes. The harsh ecological environment has also been criticized by surrounding villagers, hindering the development of local economy.

4. Improvement of Living Environment

The implementation of the comprehensive improvement project of Shichuan River (urban section) has greatly improved the flood control capacity of Shichuan River by changing the past scene of river water pollution, garbage and waste water mudflat. Now Shichuan River has clear water waves around the river and has become the urban landscape belt for people in Fuping urban area to relax, entertain and visit in person. Improved the overall image and taste of Fuping County, making positive contributions to achieving green, harmonious, and beautiful Fuping. The implementation of this project plays an important role in achieving the strategic goals of economic development in Fuping County and even Weinan City. On the basis of improving the flood discharge capacity of the Shichuan River and the flood control standards on both sides, it is of great strategic significance to improve the land use value through the leveling of the riverbank, promote the sustained and rapid development of the national economy, and accelerate the development of the western region.



Before Land Consolidation **After Land Consolidation**

Figure 2. The Ecological Landscape Transformation before and after Consolidation

This project is a comprehensive ecological project that integrates sightseeing, tourism, vacation, and leisure entertainment. After completion, the funds accompanying the one-way flow of passengers from economically developed areas are injected into this area, playing a role in balancing economic benefits. The project construction can promote the rapid development of the tourism industry in Fuping County, expand customer sources, increase foot traffic, and increase the income of local residents, which will have a promoting effect on the regional economic and social development. Meanwhile, with the continuous opening up of the local area, cultural exchange and dissemination have increased, improving the ideological and cultural level of local residents. It can promote the social and economic development of the region. The construction of this project is the prerequisite and foundation for the rapid development of the economy along the river in Fuping County, and it is of great significance and role in promoting the sustainable development of the regional society and economy. The construction of this project has improved the living environment of residents, enhanced community functions, improved cultural construction conditions, and improved the lifestyle of local people, bringing great improvement to the cultural and natural environment of the region (Figure 2).

Based on comprehensive ecological governance measures, by controlling river pollution, expanding waterfront space, and strengthening air circulation; The design of ecological revetment, ecological design of riverbed longitudinal section, and green corridor adopts a new water resource utilization model that coordinates "open source purification utilization discharge regeneration" and opens up new ways. The sewage resource utilization measures are used to purify and regenerate sewage, ensuring that water resources are not damaged and can enter the recycling system well. Reclaimed water reuse is the deep treatment and reuse of wastewater, which turns waste into treasure. It can not only reduce the intake of fresh water, but also alleviate the crisis of urban and industrial water use, opening up reliable new water sources for the sustainable utilization of regional water resources [5]. The implementation of this project has improved the water environment of the watershed, making the river a beautiful river with safety, ecology, and landscape. The quality of living environment has been significantly improved.

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