

Expressway Transportation Hub and Land Spatial Composite Utilization

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Abstract: *This article mainly takes a domestic renovation project as an example to analyze its regional status, propose the main strategies for land spatial composite utilization, and list the relevant project planning processes. The construction and improvement of the highway network is a product of social industrialization and urbanization development. Land resources are non renewable resources. Land conservation is a major strategic issue related to the development of the entire national economy and social stability. The per capita land area in China is only one-third of the world's per capita, and the per capita arable land area is less than 43% of the world's per capita. Under the macro control policy of land tightening implemented by the country, the rational and economical use of land is related to the sustainable development of highway construction. Among them, interchanges have obvious characteristics of centralized and high consumption in terms of land occupation, making them a "major user" of land for the construction of highway sub projects. The rational use of land is an important link in saving land for highway construction, which is worth studying and exploring.*

Keywords: traffic first; Release existing land; Land spatial composite utilization.

1. INTRODUCTION

1.1 Interchange Form

A certain expressway interchange is a service type interchange, which adopts a diamond shaped layout with inner and outer ring ramps. The original interchange was considered for commercial reservation to serve local residents, with strong commercial foresight. The reserved land area was relatively large, but due to various reasons such as management and safety, it ultimately did not achieve its function, resulting in most of the current land being idle.

1.2 Surrounding Form of the Project

A certain highway interchange is located in the western part of a certain city. With the development of the city, the surrounding area of the project has become highly urbanized, and over 100 high-tech enterprises have gathered in the surrounding area. The existing environment and image are not integrated with the development of the surrounding cities. The overall summary is as follows

1.2.1 Lack of city identification. As a national central city, international trade center, and comprehensive transportation hub, overpasses occupy a large area and are not compatible with urban positioning, resulting in a lack of city identification.

1.2.2 Low intensification of land resources, roundabout interchange ramps, large land area, and low utilization of other land except for transportation channels themselves Causing idle waste.

1.2.3 Height difference barrier: The height difference between the highway and the ground is up to 10m, forming a natural barrier. The entire interchange divides the area in two, and the travel of residents in the area is separated by multiple factors such as interchanges and highways. Pedestrians have a long detour and poor direct accessibility.

1.2.4 Current situation of landscape homogenization: There is no specialized landscape design for interchanges, and there is no significant difference compared to other interchanges. The landscapes in each area are homogenized and have no obvious characteristics.

1.2.5 Lack of pleasant urban public green spaces, with only conventional highway greening within the scope of interchanges, single landscape layout and tree species, and severe landscape homogenization. At the same time, influenced by the separation of overpasses, the surrounding area is mainly composed of three old buildings. Although there are many large residential gardens distributed in the surrounding area, there is a lack of large-scale urban public green space.

1.2.6 Noise issues: The surrounding areas of interchanges are rapidly developing, and residential and commercial facilities are rapidly increasing. Highway noise has a significant impact on the surrounding environment.

2. MAIN STRATEGIES FOR LAND SPATIAL COMPOSITE UTILIZATION

One of the goals of the project renovation is to improve the transportation environment of the area, promote regional urban functions, release urban development land, revitalize the use of existing land, and achieve intensive land use while ensuring the optimal traffic function of the interchange. The total area of the current project plot is 661420m² (approximately 992 acres). After the renovation of the project, it is planned to adjust the road and slope protection land within the project plot to Class II residential land, with a total released land area of 199850m².

2.1 Traffic priority

Due to the complex design of the original high-speed interchange ramp, surrounding vehicles enter and exit the highway for detours, resulting in low travel efficiency and frequent congestion. The design is based on the principle of improving the traffic conditions around the interchange and improving the efficiency of surrounding travel. By redesigning the interchange plan, the current detour distance is reduced, and measures such as diverting direct traffic and turning traffic are taken to improve the regional traffic environment and improve travel efficiency. At the same time, the land within the interchange area is released.

2.2 Interaction between City and Nature

Considering that the development plot will still be divided into two after the renovation of the overpass, which is not conducive to internal communication within the community, and noise and exhaust will also seriously deteriorate the quality of land development. The design effectively links the urban interface originally cut off by the interchange Viaduct by covering the overpass, forming a three-dimensional undulating green cover, creating a Microclimate, and realizing the dialogue between the city and nature [3].

2.3 Creating green spaces for urban public spaces

The construction of urban parks on elevated roads must first meet the traffic needs of highways; Secondly, under this premise, ensure the normal use of land use functions and implement multi site, multi plane, and multi-dimensional connectivity; Finally, add the concept of modern scientific and technological intelligence as a combination of the three. The design of the site is based on the focus on the urban landscape axis, creating China's first elevated fully covered urban park, which will become an important transportation fortress and the aerial garden of Zengcheng. It must be able to establish itself among communities and face various cities, and serve as an unbounded park to seamlessly connect various land uses. Featuring ecological leisure, shaping the benchmark image of innovative development cities, utilizing modern technology to create a future landscape experience portal, thus innovating urban leisure and recreational green spaces that integrate functions such as leisure and recreation, sports and fitness, and technological experience, meeting the different needs of surrounding residents, and leveraging ecological benefits to improve the local ecological landscape environment of the city. Rural electricity consumption can indirectly indicate the extent of mechanization in rural areas and serves as a complementary metric to the total mechanical power indicator. Since the initiation of economic reforms and opening-up, China has been committed to rural infrastructure development. Rural electricity consumption has surged from 25.3 billion kWh in 1978 to 971.7 billion kWh in 2020, exhibiting an average annual growth rate of 9.1%.

2.4 Measures for the utilization of non engineering land for interconnection

The grain sown area, which refers to the land actually cultivated within a specific region, is a critical resource for agricultural production and a key factor in ensuring continuous grain production. Land, as the most fundamental condition for food production, plays a fundamental role in food production. Modeling and predicting food production based on the grain sown area hold significant guidance value. The total power of agricultural machinery encompasses the aggregate mechanical power utilized in agriculture, forestry, animal husbandry and fisheries. This includes machine plowing, machine irrigation, machine harvesting and machine transportation. It serves as an indicator of the overall level of agricultural mechanization in a region, which, in turn, reflects the level of agricultural production in a country. Additionally, the coefficients of x still do not align with economic interpretation, indicating the persistence of strong multicollinearity in the model at this stage.

Table 1: Regression coefficients after removing the variable x

Parameter	Estimated parameter	Standard deviation	t-value	Pr(> t)	VIF
Intercept	0.0000	0.0465	0.000	1.000	0
x	0.8371***	0.0517	16.202	0.000	1.2066
x	-0.0414	0.0778	-0.532	0.598	2.7360
x	-0.2039*	0.0784	-2.599	0.014	2.7813

2.4.1 Land use within existing interchange areas

According to relevant statistical data, the national highway network has been completed and opened to traffic for about 60000 kilometers, and a large amount of existing non engineering land for interconnections needs to be reasonably developed and utilized to fully leverage the benefits of land resources. Some provinces have realized the positive significance of developing land in the interchange zone, promoting land conservation on highways by improving land use efficiency, and using conditional plots of land for highway housing construction to reduce land acquisition for housing construction. Due to poor accessibility, the overall effective development and utilization of some plots of existing non engineering land for interconnectivity are limited to a certain extent. However, as industry management departments and land use owners, highway management units have the conditions to combine with the later operation and maintenance characteristics of highways for reasonable land development and utilization. According to data, in the early stages of operation, in order to maintain a good green ecological environment within the red line of the highway, the cost of green maintenance accounts for 20% of the daily maintenance cost during the operation stage of the highway. Based on a rough estimate of daily maintenance cost of 40000 to 50000 yuan/km per year, for completed highways, the annual green maintenance cost is approximately 300 million yuan. The demand for green maintenance on such a scale requires a corresponding nursery base to ensure supply, while non engineering land in the interchange area can meet this demand to a certain extent, in order to reduce the other land resources occupied by the nursery base. Of course, after addressing the issue of safe entry for personnel, the highway management department can also conduct operational bidding to revitalize the existing land assets.

2.4.2 New Attempts in Land Acquisition for New Interchanges

With the follow-up implementation of the national highway network and local highway planning, the contradiction between highway construction and land approval will become more prominent, effectively reducing. The scale of land use is particularly important. It is recommended to take necessary engineering measures to effectively restore the cultivation conditions of non engineering land in the interchange area and ensure the availability of the land. In areas with limited arable land, efforts can be made to reduce the scale of highway land use through coordination, reasonable compensation, and returning land to the people during the land acquisition process. Due to the difficulty of coordination in some areas, the management department can also fully develop and utilize non engineering land acquisition, and can also consider using it as a reserve land for long-term highway construction to implement the "one for one" land replacement policy. This is also a new idea for rational land use.

3. PROJECT PLANNING RELATED PROCESSES

The rapid development of Internet technology has changed the traditional international business activities and triggered the explosive growth of cross-border e-commerce, which has led to problems such as the inability to apply the huge amount of information in a timely manner, homogeneous competition and over-reliance on search engines. This paper takes the development status of China's cross-border e-commerce platform Alibaba as an entry point, analyses the status quo of Alibaba's development of cross-border e-commerce and its problems from a micro point of view, and puts forward targeted countermeasures to solve the problems. The rise of Internet technology has triggered the rapid development of cross-border e-commerce, making the total amount of cross-border e-commerce transactions continue to break through the historical value and become a new trend is widely sought after. Although cross-border e-commerce started late in China, it has subverted China's inherent business trade model, and has attracted widespread attention from all walks of life. Many scholars in China have also studied the characteristics of cross-border e-commerce and the role played by foreign trade, but most of them are at the theoretical level, and there are few studies on the practical aspects of cross-border e-commerce. This paper takes the development status quo of China's cross-border e-commerce platform Alibaba International Station as an entry point, analyses the status quo of Alibaba's development of cross-border e-commerce and its coping strategies from a micro perspective, with a view to enriching the theory of cross-border e-commerce and at the same time, playing

a guiding role in the development of cross-border e-commerce in China.

The Quantum economics, originating from the quantum physics theory, studies economic activity's quantization rules and applications. Planck's revelation of energy discontinuity in 1900 showed that all phenomena, including the economy, have quantization properties. This contrasts traditional economics, which treats economic variables as continuous. In 1960, Schmidt first analyzed the quantum state characteristics of money and debt[1] and suggested that "output is a time-quantized instantaneous event"[2]. In 1978, Qadir introduced the concept of "quantum economics" and hypothesized that individual preferences are revealed after surveys and that infinite factors affect choices[3]. However, progress in this area has been slow over the past 30 years, and innovative research has been scattered.

Russian scholar Ilyinsky applied quantum field theory to explore financial markets, described as "financial fields," to derive equations for the evolution of asset prices and capital flows[4]. American scholar Shubik discovered the inaccuracy of economic dynamics[5]. Singaporean scholar Ba Kui published three monographs on quantum economics, studying futures theory[6], interest rates and coupon bonds[7], and the design of financial instruments[8].

After 2010, quantum finance developed rapidly. Serbian scholar Vukotik predicted that quantum economics would be the foundation of global economic theory[9]. Portuguese scholar Goncalves studied chaos theory and quantum game theory[10], and quantum financial approaches to finite strategy games[11]. British scholar Haven and Swiss scholar Khrennikov discuss quantum probability effects in economics[12], finance[13], and the application of quantum information in the social sciences[14]. American scholar Wendt considers consciousness a macroscopic quantum mechanical phenomenon[15].

Prof. Amit Goswami builds a bridge between physics and economics, charting the path from neoclassical to quantum economics[16]. Arijit predicts GDP changes using quantum economics formulas[17]. The research of quantum economics has covered various subfields, showing the trend of systematization.

In recent years, Long Short-Term Memory (LSTM) neural networks have shown great potential for application in predicting financial time series data. Early studies have demonstrated that LSTM can capture the long-term dependence of time series and outperform traditional methods in stock price forecasting[18]. Follow-up studies further confirm that LSTM can learn the nonlinear patterns of time series, and its accuracy in stock price prediction significantly outperforms that of ARIMA and other methods[19]. Y. Liu[20] examined the effectiveness of LSTM in predicting financial market indices and demonstrated that it can provide more accurate market predictions, especially in volatile markets, to maintain model stability.

3.1 Land Collection and Storage Stage

The key to similar land development lies in the nature of the land. How to achieve the transformation from transportation facility land to development land requires strong support from relevant government departments. Therefore, it is necessary to attach importance to the preliminary planning plan, mainly including land potential excavation and land consolidation (verification of ownership and current status, interchange and urban road renovation), implementation of land retreat distance from expressways (affecting the exploitable range), verification of upper level planning conditions (urban and soil planning), and improvement of surrounding areas. We will strive for the support of relevant departments such as the Municipal Planning and Natural Resources Bureau, the Housing and Urban Rural Development Bureau, and other relevant departments in terms of regulatory planning, market research and feasibility analysis, and planning optimization. After the initial planning is basically stable, the upper level planning and detailed control planning modifications will be carried out, mainly through:

Seek opportunities for upper level planning modification, and modify the upper level planning (which can fully utilize the window period for national spatial planning preparation and adjustment).

Conduct detailed planning demonstration and modification for control. The interchange plot is transformed from transportation facility land to second-class residential land through optimization and transformation of the interchange, modification of the urban master plan, modification of the land plan, modification of the control plan, and government collection and transfer, ultimately achieving government collection and storage.

3.2 Transportation Interchange Renovation Project Approval

Determine the interchange renovation plan through the design phase and the review meeting of the transportation department. The project was approved by the Provincial Development and Reform Commission and approved by the Provincial Department of Transportation in two stages of design. Considering that the covered park is a green space open to the public, its operation and management will be taken over by the local government after completion. The landscape engineering of the covered park will not be included in the scope of the project approval, and will be invested and constructed by the land transferee, only registered with the local government; The upper cover structure that provides the base for the park is essentially a sound insulation, noise reduction, and environmental protection measure set up to consider the impact of road traffic on the surrounding environment. This part serves as an auxiliary facility for road construction and is constructed in sync with the interchange renovation.

The test set was introduced into the model to predict grain output for the years 2018 to 2020, and the results are presented. The model predicted a grain output of 654 million tons for 2018, with a negligible error rate of 0.66% compared to the actual value of 658 million tons. Similarly, the prediction for 2019 yielded a grain output of 649 million tons, with a minor error rate of 2.29% compared to the actual value of 664 million tons. In 2020, the model forecasted a grain output of 643 million tons, with an error rate of 3.88% compared to the actual value of 669 million tons. The three-year forecast error rate remains below 5%, affirming the model's capability to provide more accurate grain output forecasts under specific conditions.

4. CONCLUSION

In summary, exploring a new model for revitalizing existing land will make the construction of the project an important carrier for showcasing urban characteristics, conveying regional culture, and shaping the city's image window; And become an important functional green space for leisure and recreation leading land comprehensive development projects. The transportation facilities of this project have entered the implementation stage, and its planning plan is worth promoting similar projects. But in the planning of the complex. In the preceding section, three models were constructed based on the influencing factors of China's grain yield. After assessing the regression errors, it became evident that the support vector regression model was the most effective, followed by the random forest model. However, the random forest model provides importance measures for influencing factors on grain yield, while the multiple linear regression model holds economic significance that is distinct from the support vector regression model. Consequently, in an effort to amalgamate the strengths of each model, this section endeavors to employ the inverse variance method for combining the three models, thereby generating a more scientifically robust, accurate and stable forecast.

There are still coordination and communication issues in planning, design, construction, and management:

4.1 The synchronization of land development timing and transportation construction.

The current land development subject and transportation construction subject are divided into two parts, and the two parts are independent individuals. Moreover, the determination of the land development subject often lags behind the transportation construction, and the planning plan and transportation construction in the early stage of development often cannot be synchronized and matched, resulting in many uncoordinated and unsmooth connections in the transportation construction process and the transportation organization of the plot. Suggest synchronous research or moderate pre research between the planning plan and the transportation renovation plan.

4.2 Implementation standards for cross industry and multi-disciplinary situations

The project involves various professions such as highways, municipal engineering, and architecture. The design of the project cannot simply apply a certain industry standard. For example, after the interchange renovation, the project adopts a fully enclosed upper cover form, and how to implement relevant specifications, standards, and acceptance procedures for ventilation, smoke exhaust, and fire safety in the upper and lower spaces. Jet fans are installed on the top of the cover, This model not only has a large scale of construction projects, but also brings considerable difficulty and maintenance investment to operation and management. Therefore, it is necessary to consider the actual situation of the project. Conduct special research on the situation. The intensive utilization of land resources along highways will inevitably enter a new stage of comprehensive development. The comprehensive development model is a necessary path to adapt to the harmonious development of highway transportation and cities, and new design concepts will continue to emerge, requiring more scholars to study and explore together.

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