

# Research on Evaluation and Optimization of Human Settlement: A Case Study of Shijiazhuang City

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## ABSTRACT

With the acceleration of urbanization, the quality of the Human Settlement has become increasingly prominent, significantly impacting residents' quality of life and the sustainable development of cities. This paper takes Shijiazhuang City as an example and constructs a comprehensive evaluation index system for the Human Settlement, covering five dimensions: natural environment, infrastructure, public services, social culture, and resident satisfaction, with a total of 25 specific indicators. Through methods such as questionnaires, field research, and data analysis, the study conducts a thorough evaluation of Shijiazhuang's Human Settlement. The results indicate that while Shijiazhuang performs well in the natural environment dimension, there are shortcomings in infrastructure, public services, and social culture, and resident satisfaction needs to be improved. Based on the evaluation findings, the paper proposes targeted optimization strategies and validates their effectiveness through empirical research. The research provides valuable insights for optimizing the Human Settlement in Shijiazhuang and similar cities.

**Keywords:** Human Settlement; Shijiazhuang City; evaluation index system; optimization strategies; empirical research

## 1. Introduction

### (1) Research Background and Significance

As urbanization progresses, the rapid growth of urban populations and expansion of cities have highlighted critical issues in the quality of Human Settlement. The Human Settlement, as a fundamental condition for urban living, directly affects residents' quality of life and the sustainable development of cities. Therefore, evaluating and optimizing the Human Settlement is essential for enhancing urban living standards and promoting sustainable urban growth.

Shijiazhuang, the capital of Hebei Province, has achieved remarkable progress in economic development and urban construction in recent years. However, rapid urbanization has also brought challenges such as traffic congestion, environmental pollution, and insufficient

public services, which hinder both residents' quality of life and the city's sustainable development. Thus, this study aims to evaluate and optimize Shijiazhuang's Human Settlement, offering practical solutions to these pressing issues.

### (2) Domestic and International Research Status

#### ① Domestic Research Status

Research on Human Settlement in China began relatively late but has developed rapidly in recent years. Scholars have explored this field from various perspectives, yielding significant results. In terms of evaluation index systems, domestic scholars have constructed a variety of evaluation index systems for Human Settlement. Among which, the notable contributions include Academician Wu Liangyong's "Human Settlement Science" framework and Professor Li Dehua's "Urban Human Settlement Evaluation System."

Optimization strategies proposed by domestic scholars emphasize urban greening and ecological protection, infrastructure and public services infrastructure improvement, and urban cultural quality enhancement.

## ② International Research Status

International research on Human Settlement has a longer history, with well-established theoretical frameworks and practical experiences. In terms of evaluation index systems, international scholars have constructed a variety of evaluation index systems for Human Settlement. Among which, the United Nations Human Settlement Programme' "Urban Indicators Framework" and the World Bank's "Urban Sustainability Index System" are widely recognized. Optimization strategies from abroad focus on green buildings, low-carbon transportation, urban planning, and governance improvements.

### (3) Research Content and Methodology

#### ① Research Content

This study includes:

1. Constructing an evaluation index system for Human Settlement.
2. Assessing the Human Settlement in Shijiazhuang.
3. Proposing optimization strategies for Shijiazhuang.
4. Conducting empirical research to validate the strategies.

#### ② Research Methodology

The study employs questionnaires, field research, and data analysis to collect and analyze data on resident satisfaction and needs, current status and problems, and conduct evaluation and optimization studies.

## 2. Construction of the Human Settlement Evaluation Index System

### (1) Principles of Index System Construction

① Scientificity: The system should be based on scientific theories and methods to ensure objectivity and accuracy.

② Comprehensiveness: It should cover all aspects of human settlement, including natural environment, infrastructure, public services, social culture, and resident

satisfaction to ensure that the evaluation is comprehensive and systematic.

③ Operability: Indicators should be measurable and feasible for data collection and analysis.

④ Dynamism: The system should adapt to urban development and changes over time for adjusting and improving, to ensure the timeliness and adaptability of evaluation.

### (2) Process of Index System Construction

① Literature review and theoretical analysis: By consulting relevant literature and theories, understand the research progress of Human Settlement evaluation and the method of constructing index system.

② Preliminary selection and screening of indicators: According to the principle of index system construction, combined with the actual situation of Human Settlement in Shijiazhuang, a series of indicators are initially selected. Then, through expert consultation and questionnaire survey, the indicators are screened and optimized, and finally 25 specific indicators are determined.

③ Determination of indicator weights using methods like the Analytic Hierarchy Process (AHP) to ensure the rationality and scientificity of the evaluation results.

### (3) Specific Indicators

The evaluation index system of Human Settlement constructed in this paper includes five dimensions and 25 specific indicators. The details are as follows:

① Natural Environment: Air quality index, urban green coverage rate, per capita park area, urban noise levels, urban water quality.

② Infrastructure: Per capita road area, public transportation coverage, water supply penetration rate, power supply reliability, drainage system completeness, gas penetration rate, internet penetration rate.

③ Public Services: Number of hospital beds per 1,000 people, number of teachers per 1,000 people, public library collections, community service center coverage, number of elderly care facilities.

④ Social Culture: Proportion of resident spending on cultural/recreational activities, proportion on education, frequency of community cultural activities, resident

satisfaction with community culture.

⑤ Resident Satisfaction: Satisfaction with human settlement, transportation, public services, public security, and urban management.

### 3. Evaluation of Shijiazhuang's Human Settlement

#### (1) Data Sources and Sample Selection

Data was collected through questionnaires (random sampling), field research, and official statistics from Shijiazhuang's government departments. The questionnaire used random sampling to investigate the residents in different areas of Shijiazhuang. The field research mainly investigated the urban planning, infrastructure construction and public service facilities in Shijiazhuang. The official statistics mainly come from Shijiazhuang Municipal Bureau of Statistics and relevant departments.

#### (2) Analysis of Evaluation Results

##### ① Natural Environment

Performs well in air quality index, urban green coverage rate and per capita park area but needs improvement in urban noise levels and urban water quality, which may be related to the industrial layout and traffic conditions of Shijiazhuang.

##### ② Infrastructure

Shijiazhuang's per capita road area, public transport coverage and other indexes performed well. However, there is still room for improvement in indexes such as water supply penetration rate and power supply reliability. In addition, there are also shortcomings in indexes such as the perfection rate of drainage facilities, gas penetration rate and Internet penetration rate. This may be related to the infrastructure construction and renovation of Shijiazhuang.

##### ③ Public Services

The number of beds per thousand people in medical institutions and the number of teachers per thousand people in Shijiazhuang performed well. However, there is still room for improvement in the collection of books in public libraries and the coverage rate of community service centers. In addition, the number of old-age service institutions is also insufficient. This may be related to the

allocation and investment of public service resources of Shijiazhuang.

##### ④ Social Culture

The proportion of residents' cultural and entertainment expenditure and the proportion of residents' education expenditure in Shijiazhuang performed well. However, there is still room for improvement in the number of community cultural activities and resident satisfaction with community culture. This may be related to the organization of cultural activities and the creation of cultural atmosphere in Shijiazhuang.

##### ⑤ Resident Satisfaction

Resident satisfaction with the human settlement, resident satisfaction with transportation and other indicators performed well. However, resident satisfaction with public services, social security and urban management still have room for improvement. This may be related to the quality of public services, social security and urban management in Shijiazhuang.

### 4. Optimization Strategies for Shijiazhuang's Human Settlement

#### (1) Natural Environment Optimization

##### ① Enhance Urban Greening and Ecological Protection

Increase the intensity of urban greening and improve the coverage of urban greening; Strengthen ecological protection and protect urban ecological environment and biodiversity. Specific measures include: formulating and implementing urban greening planning to increase the area of urban green space; Strengthen the construction and management of urban parks and green spaces to improve the quality of green spaces; Promote green buildings and low-carbon transportation to reduce urban energy consumption and emissions.

##### ② Improve Air Quality

Strengthen industrial pollution control and motor vehicle exhaust emission control to reduce air pollution. Specific measures include: strengthening the supervision and management of industrial enterprises to ensure that industrial emissions meet the standards; Promote new energy vehicles and clean energy to reduce

vehicle exhaust emissions; Strengthen urban air quality monitoring and early warning, and take timely measures to deal with air pollution.

### ③ Upgrade Urban Water Quality

Strengthen the management and protection of urban water bodies and improve the quality of urban water bodies. Specific measures include: strengthening the monitoring and management of urban water bodies, and timely discovering and dealing with water pollution problems; Strengthen the construction and management of urban drainage facilities and improve drainage capacity; Popularize rainwater collection and utilization technology to reduce the impact of urban rainwater runoff on water quality.

### (2) Infrastructure Optimization

#### ① Improve Transportation Networks

Strengthen urban traffic planning and design and optimize the layout of traffic network; Strengthen the construction and management of public transport facilities and improve the coverage and service level of public transport. Specific measures include: formulating and implementing urban transportation planning and optimizing transportation network layout; Strengthen the construction and management of public transport facilities to improve the convenience and comfort of public transport.

#### ② Upgrade Infrastructure

Roads and traffic facilities: increase the maintenance and repair of urban roads to ensure smooth and safe roads; Add bus lanes, optimize the layout of bus lines, and improve the convenience and coverage of public transport systems; Encourage and support non-motor vehicle travel, build and improve bicycle lanes and pedestrian lanes, and build a green travel system.

Water supply and drainage system: upgrade water supply facilities, improve water supply efficiency and safety, and ensure water quality meets the standard; Improve the drainage system, strengthen the separate treatment of rainwater and sewage, and reduce urban waterlogging and water pollution.

Energy and communication: promote smart grid technology to improve power supply reliability and

energy efficiency; Expand the use of clean energy such as natural gas and reduce coal pollution; Accelerate the construction of a new generation of communication infrastructure such as 5G networks and improve the level of urban informatization.

### ③ Promote Information Construction

Strengthen the informatization construction, improve the Internet penetration rate and informatization level; Promote new technologies and models such as smart cities and intelligent transportation.

### (3) Public Services Optimization

#### ① Optimize the Allocation of Educational Resources

Balanced educational resources: according to the population distribution and school-age population changes, rationally adjust the school layout to ensure that each region has sufficient educational resources; Increase investment in weak schools and narrow the gap between schools.

Improve the quality of education: strengthen the training of teachers and improve their quality and teaching level; Popularize quality education and pay attention to students' all-round development; Encourage and support social forces to run schools and increase the diversity and flexibility of education supply.

#### ② Enhance Healthcare Services

Improve the medical system: optimize the layout of medical resources, strengthen the construction of primary medical and health institutions, and build a graded diagnosis and treatment system; Encourage and support social capital to run medical services and increase the supply of medical services.

Improve the quality of medical service: strengthen the training of medical personnel and improve the level of medical technology and service quality; Promote telemedicine and health management services to improve the accessibility and convenience of medical services.

Strengthen the construction of public health system: improve the public health emergency management system and improve the ability to deal with public health emergencies; Strengthen the prevention and control of infectious diseases and health education to improve residents' health literacy.

## **5. Empowering Digital Intelligence to Accelerate the Collaborative Transformation of Digital Greening**

The human settlement of digital intelligence empowerment has achieved remarkable results in Shijiazhuang. By introducing modern information technology and artificial intelligence technology, the integration of data collection, processing, analysis and judgment has been realized, which has brought many advantages to the improvement of human settlement. The following is a practical case of Shijiazhuang City to illustrate the advantages of digital intelligence in empowering human settlement:

### **(1) Shijiazhuang "Multi-Survey Integration" Information Service Platform**

In order to deepen the "delegate power, improve regulation, and upgrade services" reform and optimize the deployment requirements of the business environment, Shijiazhuang Bureau of Natural Resources and Planning jointly developed and built a "multi-survey integration" information service platform in Shijiazhuang based on SuperMap GIS platform.

The platform has further improved the efficiency of surveying and mapping services, and built a scientific, convenient and efficient examination and approval and management system for engineering construction projects. It provides information services to support the "multi-survey integration" business in 8 districts and 13 counties, and realizes real-time dynamic supervision and sharing of surveying and mapping results. . The platform is deeply integrated with the spatio-temporal big data platform, which realizes the application mode of "multi-survey integration" and provides data application support for natural resource users. This measures improve the efficiency and quality of surveying and mapping services for engineering construction projects, and reduce the burden on enterprises, optimize the business process and shorten the time limit for government affairs, realize the real-time dynamic monitoring and sharing of data, and improve the application value of data.

### **(2) Digital Village Construction in Anxia Village,**

Shijing Township, Luquan District, Shijiazhuang City

Anxia Village actively explores digital empowerment rural governance, uses village-level affairs management platform applet, establishes party-mass service center on the cloud, and fully promotes the construction of "digital village".

Villagers who register for the village-level affairs management platform can give feedback and suggestions to the secretary of the village party branch through the "Villagers Tell Things" window on the platform. The secretary of the village party branch can reply online and handle it, realizing the online circulation of the whole process of talking, discussing, handling and evaluating, forming a service mode of "villagers placing orders, party organizations sending orders and party member taking orders". It has enhanced the villagers' participation in the co-construction and co-governance of villages, and enhanced the villagers' sense of acquisition and satisfaction. It has realized the deep integration of informatization and rural governance, and improved the efficiency and level of rural governance. It has promoted the development of rural governance in the direction of modernization and intelligence.

### **(3) Smart Management of Online Homestays in Shijiazhuang City**

Shijiazhuang actively promoted the experience of intelligent management application platform of smart management of online homestays in Chang'an Branch, and built online homestay management control system module by using high technology.

Online homestay operators register the housing information through small programs or related WeChat official account. Guests check in through the check-in code, realizing real name, real number, fact and real-time information registration. The public security organs realize real-time supervision and early warning of online homestays through the platform. It improves the efficiency and accuracy of online homestay management and reduces potential safety hazards, enhances the guests' experience and sense of security, and provided strong support for public security organs to crack down on illegal crimes.

(4) In Luquan District, Shijiazhuang City, the local government actively promotes the demolition and rectification work, demolition and construction are carried out simultaneously, and efforts are made to improve the human settlement according to local conditions. For example, in Yongbi North Street, Tongye Town, Luquan District, the local government demolished a messy goods rental station and converted it into a garden covering an area of more than 3,000 square meters. This garden includes a garden, a pool fountain, sports equipment, a basketball court and a promenade for villagers to rest, which not only beautifies the rural environment, but also provides a good place for villagers to have fun. This move not only improves the livability of the countryside, but also enhances the happiness and satisfaction of the villagers.

Through the implementation of the above optimization strategies and the demonstration of practical cases, it can be seen that the digital intelligence empowerment for human settlement has achieved remarkable results in Shijiazhuang. By introducing modern information technology and artificial intelligence technology, the integration of data collection, processing, analysis and judgment has been realized, providing residents with a more livable, convenient and efficient human settlement. These advantages are not only reflected in improving the efficiency and quality of governance, but also in improving residents' sense of acquisition and satisfaction, which provides a strong support for promoting urban sustainable development and modernization.

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