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Study on Livability Evaluation and Transformation Path of Panzhihua City

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Abstract
Against the backdrop of the global wave of urban livability construction and China's resource-based city transformation strategy, Panzhihua, an industrial hub rising on the back of steel industry, is undergoing a transformative leap from a "hundred-li steel city" to a "high-quality livable place with beautiful mountains and rivers". Taking Panzhihua City as the research object, this paper constructs a livability evaluation index system covering six dimensions, namely ecological environment, living conditions, public services, economic development, social governance and transportation, based on theories such as science of human settlements and urban sustainable development. By adopting a combined quantitative and qualitative research methodology integrating questionnaire surveys, field interviews and statistical data analysis, the paper conducts a systematic investigation into the current livability status of Panzhihua's main urban areas. The study finds that the effectiveness of ecological restoration, the level of equalization in public services, and the quality of industrial transformation are the core factors influencing Panzhihua's livability, while shortcomings in transportation infrastructure and insufficient coordination between urban and rural development constitute the primary constraints. Based on the results of empirical analysis, this paper proposes targeted improvement strategies from three aspects: precision policy implementation, long-term mechanism construction, and differentiated supply. These strategies not only provide empirical support for Panzhihua to high-quality build a common prosperity pilot zone and a regional central city in southwestern Sichuan and northwestern Yunnan, but also offer a reference framework for the livability transformation of similar resource-based cities across the country.

Keywords: Resource-based City; Livability; Panzhihua; Transformation Path; Evaluation System

I. Introduction

1.1 Research Background and Problem Formulation

Urban competition in the 21st century has shifted from a mere contest of economic scale and growth rate to a rivalry centered on comprehensive quality and residents' well-being. The concept of "Better City, Better Life" advocated by the United Nations Human Settlements Programme (UN-Habitat), coupled with the global practice of the Sustainable Development Goals (SDGs), has clearly demonstrated that "livability" has become the core value orientation of modern urban development. In China, with the evolution of the principal social contradiction, the "people's ever-growing needs for a better life" have put forward higher requirements for urban construction. The Report to the 20th National Congress of the Communist Party of China explicitly states that it is imperative to "improve the level of urban planning, construction and governance, accelerate the transformation of development models for megacities and super-large cities, implement urban renewal actions, strengthen urban infrastructure construction, and build livable, resilient and smart cities". [1] This series of top-level design initiatives marks the official entry of China's urban development into a new phase centered on people and guided by quality.

Against this grand backdrop, the transformation of resource-based cities is particularly urgent and complex. Once hailed as the "pillars" of China's industrialization drive, these cities have long relied on a single-resource development model. However, when facing resource depletion or market fluctuations, they have been plagued by a series of "urban diseases" such as unbalanced industrial structure, ecological degradation, and intertwined social problems. How to break free from the fate of "resource exhaustion leading to urban decline" and achieve a remarkable transformation from "production-oriented" to "life-oriented" cities has become an era-defining issue confronting all resource-based cities.[2] The 14th Five-Year Plan for Supporting the Transformation and Development of Resource-based Areas issued by the State Council further identifies "enhancing urban functional quality" and "building livable and business-friendly cities" as core tasks, highlighting the pivotal role of livability transformation in national strategies.

Panzhihua City, a "hundred-li steel city" born out of the Third Front Construction and thriving on vanadium-titanium magnetite resources, serves as a typical case of this transformation challenge. Since its establishment in 1965, Panzhihua has taken the steel industry as its pillar and made indelible contributions to national construction. Nevertheless, entering the post-industrial era, the drawbacks of its "steel-dominated" industrial structure have become increasingly prominent. Coupled with the ecological pressure exerted on the Jinsha River Basin by extensive development in the early years, the city’s image has been stereotyped as an industrial landscape characterized by "smoke-filled skies and roaring noises". In recent years, the CPC Panzhihua Municipal Committee and the Municipal People’s Government have made a forward-looking decision based on a comprehensive assessment of the situation, launching the urban brand of "Heroic Panzhihua · Sunny Health Resort" and setting new development orientations as a "common prosperity pilot zone" and a "modern regional central city in southwestern Sichuan and northwestern Yunnan". This initiative has kicked off a profound transformation of Panzhihua from a "tough steel giant" to a "warm and sunny destination".

Yet, this transformation journey is fraught with challenges. What are the genuine perceptions of local residents? Do the existing livability improvement initiatives accurately address the core concerns of the public? Which factors act as key drivers for enhancing livability, and what shortcomings pose insurmountable obstacles? These questions urgently require scientific and systematic empirical research to find answers. Therefore, this study aims to construct a livability evaluation system tailored to Panzhihua’s actual conditions, conduct an in-depth analysis of its current situation, identify core influencing factors and major constraints, and on this basis, propose forward-looking, targeted and operable transformation paths. The research is intended to provide theoretical reference and practical guidance for the high-quality development of Panzhihua and similar resource-based cities across China.

1.2 Research Significance

This study attempts to integrate the science of human settlements, urban sustainable development theory and resource-based city transformation theory, constructing a multi-dimensional and dynamic evaluation framework for urban livability. This effort not only enriches the theoretical connotation of urban livability research, but also shifts the research perspective from general cities to resource-based cities with special historical backgrounds and development paths. It helps deepen the understanding of the internal logic and specific laws governing the livability transformation of such cities, addressing the gap in existing research where insufficient attention has been paid to the livability of resource-based cities.

For Panzhihua specifically, the empirical data and analytical conclusions provided by this study can serve as an accurate "diagnostic report" and "roadmap" for government decision-making. They can help avoid blindness and fragmentation in policy formulation, ensuring that limited public resources are allocated to areas that most effectively enhance residents’ sense of well-being. For other resource-based cities trapped in similar transformation predicaments (such as Fuxin, Hegang and Tongling), the evaluation system, identified common problems and proposed transformation paths in this study hold significant reference value and promotion significance. They contribute to the formation of a replicable and scalable "Chinese-style" paradigm for the livability transformation of resource-based cities.

II. Research Status at Home and Abroad

2.1 Research Progress Abroad

Foreign research on urban livability originated in the 1960s. British scholar David L. Smith first put forward the concept of "amenity" in Amenity and Urban Planning, dividing urban environmental quality into three dimensions: public health, residential comfort, and the amenity brought by historic buildings.[3] In 1977, David pioneered the concept of a livable city, emphasizing that cities should meet residents’ living needs and highlighting the core status of ecological environment and humanistic care, which laid a theoretical foundation for subsequent research.[4] Marked by the report Evaluation of Urban Livability in the United States, an evaluation system dominated by objective indicators took shape. Since then, academic research has gradually shifted from single-dimensional cognition to multi-dimensional comprehensive research, forming a core research paradigm centered on indicator system construction and empirical assessment.

Later, the United Nations Human Settlements Programme (UN-Habitat) proposed the concept of "habitable human settlements", emphasizing the coordination of ecological security, social equity, and economic sustainability. The Global Liveability Index released by the Economist Intelligence Unit (EIU) of the United Kingdom focuses on five dimensions including stability, healthcare, and cultural environment. In the research on resource-based cities, the Ruhr Region of Germany has achieved a leap from an industrial decline area to a livable urban agglomeration through a three-dimensional transformation model of "industrial restructuring, ecological restoration, and cultural reconstruction". Its experience indicates that ecological restoration and industrial diversification are the key paths to enhance the livability of resource-based cities.

2.2 Domestic Research Status

Domestic research on urban livability started relatively late but has developed rapidly, forming a research pattern that integrates international perspectives with local characteristics. With the issuance of the Scientific Evaluation Standards for Livable Cities in 2007, a multi-dimensional evaluation index system was established.[5] Domestic research is based on the science of human settlements proposed by Academician Wu Liangyong, and has gradually constructed a research framework in line with China's national conditions. Early research focused on theoretical introduction and localization adaptation. From the perspective of ecosystem, Zhou Zhitian et al. proposed that livable cities should follow natural laws and incorporate economic development, safety assurance, ecological environment, and quality of life into the evaluation dimensions. Through questionnaire surveys, Zhang Wenzhong et al. conducted an empirical study on the livability status of Beijing from five dimensions: safety, environmental health, living convenience, travel accessibility, and residential comfort, providing practical reference for improving urban livability.[6] In recent years, domestic research has shown the characteristics of diversified indicator systems and refined research methods. For example, the China Urban Livability Index constructed by the Urban Construction Magazine covers 90 indicators under four pillars, namely economic vitality, environmental sustainability, urban governance, and social culture & education, and adopts a combination of standardized value method and Shapley weight method to improve the scientificity of evaluation. At the practical level, relevant research results have been widely applied in urban planning practice. The 2024 China Urban Livability Index Ranking shows that cities such as Shanghai and Hangzhou rank among the top, while also revealing that Chinese cities still have room for improvement in the coordinated development of economy and environment, and the balanced allocation of public services.

In general, domestic and foreign research on urban livability has formed a relatively complete theoretical framework and evaluation system, but there are still common deficiencies, such as subjective divergence in index weight allocation, insufficient cross-regional comparative research, and imperfect dynamic evaluation mechanisms. Regarding resource-based cities, scholars mostly focus on the impact of single dimensions such as ecological restoration and industrial transformation on livability. Typical cases include studies on the transformation of coal mining areas in Datong, Shanxi, and the development of agricultural alternative industries in Fuxin, Liaoning. However, existing research has two major shortcomings: first, it lacks targeted analysis of resource-based cities in the subtropical climate zone of Southwest China; second, it fails to fully integrate new issues such as public service equalization and urban-rural integration under the background of common prosperity.

III. Construction of Livability Evaluation Index System and Research Design for Panzhihua

3.1 Principles for Constructing the Evaluation Index System

To ensure the scientificity and applicability of the evaluation system, this study follows the following four principles: Systematic Principle: Covering the main aspects affecting urban livability and reflecting the internal connections among various elements. People-oriented Principle: Taking meeting residents' needs and improving residents' well-being as the fundamental starting point for indicator setting. Local Characteristic Principle: Fully considering Panzhihua's unique natural and humanistic endowments as a resource-based city and a region in the dry-hot valley. Operability Principle: The indicator data should be easily accessible, including both objective statistical data and subjective evaluation obtained through questionnaire surveys.

3.2 Framework of the Evaluation Index System

Based on the above theories and principles, this study constructs an evaluation system consisting of 6 primary indicators, 16 secondary indicators, and 44 tertiary indicators (see Table 1).

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Table 1. Urban Livability Evaluation Index System of Panzhihua City

Primary Indicator	Secondary Indicator	Tertiary Indicator
A. Ecological Condition	A1. Quality of the natural environment	The ratio of days with good air quality, the annual average concentration of PM2.5, and the compliance rate of acoustic environment functional zones
	A2. Ecological Restoration and Conservation	Green coverage rate of built-up areas, per capita park green space area, and ecological restoration rate of mines
	A3. Sunshine Health and Wellness Resources	Annual sunshine duration, annual average temperature, negative oxygen ion concentration
B. Housing Conditions	B1. Housing Security and Quality	per capita floor area of residential buildings, coverage rate of affordable housing, renovation rate of old residential areas
	B2. Community Environment and Safety	Satisfaction with Community Security, Satisfaction with Property Management, and Adequacy of Community Public Activity Spaces
C. Public Service	C1. Educational Resources	Coverage rate of high-quality primary and secondary schools, number of teachers per 10,000 people
	C2. Health care	Number of licensed physicians per 1,000 population, number of tertiary hospitals, and accessibility of community healthcare services
	C3. Culture and Sports	per capita area of public cultural facilities, per capita area of sports venues, richness of cultural activities
D. Economic Development	D1. Economic Vitality and Employment	GDP growth rate, urban registered unemployment rate, and the proportion of high-tech industry added value
	D2. Income and Consumption Levels	per capita disposable income of urban residents, Engel coefficient
	D3. Quality of Industrial Transformation	The High-end Level of Vanadium-Titanium Industry, the Output Value Ratio of Sunshine Health Industry, and the Penetration Rate of Digital Economy
E. Social Governance	E1. Social equity and inclusion	urban-rural income ratio, basic public service equalization index
	E2. Social Security and Stability	Incidence rate of criminal cases, food safety satisfaction, and the completeness of the emergency management system
	E3. Citizen Participation	Participation Willingness of Residents in Community Affairs and Satisfaction with Government Work
F. Transportation	F1. Convenience of external transportation	High-speed rail reaches more cities, more flight routes, and higher highway density
	F2. Convenience of urban transportation	Bus stop coverage within 500 meters, average commuting time during morning and evening rush hours, and the completeness of the slow traffic system

3.3 Research Methods and Data Sources

This study adopts a mixed research method combining subjective and objective approaches for data collection and analysis:

Questionnaire Survey: A stratified random sampling method was employed to distribute 600 structured questionnaires covering the six dimensions across Dongqu District, Xiqu District, and Renhe District of Panzhihua City. A total of 545 valid questionnaires were retrieved, with an effective recovery rate of 90.8%. A 5-point Likert scale was used to measure residents' subjective perceptions.

In-depth Interviews: Semi-structured in-depth interviews were conducted with 15 citizens of different ages, occupations, and residential areas, so as to supplement the explanatory information and in-depth insights of the questionnaire data.

Statistical Data Collection: Statistical data from multiple departments of Panzhihua City for the period 2020–2025 were systematically collected, which were used for cross-validation with subjective perception data.

Data Analysis: Finally, SPSS software was used to conduct descriptive statistics, reliability and validity tests, factor analysis (dimension reduction and common factor identification), and multiple linear regression analysis, so as to explore the influence weights of each dimension on the overall livability.

IV. Empirical Analysis of the Current Livability Status of Panzhihua

4.1 Descriptive Statistical Analysis

Preliminary analysis of the questionnaire data yielded the overall evaluation of Panzhihua residents on the livability of each dimension (see Table 2).

Table 2. Average Scores of Panzhihua Residents on Livability Across the Six Dimensions (1–5 Points)

Dimension	Grade	Key Findings
Ecological Condition	4.2	Optimal climate conditions lead to significant improvement in air quality
Social Governance	3.9	Good public order, but uneven urban-rural services
Housing Conditions	3.8	Housing quality satisfactory, but facilities in old residential areas insufficient
Economic Development	3.7	Economic growth is stable, but there is insufficient high-quality employment
Public Service	3.5	Insufficient quality/quantity of educational and medical resources
Transportation	3.1	Inconvenient external transportation and severe urban congestion

Table 3. Component Interpretation

Component	Factor Name	Key Indicators	Variance Explained	Cumulative %
1	Ecological-Wellness Attractiveness	A1, A3	28.5%	28.5%
2	Public Service Equalization	C1, C2, E1	18.2%	46.7%
3	Industrial Transformation Quality	D1, D3	12.8%	59.5%
4	Transportation Accessibility	F1, F2	8.1%	67.6%

5	Community Micro-environment	B2	4.7%	72.3%

Using principal component analysis with varimax rotation, 5 common factors with eigenvalues greater than 1 were finally extracted, with a cumulative variance contribution rate of 72.3%, indicating good explanatory power. Factor 1: Ecological-Wellness Attractiveness (variance contribution rate: 28.5%). It is mainly composed of indicators such as A3 (sunny wellness resources) and A1 (natural environmental quality). This shows that the unique natural climate and restored ecological environment constitute Panzhihua's core livability hallmark. Factor 2: Level of Public Service Equalization (variance contribution rate: 18.2%). It is mainly composed of indicators such as C1 (educational resources), C2 (medical and health services), and E1 (social equity). It reflects that the high-quality and balanced supply of public services is a key factor affecting residents' living experience. Factor 3: Quality of Industrial Transformation (variance contribution rate: 12.8%). It is mainly composed of indicators such as D3 (quality of industrial transformation) and D1 (economic vitality). This indicates that residents' confidence in the city's future development prospects is directly linked to the success of the industrial transformation towards high-end and diversified development. Factor 4: Transportation Accessibility (variance contribution rate: 8.1%). It is mainly composed of indicators such as F1 (external transportation) and F2 (urban internal transportation). This confirms that transportation is currently the most prominent shortcoming. Factor 5: Community Micro-environment (variance contribution rate: 4.7%). It is mainly composed of indicators such as B2 (community environment).

Table 4. Regression Analysis Summary (Dependent Variable: Overall Livability Satisfaction)

Predictor	**Standardized β**	**t-value**	**p-value**	**Significance**
Factor 1	0.428	7.89	<0.001	***
Factor 2	0.356	6.54	<0.001	***
Factor 3	0.291	5.36	<0.001	***
Factor 4	0.082	1.65	0.102	n.s.
Factor 5	0.045	0.99	0.324	n.s.
Model Fit	**R^2 = 0.683**	**Adjusted R^2 = 0.672**	**$F(5,239)$ = 58.24**	**$p < 0.001$**

Note: ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$, n.s. = not significant

The factor analysis yielded five distinct components with eigenvalues exceeding 1.0, cumulatively explaining 72.3% of the total variance. Multiple regression analysis identified three statistically significant predictors of overall livability satisfaction: Ecological-Wellness Attractiveness ($\beta = 0.428$, $p < 0.001$), Public Service Equalization ($\beta = 0.356$, $p < 0.001$), and Industrial Transformation Quality ($\beta = 0.291$, $p < 0.001$). These three factors constitute the core drivers shaping residents' livability perceptions in Panzhihua.

Combining quantitative data and qualitative interviews, two major constraints are identified: 1.Shortcomings in transportation infrastructure. Located at the border of Sichuan and Yunnan provinces, Panzhihua is inherently disadvantaged by its rugged terrain characterized by high mountains and deep valleys. At present, external transportation still relies mainly on conventional-speed railways and highways. The high-speed railway network has not yet been fully integrated into the national trunk line system, and air routes are limited with high ticket prices. This not only restricts the inflow of talents, capital and other essential factors, but also hinders the development of emerging industries such as sunny wellness tourism. As a person in charge of a local wellness enterprise revealed in the interview, "Many customers from other regions are attracted by our climate, but they hesitate to come once they learn that they have to transfer several times during the journey."

Insufficient coordination between urban and rural development. Despite the rapid changes and upgrading of the urban landscape, the urban-rural dual structure remains prominent. The level of public services such as education, medical care and elderly care in rural areas lags far behind that in urban districts. This disparity has led to excessive population concentration in central urban areas, exacerbating "urban diseases" and constraining rural revitalization efforts. During the interviews, many residents from suburban areas expressed their concerns about "difficulties in accessing medical services and long distances to schools".

V. Countermeasure Suggestions for Improving Panzhihua’s Urban Livability

Based on the empirical analysis of Panzhihua residents’ perceptions of livability discussed above, this chapter constructs a four-in-one improvement path system from a systematic optimization perspective, namely "strengthening core advantages, addressing key shortcomings, establishing long-term mechanisms, and adapting to diverse demands", and puts forward targeted, forward-looking and operable countermeasure suggestions.

5.1 Strengthening Ecological Wellness Advantages and Breaking Through Transportation Bottlenecks

5.1.1 Building a World-Class Sunny Wellness Destination

Panzhihua’s core advantage lies in its unique ecological and climatic resources.[7] Empirical analysis shows that "ecological-wellness attractiveness" has the strongest explanatory power for overall livability satisfaction (variance contribution rate: 28.5%, $\beta=0.428$). Therefore, it is necessary to promote the systematic transformation of ecological advantages into development advantages.

First, continue to advance ecological governance projects in the dry-hot valley of the Jinsha River, as well as ecological reclamation of industrial wastelands and tailings ponds. Explore the establishment of a regional "ecological bank" and a mechanism for accounting and trading the value of ecological products. Through the adoption of an ecologically oriented development model, transform the restored "ecological scars" into manageable and experiential ecological assets.

Second, upgrade the wellness industry system towards high-end and industrial chain integration: drive the transformation of the industry from a single climate-based wellness model to a composite industrial ecosystem featuring "integration of medical care and wellness, combination of sports and health preservation, and linkage of culture, tourism and wellness". Specific paths include: introducing internationally renowned health management institutions and rehabilitation medical brands to jointly build high-end wellness complexes; formulating and promoting regional wellness service standards and certification systems; encouraging local medical resources (such as Panzhihua Iron and Steel General Hospital) to expand into characteristic specialties such as rehabilitation and convalescence.

Third, systematically integrate the "Sunny Flower City" image into urban color planning, architectural style guidelines and public art installations. For example, warm color palettes and photovoltaic building materials can be systematically applied in key urban nodes, riverside corridors and public buildings to enhance visual recognition. Regularly organize brand events such as the "International Sunny Art Festival" to boost the city’s cultural appeal.

5.1.2 Developing a Three-Dimensional Transportation Network

"Transportation accessibility" is currently the most prominent shortcoming (with the lowest score of 3.1 points). Due to the lag in transportation infrastructure, Panzhihua faces high transportation costs for import and export trade, which seriously restricts logistics efficiency.[8] Therefore, it is imperative to implement a dual-driven strategy of "tackling the construction of major external transportation corridors" and "optimizing internal urban microcirculation".

On the external transportation front, actively strive to maximize the connection efficiency of the Chongqing-Kunming High-Speed Railway and the Chengdu-Kunming High-Speed Railway Double Line at the Panzhihua hub, and promote the opening of high-frequency intercity direct trains to Chengdu, Kunming and Chongqing. In the aviation sector, work towards upgrading Bao’anying Airport into a regional tourism trunk airport, increasing the frequency of flights to first-tier cities such as Beijing, Shanghai, Guangzhou and Shenzhen, and exploring the launch of cross-border tourism charter flights to Southeast Asia. Meanwhile, plan and construct a tourism scenic byway connecting Lijiang and Dali, to deeply integrate into the Greater Shangri-La ecological tourism loop.

Based on the characteristics of a mountainous city, construct a multi-level public transportation system dominated by regular public transport and featuring slow traffic. Focus on building a continuous, safe and comfortable network of mountain hiking trails, riverside greenways and dedicated bicycle lanes, and implement an integrated fare system for "public transport & slow traffic" to achieve seamless connection. Leverage smart transportation technologies to realize real-time public transport scheduling and intelligent parking resource management, so as to alleviate peak-hour traffic congestion.

5.2 Systematic Construction of Long-Term Mechanisms: Promoting Equalization of Public Services and Modernization of Social Governance

5.2.1 Advancing the High-Quality and Balanced Development of Basic Public Services

"Level of public service equalization" is the second largest core driving factor (β=0.356). Efforts should be made to narrow the service gap between urban and rural areas and among different regions.

In the field of education, institutionalize the "county-managed school recruitment" system and the rotation system for school principals and teachers, and encourage the establishment of cross-regional "education consortia". Increase investment in educational informatization, build a city-wide "cloud classroom of famous teachers" and a digital teaching resource library, and realize the full coverage and sharing of high-quality curriculum resources.

In the medical and health service system, take the construction of urban medical groups and county medical communities as the starting point to promote the downward flow of high-quality resources from Grade-A tertiary hospitals. Establish a hierarchical diagnosis and treatment model featuring "primary care first, two-way referral, separation of acute and chronic diseases, and linkage between upper and lower-level medical institutions". Rely on the regional health information platform to achieve the interconnection of residents' electronic health records and medical records.

In the construction of an age-friendly city, formulate a public service plan covering the entire life cycle. At the community level, build embedded elderly care and childcare service centers, child-friendly parks and barrier-free public spaces, forming a "15-minute convenient living circle".

5.2.2 Innovating Social Governance and Risk Prevention and Control Models

First, construct a "smart governance" platform: integrate data resources from public security, urban management, transportation, emergency response and other departments to build a "unified urban operation and management platform", realizing real-time monitoring, intelligent early warning and collaborative disposal of urban operation status.

Second, cultivate a community governance community: promote the "participatory budgeting" and "community proposal system", set up community development funds, and encourage residents, social organizations and stationed units to jointly participate in community micro-renewal, environmental governance and cultural development. Cultivate local professional social work forces to improve the professionalization level of community services.

5.3 Adapting to Diverse Demands and Highlighting Urban Characteristics

Urban livability is essentially a high degree of matching of multi-dimensional needs.[9] Panzhihua needs to implement a precise supply strategy targeting different groups of people.

For young talents, centrally plan and construct youth innovation communities integrating "maker apartments, co-working spaces, roadshow centers and leisure and social facilities" in new urban districts or high-tech zones. Provide rental subsidies for talent housing, and organize targeted activities such as science and technology forums, music festivals and sports events that cater to young people's interests, creating an open, inclusive and dynamic urban atmosphere.

For "migratory bird-style" wellness groups, develop tourism-oriented real estate mainly consisting of "short-term rental apartments, wellness hotels and homestay clusters", providing flexible lease terms and one-stop wellness service packages. Establish a seasonal service alliance for wellness groups, standardize service standards, and protect their legitimate rights and interests.

For local indigenous residents, focus on the protection and adaptive reuse of industrial heritage in the process of urban renewal. Transform representative industrial relics of the Third Front Construction, such as Panzhihua Iron and Steel and Dukou, into industrial museums, creative design workshops or immersive cultural experience zones, making them core cultural landmarks that carry urban memories and enhance local identity.

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Table 5: Correlation Matrix Between Implementation Paths and Core Driving Forces

Implementation Field	Ecological and wellness Appeal (β=0.428)	Equalization of public Services (β=0.356)	Quality of industrial Transformation (β=0.291)
Ecological Value Conversion	●●●●●●●●●●○○○ (Strong Correlation)	●●○○○○○○○○○○○ (Weak Correlation)	●●●●○○○○○○○○○ (Moderate Correlation)
Breakthrough In Traffic Bottleneck	○○○○○○○○○○○○○ (Very Weak Correlation)	●●●●○○○○○○○○○ (Moderate Correlation)	●●●●●●○○○○○○○ (Moderate Correlation)
Equalization Of Public Services	○○●●○○○○○○○○○ (Weak Correlation)	●●●●●●●●●●●●○ (Strong Correlation)	●●○○○○○○○○○○○ (Weak Correlation)
Innovation In Social Governance	○○○○●●○○○○○○○ (Weak Correlation)	●●●●●●○○○○○○○ (Moderate Correlation)	○○○○●●○○○○○○○ (Weak Correlation)
Multi-Requirement Adaptation	●●●●○○○○○○○○○ (Moderate Correlation)	●●●○○○○○○○○○○ (Weak Correlation)	●●●●●●●●○○○○○ (Moderately Strong Correlation)

Note: Strong Correlation (10–12 ●): Direct and primary improvement paths; Moderately Strong Correlation (7–9 ●): Important supporting or synergistic paths; Moderate Correlation (4–6 ●): Paths with indirect facilitation effects; Weak Correlation (1–3 ●): Paths with limited relevance, serving as auxiliary measures ; Very Weak Correlation (0 ●): Essentially no direct correlation

In summary, improving Panzhihua's urban livability is a systematic project. It is necessary to focus on the three core driving factors identified in the empirical analysis, and systematically enhance the city's attractiveness, carrying capacity and cohesion through precision policy implementation, long-term mechanism construction and differentiated supply. Ultimately, this will realize the comprehensive transformation of Panzhihua from a resource-based industrial city to a high-quality sunny wellness livable destination.

VI. Conclusions

The main conclusions of this study are as follows:

Firstly, Panzhihua's urban livability presents the stage-specific characteristics of "distinct advantages and prominent shortcomings". Residents have highly recognized the ecological environment (4.2 points) and social governance (3.9 points), and the ecological restoration achievements and social security environment of the "Sunny Flower City" have become the core soft power of the city. However, the two dimensions of transportation (3.1 points) and public services (3.5 points) rank at the bottom of the scores, which reflect the "hard constraints" such as inconvenient external transportation, severe urban traffic congestion, and insufficient supply of high-quality educational and medical resources. These constraints constitute the main bottlenecks restricting the upgrading of the city's livability quality.

Secondly, Empirical analysis has identified three core driving factors of livability and their influence mechanisms. Through factor analysis and multiple linear regression model verification, this study quantified the influence weights of each dimension on the overall livability satisfaction: (1) Ecological-wellness Attractiveness (β=0.428) is the primary driving force, indicating that the unique sunny climate resources and ecological restoration achievements are the most fundamental livability capital of Panzhihua; (2) Level of Public Service Equalization (β=0.356) is the key support, reflecting residents' urgent demand for high-quality and equitable public services; (3) Quality of Industrial Transformation (β=0.291) is the important foundation, showing that residents' expectations for the city's economic vitality and high-quality employment opportunities are directly related to their livability perception. In contrast, transportation accessibility and community microenvironment do not show statistically significant impacts, suggesting that they serve more as basic guarantee conditions rather than direct driving factors in the current stage.

Thirdly, The study constructs a systematic improvement path system with the "four-in-one" framework as the core. Based on the logic of "developing strengths, addressing weaknesses, consolidating foundations and adapting to demands", a targeted countermeasure system is proposed: To strengthen ecological advantages, it is necessary to promote the capitalization of ecological resources and the upgrading of the wellness industry towards high-end; To break through transportation bottlenecks, it is imperative to implement the dual-driven strategy of tackling major external transportation corridors and optimizing internal urban microcirculation; To construct long-term mechanisms, the core lies in advancing the high-quality and balanced development of basic public services and innovating smart governance

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models; To implement precision supply, the key is to provide differentiated and refined urban spaces and services for different groups such as young talents, wellness groups and local indigenous residents. This path system emphasizes the synergistic linkage among various strategies, aiming to systematically address the core issues revealed by the empirical analysis.

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