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A Study on Pathways and Strategies for Empowering High-Quality Development Through Deep Integration of Industry and Urban Development in Yibin City

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ABSTRACT

As an important regional central city in the upper reaches of the Yangtze River, Yibin has actively promoted industry-city integration in recent years under the philosophy of "developing cities to attract industries and using industries to attract people," achieving a trans formative shift from "one black, one white" to "one blue, one green." In 2024, its GDP exceeded 400 billion yuan, with emerging industries such as power batteries and crystalline silicon photovoltaic rising rapidly; the built-up area of the central urban district reached 189.7 square kilometers, with a permanent resident population of 1.788 million. However, in the transition from "rapid expansion" to "deep integration," Yibin still faces structural challenges, including mismatches in spatial organization and functional layout, shortcomings in public services and infrastructure, bottlenecks in industrial support and talent recruitment and development, constraints related to ecological conservation and green development, and obstacles to institutional mechanisms and policy coordination. Based on a systematic review of the current status and measurement analysis of industry-city integration in Yibin, this paper conducts an in-depth analysis of the above five aspects of issues and proposes corresponding pathways and strategies: building a spatial development pattern featuring clustered collaboration and work-life balance; promoting the decentralization of public services such as education and healthcare to the grassroots level; establishing an innovation value chain integrating industry, academia, research, and application, and bridging talent and industry; strengthening the green and low-carbon ecological security barrier in the upper Yangtze River; and improving a governance system that combines centralized and decentralized management with clear rights and responsibilities, with the aim of providing a reference for similar cities in empowering high-quality development through deep integration of industry and urban development.

KEYWORDS

Industry-city Integration; High-quality Development; Pathways and Strategies.

1. INTRODUCTION

High-quality development is the primary task in comprehensively building a modern socialist country.The report of the 20th National Congress of the Communist Party of China clearly states that we must accelerate the development of the digital economy, promote the deep integration of the digital economy with the real economy, and drive the economy toward effective qualitative improvement and reasonable quantitative growth. As the primary carriers of industry and population, whether a city's spatial structure and functional layout can effectively support industrial upgrading has become a key issue in driving high-quality development. Against this backdrop, the integration of industry and urban development-that is, the organic synergy among industrial functions, urban

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functions, and population development-has emerged as a vital pathway to resolving imbalances in urban development and revitalizing the momentum of innovation[1].

Traditional urbanization models often prioritize the expansion of industrial scale while neglecting the simultaneous development of urban living services and ecological functions, leading to the widespread phenomenon of "separation of industry and city." Industrial zones are densely populated during the day but become "ghost towns" at night, while residential areas face challenges such as high commuting costs and inadequate public services. This spatial mismatch not only weakens a city's appeal to high-end talent but also constrains the innovative development of knowledge-intensive industries-7.Since the 18th National Congress of the Communist Party of China, the Party Central Committee, with Comrade Xi Jinping at its core, has attached great importance to urban development, emphasizing that "cities are built by the people and for the people." It has called for the scientific and rational planning of urban production, living, and ecological spaces, and for striking a proper balance between urban production and daily life on one hand and ecological conservation on the other. The integration of industry and urban development is precisely the concrete implementation of this requirement-using industry to drive urban development and using urban development to boost industry, thereby achieving the coordinated economic, social, and environmental development of cities through mutual empowerment[2].

As an important regional central city in the upper reaches of the Yangtze River, Yibin has actively explored the integration of industry and urban development in recent years and accumulated representative practical experience. In terms of industrial structure, Yibin has successfully achieved a trans formative leap from "one black, one white" (coal and baijiu) to "one blue, one green."In 2024, Yibin's GDP exceeded 400 billion yuan, ranking among the top 100 cities in China by GDP for five consecutive years. In terms of industrial support, the power battery industry-led by CATL-has attracted more than 120 industrial chain projects. For two consecutive years, in 2023 and 2024, its output value exceeded 100 billion yuan, with production accounting for more than 16% of the national total;The crystalline silicon photovoltaic industry, starting from scratch, has attracted nearly 40 projects-including Yingfa Deyao and Longi Green Energy-with an output value of approximately 30 billion yuan in 2024, making it one of the regions with the most complete photovoltaic industrial chains in the country.In terms of talent aggregation, Yibin has grown from having only two universities to hosting 14 universities and 19 academician (expert) workstations, with over 100,000 college students enrolled and 58, 100 high-level talents-including doctoral and master's degree holders, professionals with senior professional titles, and senior skilled workers-attracted and cultivated.In terms of urban spatial expansion, by 2024, the built-up area of the central urban district will reach 189.7 square kilometers, with a permanent resident population of 1.788 million; the population increase in the central urban district from 2020 to 2024 will amount to 220,000 people.

How to avoid the path dependence of "separation of industry and city" amid accelerating urbanization and to empower high-quality development through deep integration of industry and city is a critical challenge facing Yibin. Based on this, this paper takes Yibin City as its research subject to systematically analyze the theoretical logic, practical foundation, challenges, and policy approaches for deep integration of industry and city to empower high-quality development, with the aim of providing a reference for similar cities[3].

2. CURRENT STATUS AND MEASUREMENT ANALYSIS OF INDUSTRY-CITY INTEGRATION IN YIBIN CITY

2.1 Current Status and Characteristics of Industrial Development

Since 2016, Yibin City has driven a historic transformation in its industrial structure, guided by the strategy of "revitalizing the city through science and education and strengthening it with talent." The industrial landscape has shifted from the traditional "black and white" sectors to "blue and green"

sectors, initially establishing a modern industrial system that embodies Yibin's unique characteristics and strengths.

In terms of industrial scale and growth trends, during the 14th Five-Year Plan period, Yibin ' s regional gross domestic product (GDP) is projected to grow from 286.35 billion yuan in 2020 to 413.4 billion yuan in 2025, surpassing two 100-billion-yuan thresholds and firmly ranking third in the province. Since first entering the national top 100 cities by GDP in 2020, its ranking has risen to 87th.In 2025, the city's GDP growth rate reached 5.5%, with value-added in the secondary sector growing by 5.9% and that in the tertiary sector by 5.4%.In 2024, total industrial value-added reached 160.79 billion yuan, 1.5 times the level at the end of the 13th Five-Year Plan period. The city has consistently ranked second in the province for four consecutive years, with its share of the provincial total rising from 7.6% to 9%, and has been consecutively selected as one of the nation's Top 100 Advanced Manufacturing Cities. Compared to the end of the 13th Five-Year Plan period, industrial electricity consumption increased by 117.7%, and value-added from industrial enterprises above designated size grew at an average annual rate of approximately 10%.The industrialization rate rose to over 40 percent, with manufacturing accounting for more than 37 percent of GDP, and industry's contribution to economic growth remained consistently above 50 percent.

Table 1. Key Industrial Development Indicators for Yibin City During the 14th Five-Year Plan Period

Indicator	End of the 13th Five-Year Plan	2024	Growth Rate
Total Industrial Value Added	Approx. 107 billion yuan	160.79 billion yuan	+50%
Industrialization Rate	Approx. 35%	Over 40%	+5%
Manufacturing's Share of GDP	Approximately 30%	Over 37%	+7%
Industrial electricity consumption	Baseline	-	+117.7%
Total electricity consumption	Baseline	-	+96. 1%
Average annual growth rate of industrial value-added for enterprises above a specified scale	-	-	10% Approximately

In terms of the development of leading industrial clusters, Yibin is focused on building a "4+4+4" modern industrial system, with leading industries such as baijiu, power batteries, photovoltaic, and the digital economy gaining momentum. In the power battery sector, Yibin is fully committed to building itself into the "Power Battery Capital of China." It has established a power battery production capacity of 240 GWh, becoming one of the country's industrial clusters with the most complete industrial chain and strongest supporting and collaborative capabilities. Together with the baijiu industry, both have joined the ranks of clusters with an output value exceeding 100 billion yuan.In 2025, the value added by the power battery industry grew by 24. 1% year-over-year, while lithium-ion battery output increased by 49.2%. In the baijiu sector, the baijiu industrial cluster led by Wuliangye continued to expand; the city was awarded the title of "World Wine and Tourism Destination," and the "Sichuan Basin Strong-Aroma Baijiu" production area was selected as one of the nation's first batch of "Traditional Advantageous Food Production Areas."In the photovoltaic sector, Yibin ' s industry started from scratch and was the first in the province to establish a full industrial chain layout, with its industrial scale rising to first place in the province. In 2025, the value added of the crystalline silicon photovoltaic industry grew by 24.9% year-over-year, while mono crystalline silicon output increased by 41.5%.In the digital economy, Yibin has deeply cultivated this new frontier, with 12 companies making the 2025 provincial Top 100 Digital Economy list and the city ranking among the nation's Top 100 Digital Economy Cities for three consecutive years.

In terms of the transformation of traditional industries and the development of emerging industries, traditional sectors such as energy and chemicals, light industry and textiles, and machinery manufacturing have been revitalized and upgraded through technological transformation. Yibin successfully established a national-level specialized industrial cluster for textiles and apparel and was approved as a provincial pilot city for new-type technological transformation. At the same time, the city is accelerating its development in new growth areas such as new energy storage, new energy vehicles, the low-altitude economy, aerospace, hydrogen energy, and embodied intelligence.In 2025, the value added by the smart, connected new energy vehicle industry grew by 20.3% year-over-year, while automobile production increased by 100.9%.

2.2 Current Status and Characteristics of Urban Development

In terms of optimizing the urban spatial layout, since the start of the 14th Five-Year Plan, the built-up area of the central urban district has increased by 22 square kilometers, reaching 189.7 square kilometers. The three urban central axes-Jinsha River Avenue, North Yangtze Road, and Jiudu Avenue-have taken shape; the 22-kilometer inner ring road has been completed and opened to traffic; and construction of the 66-kilometer middle ring road is accelerating, with urban clusters “coming together like fingers forming a fist and linking up like pearls on a string.”

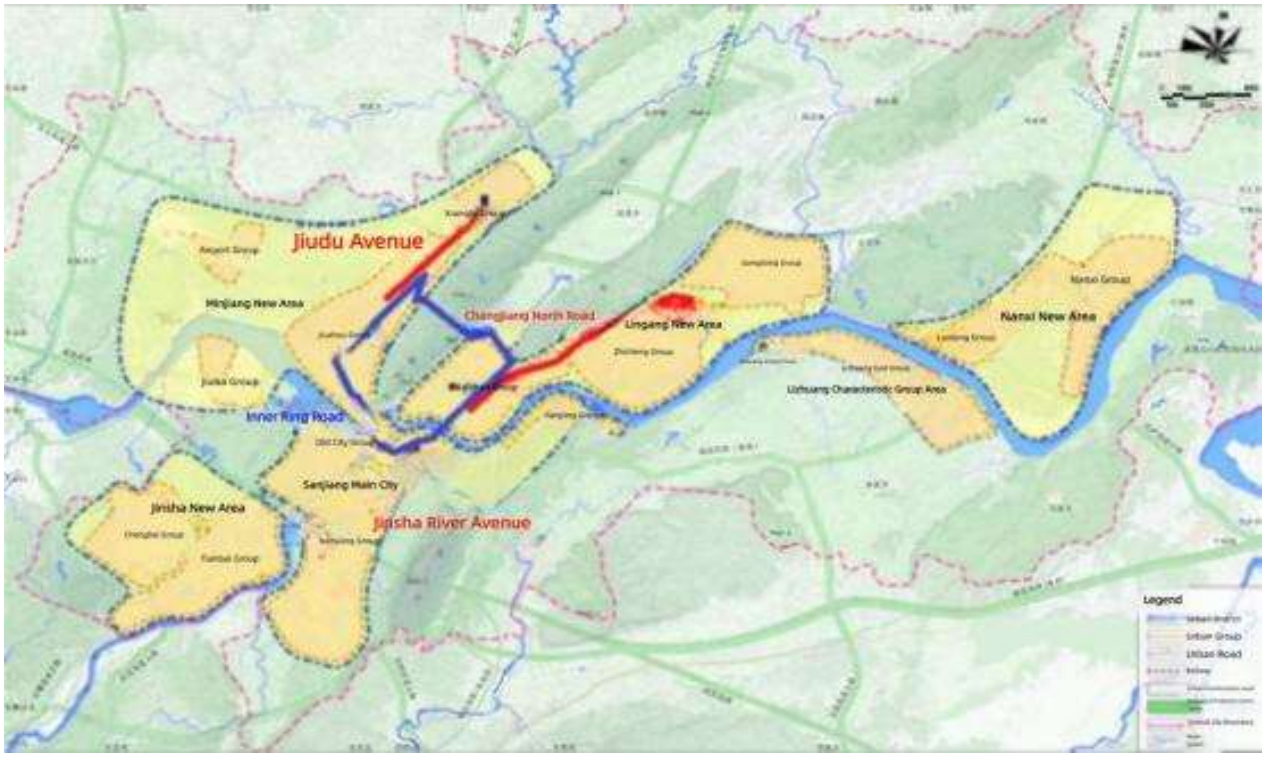


Figure 1. Planning and Construction of Yibin’s Central Urban Area

In 2024, the permanent resident population of the central urban area reached 1.788 million, an increase of 220,000 from 2020 to 2024. The city’s urban permanent resident population saw a net increase of 184,000, reflecting a clear trend of population concentration in the central urban area.

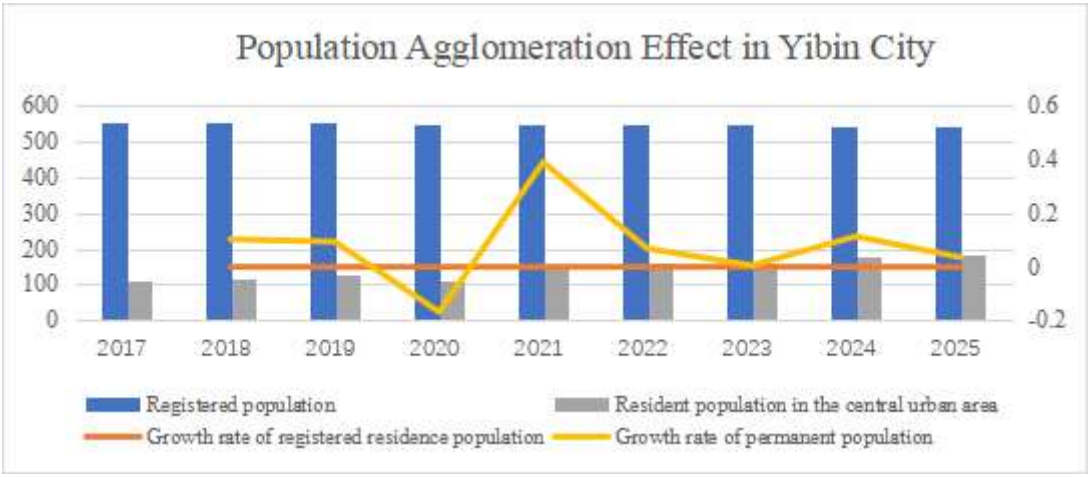


Figure 2. Population Agglomeration Effect in Yibin City

Looking toward 2035, Yibin will establish an "One Core, Three Axes" overall spatial structure: the central urban area will serve as the core to form the main urban agglomeration; the high-quality development axis along the river will drive the integration of Pingshan and Jiang'an with the main city; and the "Yi-Gao-Qi-Jun" and "Yi-Chang-Xing" axes will respectively anchor industrial revitalization and international tourism positioning. The central urban area is structured as "one core, two wings, three rivers, six districts, and multiple clusters," with the six major districts-Nan'an, Cuibai, Minjiang, Lingang, Nanxi, and Lisong-forming the "foundation" of urban development and working in concert to advance the integrated development of "industry, city, and people."

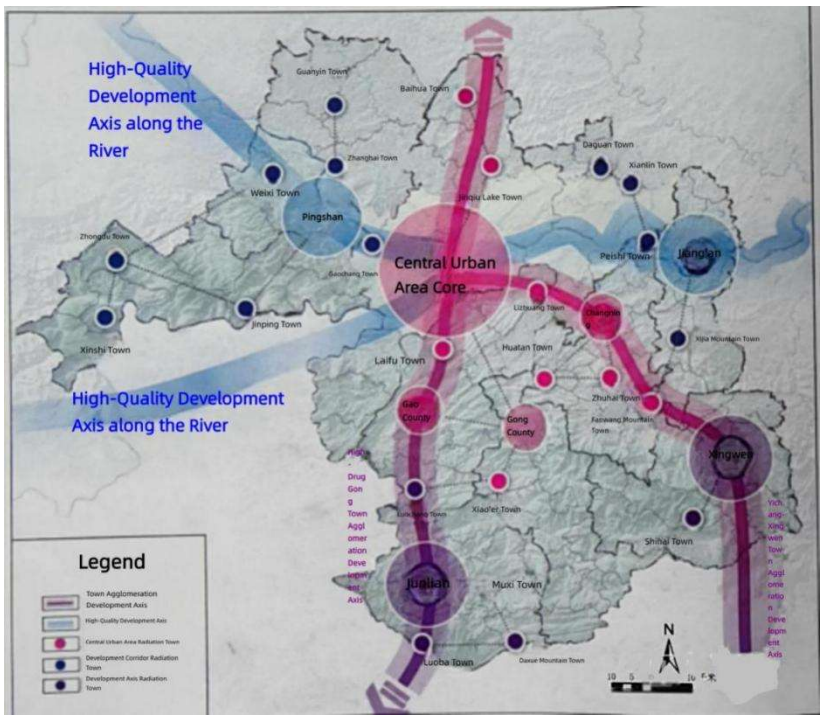


Figure 3. Spatial Strategic Layout of Yibin City

In terms of enhancing urban functionality and quality, in the realm of ecological livability, Yibin has constructed a 90-kilometer Yangtze River ecological corridor to high standards and created more than 180 small green spaces and pocket parks. The water quality excellence rate at 22 national and

provincial monitoring sections has remained at 100% for four consecutive years, with the main stem of the Yangtze River consistently maintaining Class II or higher water quality. The city's forest coverage rate has reached 46.87%, and Yibin has been recognized as one of China's "Top Ten Most Livable Cities" and " Most Happiest City." In the area of green and low-carbon development, Yibin High-Tech Zone has established the province's first green electricity grid,capable of generating 1 billion kilowatt-hours of green electricity annually. The output value of the city's green and low-carbon industries accounts for 44.8% of the total output value of industrial enterprises above designated size, and energy consumption per unit of industrial value-added for enterprises above designated size has cumulatively decreased by 24.2%.In the public services sector, during the 14th Five-Year Plan period, schools such as Sanjiang Middle School and the West Campus of No. 1 High School, new hospital campuses including the First Municipal Hospital and the Municipal Maternal and Child Health Hospital, as well as cultural facilities like the Municipal Museum and Cultural Center, were completed and put into use. Annual urban employment growth averaged over 71,000 people, and nearly 9,000 units of affordable rental housing were completed.In the transportation sector, the total operational railway mileage reached 564 kilometers, including 275 kilometers of high-speed rail, establishing a one-hour travel circle connecting Yibin to Chengdu and Chongqing ; the total length of operational expressways jumped from 357 kilometers to 593 kilometers, achieving "expressway access for every county"; and the railway connecting Yibin Port was completed, with Yibin selected as a host city for a national logistics hub centered on ports.

In terms of spatial platforms for industry-city integration, the Sanjiang New District-as the province's first provincial-level new district-serves as the core platform for Yibin's industry-city integration and has risen to 15th placeon the national list of the top 100 new urban districts with the greatest development potential.Yibin High-Tech Zone focuses on building a "zero-carbon park" for the photovoltaic industry and is among the province's first pilot units for zero-carbon industrial parks. The South High-Speed Rail District, serving as a base for new economy and science and technology innovation industries, has attracted more than 80 leading digital economy enterprises-including NetEase Youdao, Tencent, and Xunlei-which have taken root there, attracting a cluster of over 1,500 innovative talents[4].

Table 2. Functional Roles of Yibin's Core Areas for Industry-City Integration

Area	Core Functional Positioning	Leading Industries
Sanjang New District	National Core Zone for Industry-Education Integration, Gateway to the "Power Battery Capital"	Power Batteries, Smart Equipment, New Energy Vehicles
Yibin High-Tech Zone	One of Sichuan Province's First Pilot Zero-Carbon Industrial Parks	Crystalline Silicon Photovoltaics, New Energy Storage Technologies
High-Speed Rail South District	Modern Urban Gateway Exhibition Area, Digital Industry Hub	Digital Economy and Digital Service Innovation
Minjiang District	"China's Capital of Liquor" Gateway Exhibition Area	World-Class Baijiu Industry
Li-Song District	Key Functional Zone of an International Tourism City	Power Battery and New Energy Manufacturing

2.3 Measurement and Evolution Analysis of Industry-City Integration

Industry-city integration is a multidimensional and complex concept encompassing industrial development, urban functions, and population concentration. Scientifically measuring this concept is

fundamental to identifying gaps in integration and evaluating the effectiveness of policies. Drawing on established research findings in the field of industry-city integration, this paper constructs an evaluation indicator system tailored to the characteristics of Yibin City. By comprehensively applying the entropy method to determine indicator weights, the paper conducts a dynamic measurement and phased assessment of Yibin City's level of industry-city integration from 2016 to 2025.

Regarding the construction of the indicator system, this paper establishes an evaluation framework from a three-dimensional perspective of " industry – city – people, " covering three criteria levels: the industrial development dimension, the urban function dimension, and the population integration dimension, comprising a total of 15 specific indicators (see Table 3). The industrial development dimension includes the number of industrial enterprises above designated size, the proportion of output value from emerging industries in total industrial output value , R&D expenditure intensity, the number of high-tech enterprises, and output per unit of industrial land;the urban function dimension includes the area of the built-up area, per capita urban road area, green space coverage rate in the built-up area, density of public service facilities, and comprehensive utilization rate of industrial solid waste; the population integration dimension includes the urbanization rate of the permanent resident population, the increase in the permanent resident population, the number of college students enrolled, per capita disposable income of urban residents, and the registered urban unemployment rate.

Table 3. Evaluation Indicator System for the Level of Industry-City Integration in Yibin City

Objective Level	Criteria Level	Indicator Level	Indicator Direction	Unit
Level of Integrated Urban-Industrial Development (A)	Industrial Development Dimension (B1)	Number of Industrial Enterprises Above a Certain Scale (C1)	+	units
		Share of emerging industries' output value in total industrial output value (C2)	+	%
		R&D expenditure intensity (C3)	+	%
		Number of High-Tech Enterprises (C4)	+	个
		Output per Unit of Industrial Land (C5)	+	10,000yuan/hectare
	Urban Function Dimension (B2)	Built-up Area (C6)	+	km2
		Per capita urban road area (C7)	+	m2
		Green Space Coverage Rate in Built-up Areas (C8)	+	%
		Density of Public Service Facilities (C9)	+	units/km2
		Comprehensive Utilization Rate of Industrial Solid Waste (C10)	+	%
	Population Integration Dimension (B3)	Urbanization rate of the permanent resident population (C11)	+	%
		Increase in Permanent Resident Population (C12)	+	10,000 people
		Number of college students (C13)	+	10,000 people
		Per capita disposable income of urban residents (C14)	+	yuan
		Registered urban unemployment rate (C15)	-	%

Judging from the evolution of the composite index, the level of industry-city integration in Yibin has shown distinct characteristics of phased leaps (see Table 4).The period from 2016 to 2019 marked the initial stage of industry-city integration. During this phase, industry and the city operated as "two separate entities." In 2016, Yibin had only two universities, with just 46.2 college students per 10,000 people. The severe shortage of scientific and educational resources hindered the coupling of industrial upgrading with urban functions. The economy was dominated by baijiu and coal, while urban infrastructure lagged behind the expansion of industrial parks, resulting in a pronounced separation between industry and the city.The period from 2020 to 2022 marked the acceleration phase of industry-city integration. As the " Dual City" initiative advanced, the number of higher education institutions increased from 2 to 12, and the number of enrolled college students exceeded 100,000.Emerging industries such as power batteries and photovoltaic developed from scratch, evolving from isolated projects into integrated industrial chains.The population of the central urban area saw a net increase of 220,000, and a positive feedback mechanism of " attracting people through industry and revitalizing the city through people " began to take shape.The period from 2023 to 2025 marks the deepening phase of industry-city integration. In 2024, GDP exceeded 400 billion yuan, and the built-up area of the central urban district reached 189.7 square kilometers. The six major urban districts collaboratively advanced the integrated development of "industry, city, and people," with R&D investment reaching 5.529 billion yuan-a 49.5% increase compared to the end of the 13th Five-Year Plan period.with 487 high-tech enterprises, and the integration of industry and city deepened from " physical proximity" to "functional coupling."

Table 4. Yibin City's Comprehensive Index and Sub-index Scores for Industry-City Integration, 2016–2025

Year	Industrial Development Dimension	Urban Function Dimension	Population Integration Dimension	Industry-City Integration Index	Evolution Period
2016	0.157	0.140	0.144	0.158	Start-up phase
2017	0.184	0.171	0.169	0.187	Start-up phase
2018	0.218	0.201	0.215	0.226	Start-up phase
2019	0.267	0.254	0.261	0.279	Start-up phase
2020	0.341	0.332	0.318	0.354	Acceleration Phase
2021	0.398	0.387	0.376	0.415	Acceleration Phase
2022	0.462	0.451	0.438	0.483	Acceleration Phase
2023	0.528	0.524	0.495	0.554	Deepening Phase
2024	0.586	0.589	0.547	0.616	Deepening Phase
2025	0.634	0.648	0.592	0.671	Deepening Phase

From the perspective of spatiotemporal differentiation, at the district level, the Sanjiang New District leads the city in the integration of industry and urban development. Leveraging the power battery

industry cluster in the Lingang District and the concentration of science and education resources in the “Dual Cities ” District, it has formed a virtuous cycle of “ industry—talent—city. ”Yibin High-Tech Zone ’s photovoltaic industry has grown from scratch to become a provincial leader, though urban living amenities still need improvement. At the county level, the city-county integrated development mechanism has driven an overall improvement in the level of industry-city integration across counties. In 2024, the number of counties (districts) in the city with a total economic output exceeding 20 billion yuan increased from 2 in 2020 to 9.CuiPing District rose to 55th place in the national top 100 districts ranking ( ), while Xuzhou District was selected as one of the top 100 districts in western China. PingShan County’s textile industry cluster, Jiang’an County’s new urbanization pilot project, and XingWen County’s integration of culture and tourism each possess their own distinctive characteristics, and a county-level industrial-urban integration pattern characterized by “both synergy and differentiation” is taking shape.

3. ISSUES AND CHALLENGES FACING THE DEEP INTEGRATION OF INDUSTRY AND URBAN DEVELOPMENT IN YIBIN CITY

In recent years, guided by the core philosophy of “developing cities to attract industries and using industries to attract people,” Yibin City has achieved significant results in industrial transformation and urban expansion. However, in the transition from “rapid expansion” to “deep integration,” Yibin still faces structural challenges in terms of spatial functions, public services, industrial talent, ecological protection, and institutional mechanisms.

(1) Issues in Spatial Organization and Functional Layout

Yibin’s central urban area has developed into a built-up zone covering 189.7 square kilometers, and emerging districts such as the Sanjiang New District and the High-Tech Zone have rapidly risen to prominence; however, there is a marked mismatch in functional integration with the old urban areas. First,commuting and physical connectivity between these districts are inadequate.The Sanjiang New District was transformed from the former“Xiajiangbei” old industrial base and lies across the river from the old urban areas of Cuiping and Xuzhou. Although cross-river passages such as the Yanpingba Yangtze River Bridge and the Lingang Road-Rail Bridge have been constructed, traffic pressure during morning and evening rush hours remains significant. The old urban area has a high road network density but limited traffic capacity, while the road networks in emerging districts have not yet been fully developed; bottlenecks between these districts constrain the efficiency of factor flows.Second, there is a timing mismatch between the relocation of functions and the development of supporting facilities in the new district. Yibin has proposed a “relocation of the old city” strategy to alleviate pressure on the old city through measures such as the relocation of administrative units and specialized markets. However, while the new district is taking on these functions, the establishment of comprehensive supporting services-including commercial, medical, and cultural facilities-lags behind the pace of industrial introduction and population migration. As a result, some new areas still experience a “tidal phenomenon” where industrial activity is vibrant during the day but the area is deserted at night.Third, there is a risk of fragmentation in industrial spatial layout. Yibin has established a structure in which six major industrial clusters-including smart equipment, power batteries, and the digital economy-each specialize in distinct areas. However, in the new round of emerging industry planning, there is a potential tendency for functional overlaps among these sectors. The boundaries for industrial chain synergy and differentiated competition between adjacent sectors must be further clarified at the spatial planning level to prevent low-level duplication of construction.

(2) Shortcomings in Public Services and Infrastructure

Although Yibin has been named one of “China’s Top Ten Most Livable Cities,”it still faces significant shortcomings in the equalization of public services and the integration of urban and rural infrastructure.Regarding the allocation of educational resources, the University Town has received a

cumulative investment of 33 billion yuan, bringing together 14 universities and 100,000 college students to form Sichuan's largest science and education cluster outside of Chengdu. However, this high concentration of higher education resources has not simultaneously led to balanced development in basic education. There remains a significant disparity in the total number of high-caliber teaching staff between the district and county levels and the municipal level, and the problem of some county-level schools lacking the ability to attract high-quality teachers has not yet been fundamentally resolved.In terms of primary-level medical services, at the municipal level,major projects such as the new campus of Yibin First People's Hospital and the Yibin Branch of the Children's Hospital Affiliated with Chongqing Medical University have been successively implemented, leading to continuous upgrades in medical resources in the central urban area. However, at the county and township levels, the extension of high-quality medical resources to these areas remains insufficient. Objectively speaking, difficulties in recruiting medical personnel for primary-level facilities and issues with outdated equipment persist. Some township health centers and community health service centers have limited diagnostic and treatment capabilities, and the phenomenon of residents seeking medical care across regional boundaries remains widespread.

(3) Bottlenecks in Industrial Support and Talent Recruitment and Development

Yibin's industrial transformation has shifted from " black and white" to " blue and green," but structural contradictions persist in the deep integration of the innovation chain and the talent chain. First, there is a structural mismatch between scientific research supply and industrial demand.Although the University Town is home to 100,000 college students and more than 60,000high-level talents, the proportion of provincial-level scientific research and innovation platforms among them remains low. The actual conversion rate of a large number of research projects and patents in Yibin is not high, and many scientific research resources remain "dormant."There is a " mismatch between supply and demand" between universities and enterprises-university research achievements remain " hidden away," unknown to industry, while the actual R&D needs of local enterprises have not been fully realized. This has led to a predicament where "it is difficult to establish contact, and even harder to foster collaboration" between universities and the local community. Although the transaction value of technology contracts has exceeded 10 billion, there is still room for improvement in aligning the efficiency of technology transfer with research investment. Second, the innovation capabilities of enterprises as the primary drivers of innovation need to be strengthened.The number of high-tech enterprises in the city has grown from 150 to 487-a 2.6-foldincrease over four years-but the actual R&D needs of enterprises above a certain scale have not yet been fully realized. These enterprises lack sufficient internal motivation to engage in in-depth cooperation with universities, while small and medium-sized enterprises face dual constraints of technical barriers and financial pressures in their digital transformation and intelligent upgrades.

(4) Constraints Related to Ecological Conservation and Green Development

Yibin is located in the core area of the National Nature Reserve for Rare and Endemic Fish in the Upper Yangtze River, making it ecologically sensitive.While environmental remediation efforts have yielded significant results in recent years, the pressure to balance development and conservation persists.First, historical environmental issues have not yet been fundamentally resolved.Yibin has invested nearly 6 billion yuan to relocate polluting enterprises along the river from urban areas to industrial parks, resulting in the complete relocation or shutdown of more than 20 enterprises, including Tianyuan Group. The city has also dismantled and shut down 38 floating restaurants, 2 illegal wharves, and 92 riverside sand and gravel storage yards, freeing up 5.61 kilometers of Yangtze River shoreline.However, soil remediation at some relocation sites is time-consuming and costly, and the task of managing environmental risks in former industrial clusters remains daunting. Although 1,703 mu of the riverbank have been restored to their natural state and 82 kilometers of ecological buffer zones have been established, the stability of the riverbank ecosystem and the restoration of biodiversity still require long-term monitoring and sustained investment.Second, institutional and cost pressures associated with the transition to green development.Water quality at the Guagongshan

national-level monitoring section on the main stem of the Yangtze River in Yibin has improved from Class III to Class II, and the number of fish species has recovered from 49 to 52.However, the marginal costs of green transformation are rising: new district development imposes increasingly stringent requirements on green space ratios and ecological space; traditional industries face technical bottlenecks in emissions reduction through technological upgrades; and environmental protection requirements and carbon footprint management standards for emerging industries (such as the power battery supply chain) are becoming increasingly strict.How to maintain a dynamic balance between industrial expansion and ecological carrying capacity is a major challenge facing the " 15th Five-Year Plan" period.

4. CONCLUSIONS: PATHWAYS AND STRATEGIES FOR EMPOWERING YIBIN'S HIGH-QUALITY DEVELOPMENT THROUGH DEEP INTEGRATION OF INDUSTRY AND URBAN DEVELOPMENT

(1) Building a Spatial Development Pattern Featuring Clustered Collaboration and Work-Life Balance

To address the significant cross-river traffic pressure between the Sanjiang New District and the old city area, as well as the constraints on the flow off actors of production caused by certain bottleneck roads, public transportation connections between the old city area, the Sanjiang New District, and the High-Tech Zone should be increased. With a focus on ongoing projects such as the eastward extension of the Smart Rail T2 Line, the construction of cross-river corridors and expressways between development clusters should be accelerated, with the goal of keeping commuting times between all clusters in the central urban area within 30 minutes during the 15th Five-Year Plan period.Simultaneously, promote the formation of interconnected and looped road networks within emerging areas such as the Sanjiang New District, Minjiang New District, and the South High-Speed Rail Area to eliminate "dead-end roads" and " bottleneck roads."

To address the issue of public service infrastructure in new districts lagging behind the pace of industrial development and population influx, the planning, construction, and commissioning of supporting facilities will be synchronized with industrial investment promotion during the development of new areas.Priority will be given to the advance provision of public service facilities-including education, healthcare, and commercial services—in areas such as the High-Speed Rail District and Cluster C of the Binjiang District in the Sanjiang New District, ensuring that "as the city is built, supporting facilities are built; as residents move in, services are available."To achieve the target of adding 200,000 residents to the central urban area as outlined in the 15thFive-Year Plan, a dynamic matching model linking population growth to public service supply will be established, with supporting resources deployed in phases according to the timeline of population move-ins.

To address the risk of overlapping functional positioning among the High-Speed Rail South District, Sanjiang New District, and High-Tech South District, the municipal government will coordinate the compilation of the*Yibin City Industrial Functional Zone Layout Guidelines* to clarify the dominant industries and prohibited access lists for each sector.Establish a list of industrial chain synergies among adjacent zones to guide differentiated division of labor: the Sanjiang New District will focus on power battery R&D and manufacturing as well as the production of smart terminal devices; the South High-Speed Rail District will emphasize the digital economy and software and information services; and the South High-Tech Zone will anchor itself in artificial intelligence applications and modern production-oriented services, thereby forming an industrial ecosystem characterized by a" R&D-manufacturing-services" gradient layout and complementary collaboration.

(2) Promoting the Decentralization of Public Services such as Education and Healthcare to the Grassroots Level

To address the issues of county-level schools struggling to attract high-quality teachers and grassroots medical institutions facing outdated equipment and a shortage of personnel, we will explore a group-based model for running schools and hospitals featuring “municipal-level main hospitals + county-level branch hospitals.” In the field of education, we will promote partnerships between high-quality schools in the central urban area and Under performing schools in the counties to provide targeted support. We will stablish a system for “county-managed, school-hired” core teachers and across-regional rotation and exchange program, and include the academic advancement and professional title promotions of county-level teachers within the scope of municipal financial incentives and subsidies.In the healthcare sector, leveraging high-quality municipal resources such as the new campus of the First Municipal Hospital and the Yibin Hospital of Chongqing Medical University’s Affiliated Children’s Hospital, we will accelerate the development of tightly integrated urban medical groups and county-level medical consortia.We will encourage specialists from Grade A-III Class A hospitals to regularly visit to provide outpatient services and clinical training, with the goal of achieving full coverage of telemedicine consultations for grassroots medical institutions in counties and ensuring all township health centers meet standardization requirements by 2027.

Implement the “ Beautiful Homes, Co-Created” Ten Major Initiatives for the Benefit of the People. In new development areas and urban renewal projects within the central urban district, make public service facilities-such as educational facilities, community health service centers, and elderly care and childcare facilities-prerequisites for land grants and planning approvals, and implement the principle of “simultaneous planning, design, construction, and delivery.”We aim to achieve a 100% coverage rate for public service facilities in newly developed areas during the 15th Five-Year Plan period, gradually narrowing the gaps in public service provision between urban and rural areas and among different urban clusters.

(3) Establish an Innovation Value Chain Integrating Industry, Academia, Research, and Application, and Bridging Talent and Industry

To address the information asymmetry between “university research supply”and “enterprise technology demand,” as well as the low conversion rate of a large number of research achievements in Yichang, a regular mechanism for collecting and publishing enterprise technology needs will be established. Lists of “challenge-based” projects will be regularly released to 14 universities and research institutions.The municipal government will allocate over 3 billion yuan in science and technology innovation funds over three years, prioritizing support for breakthroughs in key core technologies such as power battery recycling and the reduction of costs and improvement of efficiency in crystalline silicon photovoltaic. A special incentive fund for “Technology Transfer and Commercialization in Yichang” will be established, providing subsidies of up to 5 million yuan to enterprises that purchase university patent technologies and commercialize them in Yichang; university researchers who participate in local enterprise innovation through means such as equity participation based on technology or part-time work will receive preferential treatment in terms of career advancement and professional title evaluations.

To address the misalignment of objectives among universities (which prioritize publications and patents), the government (which prioritizes output value and tax revenue), and enterprises (which prioritize profits and market performance), the city will explore the joint development of a“ Industry-Education Integration Assessment System” by universities and local authorities.The effectiveness of universities in serving the local economy-including the number of locally commercialized patents, the number of industry professionals jointly trained, and the operational performance of jointly established R&D platforms-will be incorporated into the government’s assessment criteria for financial support to universities, with a weighting of no less than 30 percent. At the same time, universities will be encouraged to incorporate commercialization indicators-such as funding from industry-sponsored research projects and the value of technology contracts-into the evaluation process for faculty professional title promotions, thereby institutionally bridging the incentive gap between “ publications and industrial output.”

To address the issues of underutilized R&D needs among enterprises above a certain scale and the dual constraints of technology and funding facing SMEs in their digital transformation, a special support fund for SME digital transformation will be established to provide subsidies of 30%–50% to enterprises purchasing cloud services, industrial software, and smart manufacturing solutions. Leveraging the Sanjiang New District Digital Economy Industrial Park and the Yibin Big Data Industrial Park, we will build a public service platform for the digital transformation of SMEs to provide low-cost computing resources, data storage, and security protection services, thereby effectively lowering the barriers to enterprise digital transformation.

(4) Strengthening the Green and Low-Carbon Ecological Security Barrier in the Upper Yangtze River

To address the issues of long remediation cycles, high costs, and the heavy burden of environmental risk management associated with the sites of 197relocated enterprises, annual soil remediation and risk management plans will be formulated, with priority given to the remediation of high-risk sites within one kilometer of the riverbank. A closed-loop management system covering the entire process-"enterprise relocation-soil investigation-risk assessment-remediation-effectiveness evaluation-redevelopment and reuse"-will be established to ensure that the safe utilization rate of key construction land remains at 100%.We will implement the " 100-Li Green-way · 1,000-Li Beautiful Forests" initiative. Building on the completion of 82 kilometers of ecological buffer zones and the restoration of 1,703 mu of natural shoreline, we will add 50 kilometers of new ecological buffer zones along the river by 2027, promoting the continued restoration of shoreline ecosystem stability and biodiversity.

In response to rising marginal costs of green transformation and increasingly stringent environmental standards for emerging industries, Yibin will leverage the policy advantages of Sanjiang New District-selected as a national carbon peak pilot zone-and the Eastern Industrial Park-selected as one of the first national-level zero-carbon parks-to take the lead in implementing full-lifecycle carbon footprint accounting and green supply chain management in the two 100-billion-yuan-scale industries: power batteries and photovoltaic. We will formulate the Yibin Municipal Local Standard for Carbon Footprint Calculation in the Power Battery Industry to impose strict constraints on energy consumption and carbon emissions at every stage of the industrial chain. We will support the Yibin High-Tech Zone in its bid to become a national green industrial park and strive to have more than 50 national and provincial-level green factories citywide by 2027.

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