

Assessing the High Quality Development of New Type Urbanization and Coordinated Development Strategies in Western China

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Abstract

The western region of China occupies a strategic position in China's coordinated regional development and modernization process, making the high-quality development of new-type urbanization a major task of the Western Development Strategy in the new era. Using statistical data from 2015 to 2023, this study constructs a multidimensional evaluation framework covering population agglomeration, economic development quality, urban spatial form, public service efficiency, and ecological support capacity, and applies the entropy weight method and coupling coordination degree model to assess urbanization quality and systemic coordination in western China. The results show that urbanization in western China has generally entered an accelerated stage characterized by both gradient catch-up and structural differentiation. Although coupling among the five subsystems is relatively high, coordination remains low, indicating that the region is still transitioning from quantitative expansion to qualitative improvement. Several provinces continue to face structural constraints related to population differentiation, uneven resource allocation, and insufficient infrastructure coverage. These findings suggest that western China should adopt differentiated urbanization pathways and strengthen institutional innovation, ecological protection, intensive land use, urban-rural integration, and cross-regional coordination to promote high-quality urbanization and coordinated regional development.

1. Introduction

The western region of China plays a pivotal role in the country's overall reform and development agenda, serving simultaneously as a national ecological security barrier, a strategic base for energy and mineral resources, and a key gateway for opening up toward Central and Western Asia. According to the official statistical classification, western China comprises twelve provincial-level administrative units, including Shaanxi, Sichuan, Yunnan, Guizhou, Guangxi, Gansu, Qinghai, Ningxia, Tibet, Xinjiang, Inner Mongolia, and Chongqing. This region accounts for a substantial share of China's total land area and population, and thus holds irreplaceable strategic significance for national security and long-term development.

With the implementation of the Guiding Opinions on Promoting the Formation of a New Development Pattern for the Western Development Strategy in the New Era and the continuous advancement of the new-type urbanization strategy, the pace of urbanization in western China has accelerated markedly in recent years[1]. The Chinese leadership has repeatedly emphasized the need to advance new-type urbanization in close coordination with comprehensive rural revitalization[2]. This requirement poses higher expectations for addressing unbalanced and insufficient development in western China and for promoting high-quality growth across the region.

Unlike traditional urbanization, which primarily focuses on the increase in urbanization rates and the expansion of urban space, new-type urbanization places greater emphasis on a people-centered approach[3]. It prioritizes the coordinated improvement of economic development quality, public service provision, spatial efficiency, and ecological environmental protection. In this context, urbanization is no longer viewed merely as a demographic or spatial process, but rather as a comprehensive transformation of development patterns and living standards.

For western China, this conceptual shift is particularly significant. Given the region's fragile ecological environment, relatively weak economic foundation, and pronounced regional disparities, pursuing an extensive, scale-driven urbanization model is neither feasible nor sustainable. Instead, improving the quality and coordination of urbanization systems has become a core policy and research concern.

From a national perspective, China's urbanization has gradually evolved into a spatial pattern characterized by "eastern leadership, central region's rise, and western catch-up"[4]. Although the urbanization level in western China has steadily increased in recent years, notable gaps remain when compared with the eastern region, particularly in terms of industrial support capacity, the equalization of public services, and the compatibility between urban development and ecological carrying capacity. Moreover, disparities within the western region itself are increasingly evident.

In some provinces, rapid population agglomeration and spatial expansion have not been accompanied by commensurate improvements in development quality[4]. Problems such as insufficient industrial support, fragmented urban spatial structures, and weak coordination among urbanization subsystems have gradually emerged. These challenges highlight the limitations of relying solely on scale expansion and underscore the urgency of shifting toward a high-quality, coordinated urbanization pathway.

Against this backdrop, based on statistical data from 2015 to 2023, this study constructs a multidimensional evaluation framework tailored to the regional characteristics of western China to systematically assess the level of high-quality development of new-type urbanization. The framework captures the internal structural features and coordination status of the urbanization system from the perspectives of population, economy, space, public services, and ecological support.

Furthermore, this study provides a comprehensive review of the urbanization trajectory and transformation practices in western China, explores a sustainable development model emphasizing ecological priority, innovation-driven growth, and urban–rural integration, and proposes targeted pathways to promote high-quality urbanization in the region.

This research contributes to the refinement of regional urbanization policy frameworks and offers empirical evidence for advancing urban–rural integration and sustainable development in western China. More broadly, it provides valuable insights for understanding how high-quality urbanization can be achieved in less-developed and ecologically sensitive regions, thereby supporting the broader goal of coordinated regional development and modernization.

2. Urbanization Development Process and Current Conditions in Western China

2.1. Analysis of the Current State of Urbanization

2.1.1. Urbanization Process and Regional Disparities

The urbanization process in western China has been closely aligned with the implementation of national development strategies. Since the launch of the Western Development Strategy, and particularly since the “13th Five-Year Plan” period, the sustained advancement of new-type urbanization and coordinated regional development policies has propelled the region into a phase of accelerated urbanization. This trend reflects the tangible outcomes of China’s regional coordination strategy and the deepening implementation of new-type urbanization policies[3].

Between 2015 and 2023, the resident population urbanization rate in western China exhibited a steady upward trajectory. The scale of the urban population continued to expand, and the structure of the urban system gradually improved, indicating sustained progress in infrastructure development, industrial spatial reconfiguration, and the expansion of public service coverage.

From an interprovincial perspective, however, urbanization development within western China displays pronounced internal heterogeneity. As shown in Fig. 1, provinces with relatively low initial urbanization levels—such as Guizhou, Tibet, and Gansu—experienced larger increases in urbanization rates, demonstrating a clear latecomer catch-up effect. In contrast, regions with relatively high urbanization levels, including Inner Mongolia and Chongqing, recorded more moderate growth rates, as their urbanization focus gradually shifted from scale expansion toward structural optimization and functional upgrading.

These differences stem not only from variations in natural conditions, economic foundations, and demographic structures, but also from divergent policy orientations and stages of development across provinces. Overall, urbanization in western China has transitioned from a phase of comprehensive acceleration to one characterized by differentiated advancement, exhibiting the coexistence of “gradient catch-up” and “structural differentiation.” Although the overall urbanization level is converging toward the national average, internal imbalances remain prominent, and significant pressure persists in improving urbanization quality[5].

2.1.2. Allocation and Structural Characteristics of Educational Resources

The allocation of educational resources constitutes a critical dimension for assessing both urbanization quality and the accumulation of human capital[6]. At the level of compulsory education, several western provinces maintain large enrollments in primary and junior secondary schools, reflecting sizable school-age populations and generating sustained demand for educational provision. Compared with national averages, some regions continue to face shortages in teacher allocation and educational facilities, resulting in considerable pressure on basic education systems.

In terms of higher education, western China exhibits a pronounced spatial concentration pattern. Provinces such as Shaanxi, Chongqing, and Sichuan have developed relatively dense clusters of higher education institutions, benefiting from historical accumulation and national strategic layout. These concentrations play a vital role in supporting regional innovation capacity and talent cultivation. By

contrast, provinces such as Tibet and Qinghai possess limited higher education resources, constraining their capacity to train and attract skilled labor.

Notably, frontier regions including Yunnan and Xinjiang have experienced rapid growth in university enrollment in recent years, which has intensified demand for high-quality faculty and advanced research platforms. Overall, while western China has achieved progress in expanding the scale of education, persistent disparities in resource allocation across regions and between urban and rural areas remain evident. Such structural imbalances in educational resources restrict orderly population mobility and undermine improvements in urbanization quality, underscoring the need for enhanced interregional coordination and optimized allocation mechanisms.

2.1.3. Population Age Structure and Spatial Patterns

Population age structure constitutes a key determinant of the sustainability of urbanization[7]. An analysis based on indicators such as the child dependency ratio, old-age dependency ratio, and total dependency ratio reveals significant regional differentiation in the demographic burden across western China.

Specifically, provinces such as Tibet, Guizhou, and Guangxi exhibit child dependency ratios that are substantially higher than the national average. These regions face rigid short-term demand for educational investment, while simultaneously possessing relatively strong long-term labor supply potential. In contrast, Chongqing and Sichuan record comparatively high old-age dependency ratios, resulting in heightened pressure on pension systems and healthcare services. Provinces such as Qinghai and Ningxia show relatively low proportions of working-age populations and higher overall dependency burdens, reflecting more complex demographic constraints.

These demographic differences generate heterogeneous constraints on the urbanization process. Regions with high child dependency ratios must simultaneously expand educational investment and employment absorption capacity, whereas areas experiencing pronounced population aging need to strengthen public service provision and social security systems. The multidimensional differentiation of population structures makes it impractical for western China to adopt a uniform urbanization pathway, instead necessitating more precise and differentiated development strategies.

2.2. Development Foundations and Conditions of Urbanization in Western China

2.2.1. Resource Endowment Foundations

Western China is characterized by pronounced resource endowments and constitutes one of China's most important regions for energy resources and ecological security. The region is rich in coal, oil, natural gas, as well as renewable energy resources such as wind and solar power, providing a solid material basis for energy development and related industries. In addition, western China features diverse natural landscapes

and distinctive cultural tourism resources, offering significant potential for the development of eco-tourism and integrated cultural–tourism industries.

From a locational perspective, western China occupies an inland frontier position and shares borders with multiple countries, serving as a critical corridor for westward opening under the Belt and Road Initiative. This geographical advantage creates favorable conditions for the development of border-oriented open economies and cross-border cooperation.

However, these advantages are accompanied by substantial constraints. The ecological environment of western China is generally fragile, and the amount of land suitable for large-scale urban development is limited[8]. Ecologically sensitive areas such as the Qinghai–Tibet Plateau, the Loess Plateau, and the Yunnan–Guizhou Plateau perform vital ecological functions while simultaneously imposing rigid constraints on urban expansion. In some localities, urban growth and resource exploitation have proceeded without sufficient consideration of ecological carrying capacity. Resource utilization remains dominated by primary extraction, with relatively short industrial chains, leading to a mismatch between ecological pressures and development benefits.

Accordingly, urbanization in western China must proceed under strict ecological protection requirements. Enhancing resource-use efficiency, extending industrial value chains, and improving ecological compensation mechanisms are essential for transforming resource endowment advantages into sustained improvements in development quality[9].

2.2.2. Economic Development Foundations

The level of economic development constitutes the core driving force of urbanization. High-performing economies promote urban growth through the agglomeration of production factors, industrial upgrading, and employment creation[10]. In terms of aggregate scale, western China’s economic output has continued to grow, yet a substantial gap remains relative to the eastern region. Per capita economic indicators also lag behind national averages, indicating limited economic support capacity for urbanization.

By 2023, western China’s gross regional product reached approximately RMB 26.9 trillion, representing steady growth compared with 2020 but remaining significantly lower than that of the eastern region. On a per capita basis, regional GDP averaged around RMB 70,900, also below the level of the central region. This relative economic underperformance constrains employment absorption, infrastructure investment, and public service provision, thereby limiting improvements in urbanization quality.

Marked internal disparities further characterize the economic landscape of western China. Certain resource-based and nodal cities have achieved relatively rapid growth by leveraging energy development, locational advantages, or targeted policy support. In contrast, ecologically fragile and remote areas tend to exhibit weak industrial foundations and insufficient endogenous growth momentum. These economic disparities are directly reflected in urbanization outcomes, often manifesting as mismatches between urban spatial expansion and industrial support capacity.

Overall, western China remains subject to a reinforcing constraint cycle characterized by a weak economic base, limited urban carrying capacity, and insufficient population agglomeration. Breaking this cycle requires accelerating industrial structure optimization and enhancing development quality to provide a more robust economic foundation for urbanization.

2.2.3. Urban Infrastructure Conditions

The urban spatial carriers of western China display a dual characteristic of rapid framework expansion and a relatively strong ecological baseline[11]. In recent years, significant progress has been made in urban infrastructure construction, and the basic spatial framework of cities has gradually taken shape. Indicators such as road length, built-up area, and green space have continued to expand, providing essential support for factor mobility and urban operations.

In per capita terms, western China exhibits certain advantages in road area and park green space, reflecting the availability of spatial resources under relatively low population density conditions. These characteristics provide favorable conditions for improving urban livability and environmental quality.

Nevertheless, from the perspectives of infrastructure density and service quality, substantial shortcomings remain. Road network density, coverage of energy pipelines, and accessibility of public facilities are generally lower than in the eastern region, particularly in county-level areas and remote localities. A pattern of “rapid expansion in total quantity but slow optimization in structure” is evident, constraining the improvement of urban functions and residents’ quality of life.

Overall, urban infrastructure in western China is characterized by the coexistence of an initially formed spatial framework and insufficient service efficiency. Future urbanization efforts must shift from an emphasis on scale construction toward quality enhancement, with a focus on improving the balance, resilience, and sustainability of infrastructure systems.

2.2.4. Social Development Foundations

The level of social development directly reflects the extent to which the benefits of urbanization are shared. Between 2015 and 2023, per capita disposable income for both urban and rural residents in western China increased steadily, indicating tangible improvements in livelihoods. In most provinces, rural income growth outpaced that of urban residents, highlighting the positive effects of poverty alleviation and rural revitalization policies in narrowing the urban–rural income gap.

This trend reflects a broader reallocation of policy resources, industrial projects, and social capital toward rural areas. Through the development of specialty agriculture, rural tourism, e-commerce, and the implementation of agricultural subsidies, income channels for rural residents have expanded, and the inclusiveness of growth has improved.

However, in absolute terms, residents’ income levels in western China remain significantly lower than those in the eastern region, and the supply of high-quality employment opportunities remains insufficient.

In some areas, the growth of urban residents' income has slowed, indicating that industrial transformation and employment structure optimization require further advancement. Income disparities between urban and rural areas, as well as among regions, have not yet been fundamentally reversed.

Overall, while social development in western China has progressed steadily, its capacity to support high-quality urbanization remains limited. Strengthening public service systems and expanding employment opportunities are essential for enhancing the endogenous driving forces of urbanization.

3. Evaluation of High-Quality Urbanization in Western China Based on the Connotation of New-Type Urbanization

3.1. Conceptual Connotation and Evaluation Principles of High-Quality New-Type Urbanization

High-quality new-type urbanization represents a systematic transformation of traditional urbanization patterns. It emphasizes a people-centered development philosophy and seeks to achieve coordinated progress across population, economy, space, public services, and ecological systems[12]. Rather than focusing solely on the expansion of urban scale or increases in urbanization rates, high-quality urbanization stresses structural optimization, functional improvement, and sustainability.

In the context of western China, high-quality new-type urbanization must simultaneously address development inadequacies and ecological constraints[13]. This requires a comprehensive evaluation framework capable of capturing both development performance and coordination among subsystems. Accordingly, the construction of the evaluation system in this study adheres to the following principles.

First, the systematic principle is emphasized. Urbanization is conceptualized as an integrated system composed of multiple interrelated subsystems. The evaluation framework must therefore reflect the interactions and interdependencies among population dynamics, economic development, spatial structure, public service provision, and ecological support capacity[14].

Second, the people-centered principle is adopted. Improving residents' well-being and development opportunities constitutes the ultimate objective of new-type urbanization. Indicators related to employment, income, education, healthcare, and living conditions are incorporated to reflect the inclusiveness and quality of urban development[15].

Third, the regional adaptability principle is followed. Given the pronounced heterogeneity across western China, the evaluation system is designed to reflect regional characteristics and development realities, avoiding the mechanical application of uniform standards derived from more developed regions[16].

Finally, the operability and data availability principle is ensured. All selected indicators are derived from authoritative statistical sources and are measurable, comparable, and suitable for quantitative analysis over time

3.2. Construction of the Evaluation Indicator System

Based on the conceptual framework of high-quality new-type urbanization and existing literature, this study constructs a multidimensional evaluation indicator system comprising five subsystems: population agglomeration, economic development quality, urban spatial form, public service efficiency, and ecological support capacity. Each subsystem reflects a distinct yet interrelated dimension of urbanization quality[16–18].

The population agglomeration subsystem focuses on the scale, structure, and mobility of the population[19]. Indicators such as the urbanization rate of the resident population, employment structure, and population dependency ratios are included to capture both demographic concentration and structural sustainability.

The economic development quality subsystem emphasizes efficiency and structural upgrading rather than sheer scale expansion[20]. Indicators related to per capita economic output, industrial structure, and innovation capacity are used to reflect the ability of the urban economy to provide stable employment and support long-term development.

The urban spatial form subsystem assesses land-use efficiency and spatial organization. Indicators such as built-up area per capita, road area per capita, and population density are employed to evaluate whether urban spatial expansion is intensive, compact, and functionally coordinated[21].

The public service efficiency subsystem measures the accessibility and quality of public services, including education, healthcare, social security, and infrastructure provision[22]. These indicators reflect the extent to which urbanization outcomes are equitably shared among residents.

The ecological support capacity subsystem captures the constraints and feedback imposed by the natural environment. Indicators related to green space, pollution emissions, and resource consumption intensity are included to assess the sustainability and environmental compatibility of urban development[23].

Together, these five subsystems constitute a comprehensive framework for evaluating the quality and coordination of new-type urbanization in western China.

Table 1
Comprehensive Evaluation Indicator System for High-Quality Urbanization in Western China

Criterion Layer (Level 1)	Criterion Layer (Level 1)	Criterion Layer (Level 1)	Criterion Layer (Level 1)
Population Urbanization	Population Scale	Proportion of Urban Population in Total Population	%
		Urban Population Density	persons/km ²
	Human Capital	Number of Teachers in Higher Education Institutions	persons
		Number of Students Enrolled in Higher Education Institutions	persons
		Student–Teacher Ratio in Higher Education Institutions	%
		Average Enrollment in Upper Secondary Education	persons
		Per Capita Education Expenditure	CNY
Economic Urbanization	Economic Quality	GDP per Capita	CNY
		Fiscal Revenue per Capita	billion CNY/10,000 persons
		Total Retail Sales of Consumer Goods per Capita	billion CNY/10,000 persons
		Per Capita Disposable Income of Urban Residents	CNY
	Economic Structure	Share of Secondary Industry Output in GDP	%
		Share of Tertiary Industry Output in GDP	%
Spatial Urbanization	Spatial Coverage	Built-up Area	km ²
		Green Coverage Rate of Built-up Areas	%
		Park Green Space per Capita	m ² /person
	Spatial Density	Total Length of Urban Roads at Year-End	km
		Urban Road Area per Capita	m ² /person
Social Urbanization	Basic Healthcare	Number of Hospital Beds	10,000 beds
	Basic Pension	Number of Participants in Basic Pension Insurance	10,000 m ³

Criterion Layer (Level 1)	Criterion Layer (Level 1)	Criterion Layer (Level 1)	Criterion Layer (Level 1)
	Urban Living Conditions	Old-Age Dependency Ratio	%
		Urban Gas Supply Coverage Rate	%
		Water Supply Coverage Rate	%
		Daily Urban Wastewater Treatment Capacity	10,000 m ³
		Harmless Treatment Rate of Domestic Waste	%
		Number of Public Toilets per 10,000 Persons	units
Ecological Urbanization	Resource Constraints	Water Resources per Capita	m ³ /person
		Number of National Nature Reserves	units
		Area of National Nature Reserves	10,000 ha
	Resource Consumption	Electricity Consumption per Capita	kWh/person
		Daily Domestic Water Consumption per Capita	L/person

3.3. Data Sources and Processing Methods

This study utilizes panel data for twelve provincial-level regions in western China covering the period from 2015 to 2023. All data are obtained from authoritative sources, including the *China Statistical Yearbook*, *China Urban Construction Statistical Yearbook*, *China Population and Employment Statistical Yearbook*, and statistical yearbooks of individual provinces[24].

To ensure comparability across indicators with different units and magnitudes, all raw data are standardized prior to analysis. For positive indicators, higher values represent better performance, whereas for negative indicators, higher values indicate poorer performance. Accordingly, different normalization formulas are applied to positive and negative indicators to eliminate dimensional inconsistencies.

Missing data for certain years or regions are addressed using interpolation methods based on adjacent-year averages, ensuring data continuity without significantly affecting overall trends. This preprocessing approach enhances the robustness and reliability of the subsequent quantitative analysis.

3.4. Entropy Weight Method

To objectively determine the weights of evaluation indicators and reduce subjectivity, this study employs the entropy weight method. This method assigns weights based on the degree of variation in each indicator, under the premise that indicators with greater information entropy contribute more to system differentiation[25, 26].

First, the standardized indicator values are used to calculate the proportion of each indicator across regions and years. Second, the information entropy of each indicator is computed. Indicators with lower entropy values—indicating greater variability—are assigned higher weights. Finally, normalized entropy weights are obtained and used to calculate composite scores for each subsystem and the overall urbanization quality index.

The entropy weight method allows for a data-driven determination of indicator importance and enhances the objectivity and credibility of the evaluation results.

3.5. Coupling Coordination Degree Model

Urbanization quality depends not only on the performance of individual subsystems but also on the degree of coordination among them. To capture this interaction, this study applies the coupling coordination degree model to assess the extent to which the five subsystems develop synergistically.

The coupling degree reflects the strength of interaction among subsystems, while the coordination degree evaluates whether these interactions lead to harmonious and balanced development. By integrating subsystem scores with coordination coefficients, the model yields a comprehensive coordination index for each region and year.

Based on existing literature, the coordination degree is classified into several stages, ranging from severe imbalance to high-level coordination. This classification facilitates the identification of regional differences in coordination status and provides a basis for diagnosing structural constraints in the urbanization process.

4. Measurement Results and Spatiotemporal Characteristics of High-Quality Urbanization in Western China

4.1. Overall Measurement Results of High-Quality Urbanization

Based on the entropy-weighted composite index, this study calculates the overall level of high-quality new-type urbanization for western China from 2015 to 2023. The results indicate that the comprehensive urbanization quality index exhibits a steady upward trend over the study period, reflecting continuous improvement in the overall performance of urbanization systems across the region.

Specifically, the average composite index increased year by year, demonstrating that western China has gradually transitioned from an initial stage of quality improvement to a more stable phase of

advancement. However, despite this positive trajectory, the absolute level of urbanization quality remains relatively low compared with more developed regions, suggesting that western China is still situated in a critical period of transformation from quantitative expansion toward qualitative enhancement.

From a regional perspective, significant interprovincial disparities persist. Provinces such as Chongqing, Shaanxi, and Inner Mongolia consistently exhibit higher composite scores, reflecting their relatively strong economic foundations, more complete urban systems, and higher levels of public service provision. In contrast, provinces such as Tibet, Qinghai, and Gansu record comparatively lower scores, indicating persistent constraints related to ecological fragility, limited economic capacity, and dispersed settlement patterns.

Overall, the measurement results reveal a pattern characterized by “overall improvement with persistent heterogeneity.” While the quality of urbanization in western China has improved steadily, regional imbalances remain pronounced and constitute a key structural challenge.

Table 2
Comprehensive Evaluation Scores of High-Quality Urbanization Development in Western China, 2024

Province	Population Urbanization	Economic Urbanization	Spatial Urbanization	Social Urbanization	Ecological Urbanization	Overall Score
Inner Mongolia	0.0858	0.0735	0.0757	0.1202	0.0366	0.3920
Guangxi	0.0806	0.0705	0.0937	0.1557	0.0637	0.4641
Chongqing	0.1285	0.0414	0.1562	0.3566	0.0953	0.7780
Sichuan	0.0444	0.0331	0.0704	0.1118	0.0753	0.3349
Guizhou	0.0822	0.0834	0.0977	0.0892	0.0920	0.4445
Yunnan	0.0954	0.0536	0.0868	0.1959	0.0994	0.5312
Xizang	0.0798	0.0473	0.0625	0.1797	0.0831	0.4524
Shaanxi	0.0725	0.0683	0.0534	0.1863	0.0582	0.4387
Gansu	0.0707	0.0391	0.0410	0.2529	0.0754	0.4791
Qinghai	0.0519	0.0181	0.0486	0.0980	0.0682	0.2847
Ningxia	0.0404	0.0469	0.0732	0.0859	0.0700	0.3163
Xinjiang	0.0622	0.0900	0.0619	0.1793	0.0659	0.4594
Average	0.0745	0.0554	0.0768	0.1676	0.0736	0.4479

4.2. Subsystem Measurement Results and Structural Differences

To further explore the internal structure of urbanization quality, this study examines the measurement results of the five subsystems: population agglomeration, economic development quality, urban spatial form, public service efficiency, and ecological support capacity.

The **population agglomeration subsystem** demonstrates moderate improvement over time, driven primarily by increases in the resident population urbanization rate and employment absorption capacity in major cities. However, in several provinces, population outflows and aging trends constrain further improvement, resulting in relatively low subsystem scores.

The **economic development quality subsystem** shows the most pronounced growth among the five subsystems. Improvements in per capita output and industrial structure upgrading contribute significantly to rising scores in provinces with strong resource endowments or strategic positioning. Nevertheless, in economically weaker regions, limited industrial diversification continues to restrict performance.

The **urban spatial form subsystem** exhibits relatively stable but modest growth. While expansion of built-up areas and infrastructure investment have improved basic urban frameworks, inefficiencies in land use and fragmented spatial structures persist in some regions, limiting further gains.

The **public service efficiency subsystem** records steady improvement, reflecting increased investment in education, healthcare, and social security. Despite this progress, disparities in service accessibility and quality between urban and rural areas, as well as among provinces, remain evident.

In contrast, the **ecological support capacity subsystem** displays relatively low scores and limited improvement. In ecologically fragile areas, environmental constraints and rising development pressures lead to tensions between urban expansion and ecological protection, constraining overall urbanization quality.

These results indicate that improvements in urbanization quality are uneven across subsystems, with economic development advancing more rapidly than ecological and public service dimensions. This imbalance highlights the structural nature of quality constraints in western China's urbanization process.

4.3. Temporal Evolution Characteristics

An analysis of temporal evolution reveals that high-quality urbanization in western China has undergone a gradual but non-linear improvement process. During the early years of the study period, growth in the composite index was relatively slow, reflecting the lingering effects of an extensive development model and structural rigidities.

Following the mid-2010s, the pace of improvement accelerated, coinciding with intensified policy support for new-type urbanization, poverty alleviation, and infrastructure investment. This acceleration suggests that institutional adjustments and targeted interventions played a positive role in enhancing urbanization quality.

However, after entering the early 2020s, the growth rate of the composite index shows signs of moderation. This deceleration indicates that further improvements increasingly depend on deep structural reforms, technological innovation, and governance capacity enhancement, rather than on factor input expansion alone.

Overall, the temporal evolution pattern reflects a shift from policy-driven acceleration toward a stage in which endogenous development capacity becomes increasingly important.

4.4. Spatial Differentiation Characteristics

From a spatial perspective, the distribution of high-quality urbanization levels across western China exhibits clear differentiation. A pattern of “higher levels in core regions and lower levels in peripheral areas” is evident. Provinces with strong central cities and transportation hubs tend to achieve higher urbanization quality, benefiting from factor agglomeration and spillover effects.

Spatially adjacent provinces often display similar urbanization quality levels, suggesting the presence of regional clustering effects. Conversely, geographically remote and ecologically sensitive regions tend to form low-value clusters, reflecting compounded constraints related to location, environment, and development capacity.

The spatial differentiation results indicate that high-quality urbanization in western China is shaped not only by internal provincial conditions but also by interregional linkages and spatial spillovers. Strengthening cross-regional coordination and improving connectivity may therefore contribute to narrowing spatial disparities.

5. Coupling Coordination Analysis and Constraint Diagnosis of High-Quality Urbanization

5.1. Measurement Results of Coupling Coordination Degree

Based on the coupling coordination degree model, this study measures the interaction intensity and coordination status among the five subsystems of high-quality urbanization in western China from 2015 to 2023. The results show that the overall coupling degree remains at a relatively high level throughout the study period, indicating strong interconnections among population, economy, space, public services, and ecological systems.

However, the coordination degree exhibits a markedly different pattern. Despite high coupling intensity, the coordination level remains relatively low, revealing a structural phenomenon of “high coupling but low coordination.” This finding suggests that while the subsystems are closely linked, their development trajectories are not sufficiently synchronized, resulting in efficiency losses and structural tensions within the urbanization system.

From a temporal perspective, the coordination degree shows a gradual upward trend, shifting from a state of moderate imbalance toward basic coordination in several provinces. Nevertheless, most regions remain

in transitional stages, and few have entered a phase of high-level coordination. This indicates that improvements in coordination lag behind overall subsystem development, highlighting the complexity of achieving high-quality urbanization.

Table 3
Comprehensive Evaluation Results of the Coupling Coordination Degree in Western China

Region	Coupling Degree (C)	Coordination Index (T)	Coupling Coordination Degree (D)	Coordination Level	Coordination Status
Inner Mongolia	0.504	0.346	0.418	5	Near Discoordination
Guangxi	0.951	0.467	0.666	7	Primary Coordination
Chongqing	0.927	0.845	0.885	9	Good Coordination
Sichuan	0.725	0.249	0.425	5	Near Discoordination
Guizhou	0.601	0.553	0.576	6	Barely Coordinated
Yunnan	0.941	0.583	0.741	8	Intermediate Coordination
Xizang	0.915	0.427	0.625	7	Primary Coordination
Shaanxi	0.865	0.379	0.573	6	Barely Coordinated
Gansu	0.552	0.377	0.456	5	Near Discoordination
Qinghai	0.497	0.156	0.278	3	Moderate Discoordination
Ningxia	0.366	0.248	0.301	4	Mild Discoordination
Xinjiang	0.84	0.449	0.614	7	Primary Coordination

Table 4
Classification Criteria for the Coupling Coordination Degree

Range of Coupling Coordination Degree (D)	Coordination Status	
	Coordination Level	
[0.0 ~ 0.1)	1	Extreme Discoordination
[0.1 ~ 0.2)	2	Severe Discoordination
[0.2 ~ 0.3)	3	Moderate Discoordination
[0.3 ~ 0.4)	4	Mild Discoordination
[0.4 ~ 0.5)	5	Near Discoordination
[0.5 ~ 0.6)	6	Barely Coordinated
[0.6 ~ 0.7)	7	Primary Coordination
[0.7 ~ 0.8)	8	Intermediate Coordination
[0.8 ~ 0.9)	9	Good Coordination
[0.9 ~ 1.0]	10	High-Quality Coordination

5.2. Interprovincial Differences in Coupling Coordination

Significant interprovincial variation characterizes the coupling coordination degree across western China. Provinces such as Chongqing, Shaanxi, and Sichuan consistently exhibit higher coordination levels, benefiting from relatively balanced development among subsystems, stronger economic foundations, and more mature governance structures.

In contrast, provinces such as Tibet, Qinghai, and Gansu remain in low-coordination stages. In these regions, ecological constraints, limited economic capacity, and insufficient public service provision jointly restrict coordinated development. Although certain subsystems may perform relatively well in isolation, their weak alignment with other dimensions results in low overall coordination.

Provinces with abundant resource endowments but less diversified industrial structures often display moderate coupling degrees accompanied by low coordination levels. This reflects a development pattern in which resource-driven economic growth outpaces improvements in population structure, public services, and ecological protection, leading to structural imbalances.

Overall, the spatial distribution of coordination levels mirrors the broader pattern of regional differentiation in urbanization quality, reinforcing the need for differentiated and region-specific policy interventions.

5.3. Diagnosis of Key Constraint Factors

To further identify the underlying causes of low coordination, this study conducts a constraint diagnosis by examining the relative contributions of each subsystem to coordination inefficiencies. The results indicate

that ecological support capacity and public service efficiency are the most significant constraint factors across most provinces.

In ecologically fragile regions, strict environmental protection requirements and limited carrying capacity constrain urban expansion and industrial development. At the same time, insufficient investment in ecological restoration and green infrastructure exacerbates tensions between development and protection, thereby reducing coordination levels.

Public service provision constitutes another major constraint. In several provinces, gaps in education, healthcare, and social security systems limit population agglomeration and labor mobility. These deficiencies weaken the feedback mechanisms between population dynamics and economic development, undermining overall system coordination.

In addition, mismatches between economic development and urban spatial form are evident in some regions. Rapid expansion of built-up areas without corresponding industrial support or population inflows leads to inefficient land use and underutilized infrastructure, further constraining coordination.

These findings suggest that low coordination is not the result of a single weak subsystem, but rather of compounded mismatches among multiple dimensions of urbanization.

5.4. Structural Mechanisms Behind Coordination Constraints

The persistence of coordination constraints in western China reflects deeper structural mechanisms. First, the legacy of an extensive, investment-driven development model has led to uneven subsystem advancement. Economic growth has often been prioritized over public services and ecological protection, creating long-term structural imbalances.

Second, institutional fragmentation across administrative boundaries limits cross-regional coordination. Differences in policy priorities, fiscal capacity, and governance effectiveness hinder the formation of integrated urban systems and reduce the efficiency of resource allocation.

Third, population mobility constraints—stemming from employment structure mismatches, limited public service access, and institutional barriers—restrict the positive feedback between population agglomeration and urban system optimization.

Together, these mechanisms explain why high coupling does not automatically translate into high coordination. Addressing coordination constraints therefore requires systemic reforms that target both structural and institutional dimensions of urbanization.

6. Conclusions and Policy Implications

6.1. Main Conclusions

Based on panel data from 2015 to 2023 and employing the entropy weight method and coupling coordination degree model, this study systematically evaluates the level and coordination characteristics of high-quality new-type urbanization in western China. The main conclusions can be summarized as follows.

First, the overall quality of new-type urbanization in western China has improved steadily during the study period. The comprehensive index exhibits a clear upward trend, indicating that the region has gradually shifted from an extensive, scale-oriented urbanization model toward a quality-oriented development trajectory. Nevertheless, the absolute level of urbanization quality remains relatively low, and western China continues to lag behind more developed regions, underscoring the long-term and incremental nature of quality improvement.

Second, substantial regional disparities persist in both urbanization quality and subsystem performance. Provinces with stronger economic foundations, more complete urban systems, and better governance capacity consistently achieve higher scores, while ecologically fragile and economically weaker regions remain constrained. These disparities reflect differences in development conditions, resource endowments, and institutional capacity, and they reinforce the need for differentiated urbanization pathways.

Third, although the coupling degree among urbanization subsystems is generally high, the coordination degree remains low, revealing a structural pattern of “high coupling but low coordination.” This indicates that improvements in individual subsystems have not yet translated into synchronized and harmonious development. Ecological support capacity and public service efficiency emerge as the most significant constraint factors, highlighting the structural nature of coordination bottlenecks in western China’s urbanization process.

6.2. Policy Implications

Based on the above findings, several policy implications can be derived to promote high-quality new-type urbanization in western China.

First, a differentiated urbanization strategy should be adopted to reflect regional heterogeneity. Rather than pursuing uniform development targets, provinces should formulate urbanization pathways aligned with their ecological conditions, economic foundations, and population structures. In ecologically sensitive areas, development intensity should be strictly controlled, and urbanization should prioritize quality improvement over spatial expansion.

Second, the coordination among urbanization subsystems should be strengthened through institutional innovation. Greater emphasis should be placed on improving public service provision and ecological protection to address key coordination constraints. Enhancing the equalization of basic public services and increasing investment in green infrastructure can improve feedback mechanisms between population agglomeration, economic development, and environmental sustainability.

Third, urban–rural integration should be advanced as a central component of high-quality urbanization. By improving rural infrastructure, expanding non-agricultural employment opportunities, and facilitating factor mobility between urban and rural areas, western China can reduce structural disparities and enhance the inclusiveness of urbanization outcomes.

Fourth, cross-regional coordination and connectivity should be enhanced. Strengthening transportation networks, industrial linkages, and policy coordination among provinces can facilitate factor flows and spatial spillovers, thereby narrowing regional disparities and promoting more balanced urban system development.

Finally, governance capacity and long-term institutional mechanisms should be reinforced. Improving policy coherence, fiscal coordination, and local implementation capacity is essential for translating development goals into effective outcomes. High-quality urbanization in western China ultimately depends on sustained institutional support and adaptive governance frameworks.

Declarations

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Author Contributions

W.A. contributed to conceptualization, methodology, software, formal analysis, visualization, and writing – original draft. J.Q. contributed to investigation, data collection, data curation, and resources. Y.J.W. contributed to conceptualization, methodology, validation, interpretation of the results, supervision, project administration, and writing – review and editing. All authors discussed the findings, read and approved the final manuscript, and agreed to be accountable for all aspects of the work.

Competing Interests

The authors declare no competing interests.

Data Availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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Figures

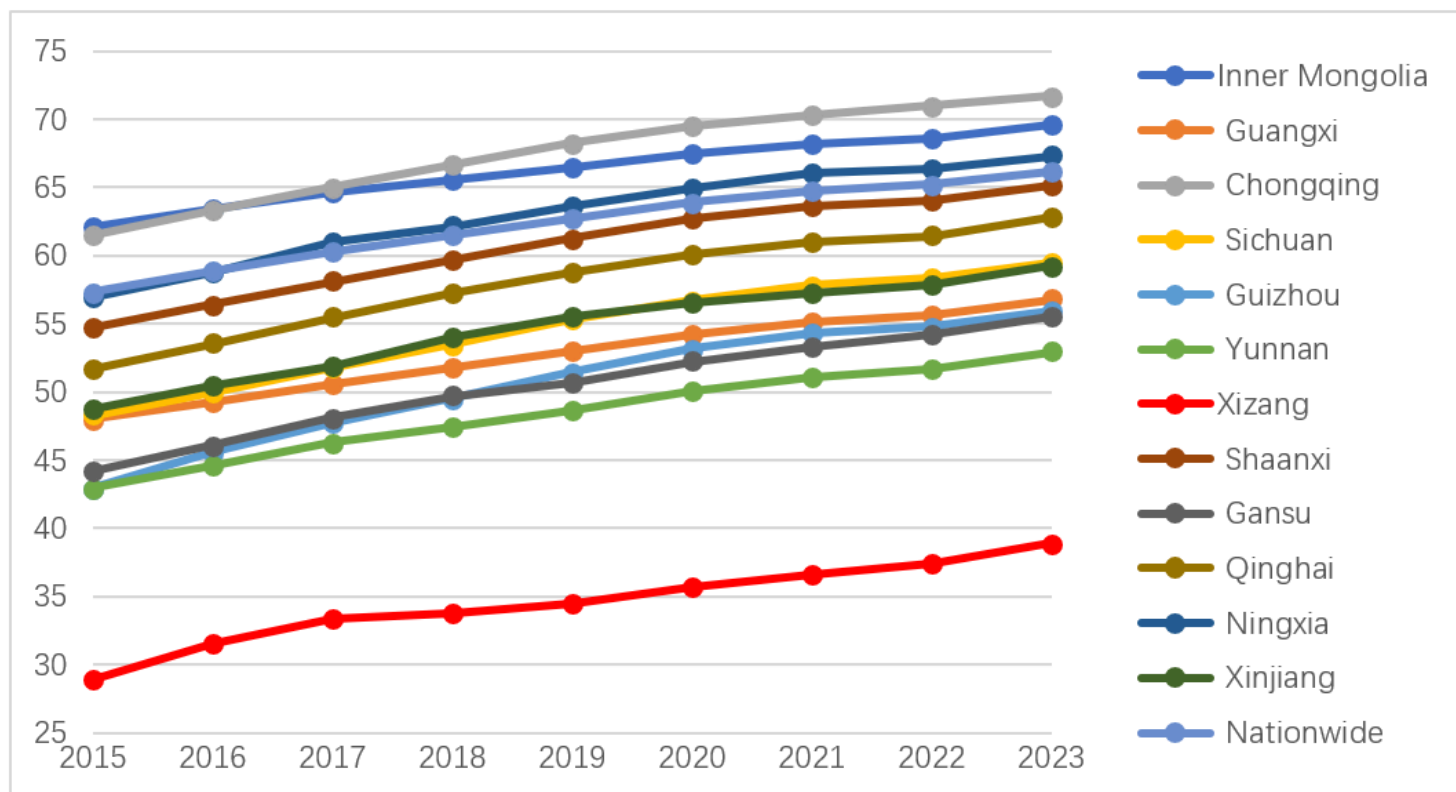


Figure 1

Resident Population Urbanization Rate in Western China, 2015–2023 (%)

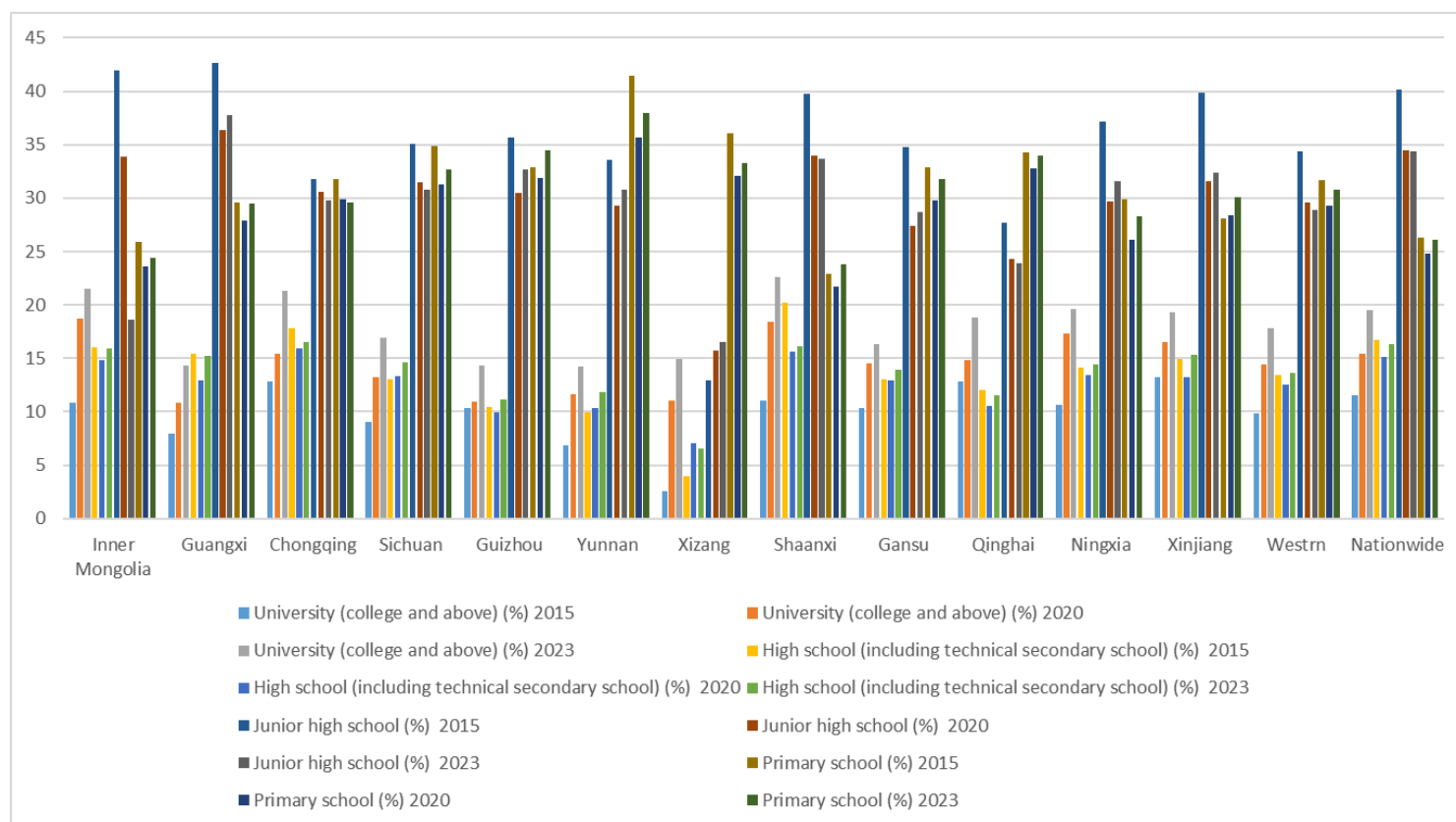


Figure 2

Educational Attainment of the Population in Western China, 2015–2023

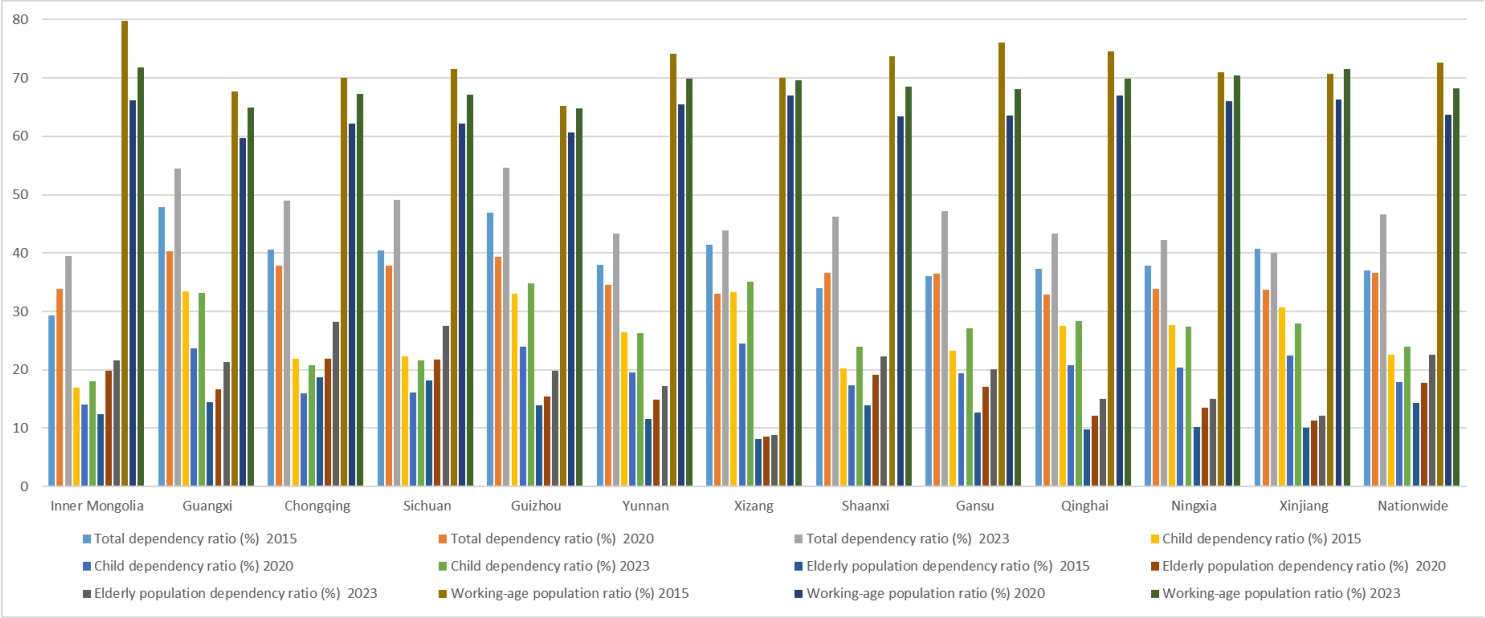


Figure 3

Dependency Ratio and Its Composition in Western China, 2015–2023

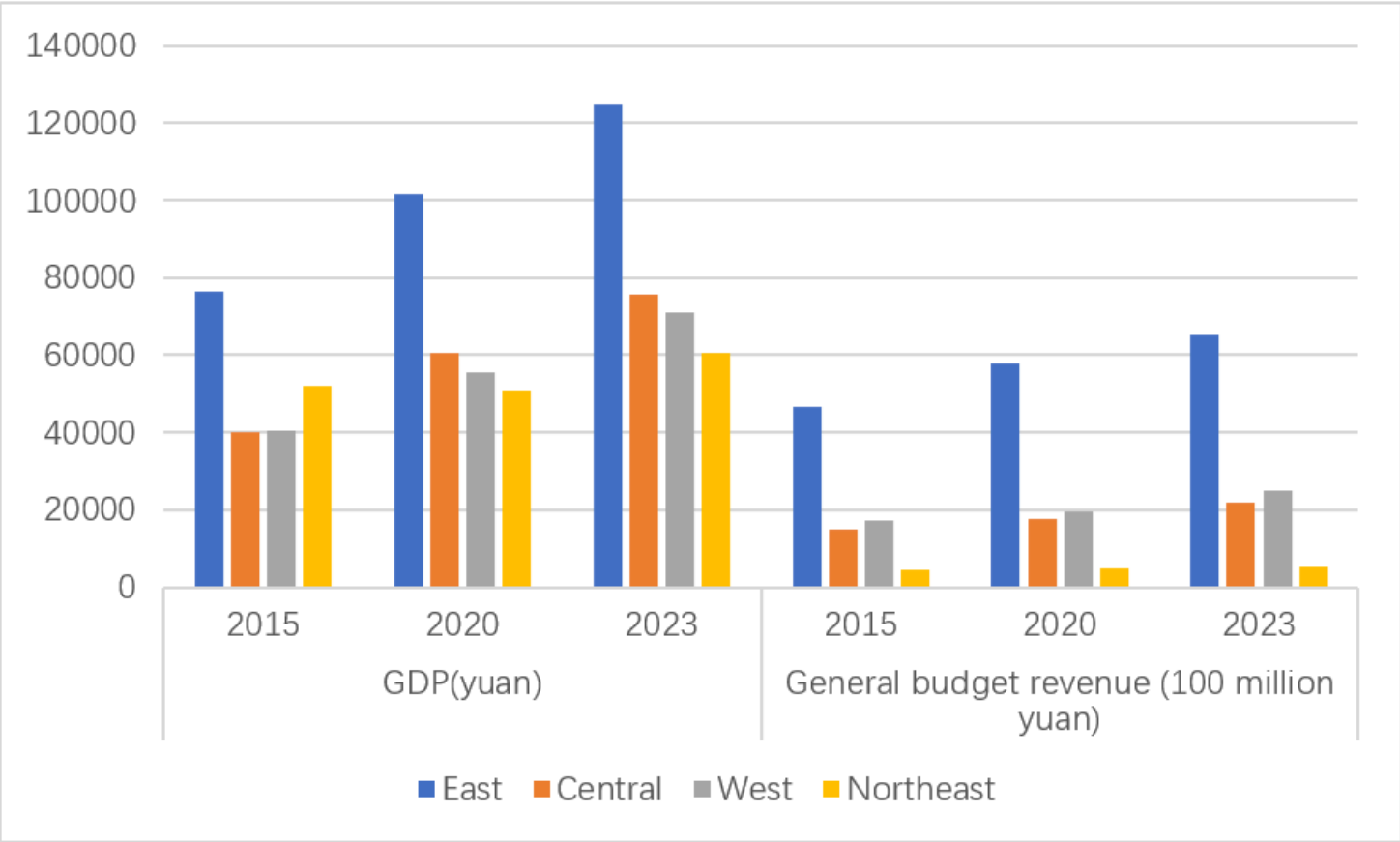


Figure 4

Overall Economic Conditions in Eastern, Central, Western, and Northeastern China

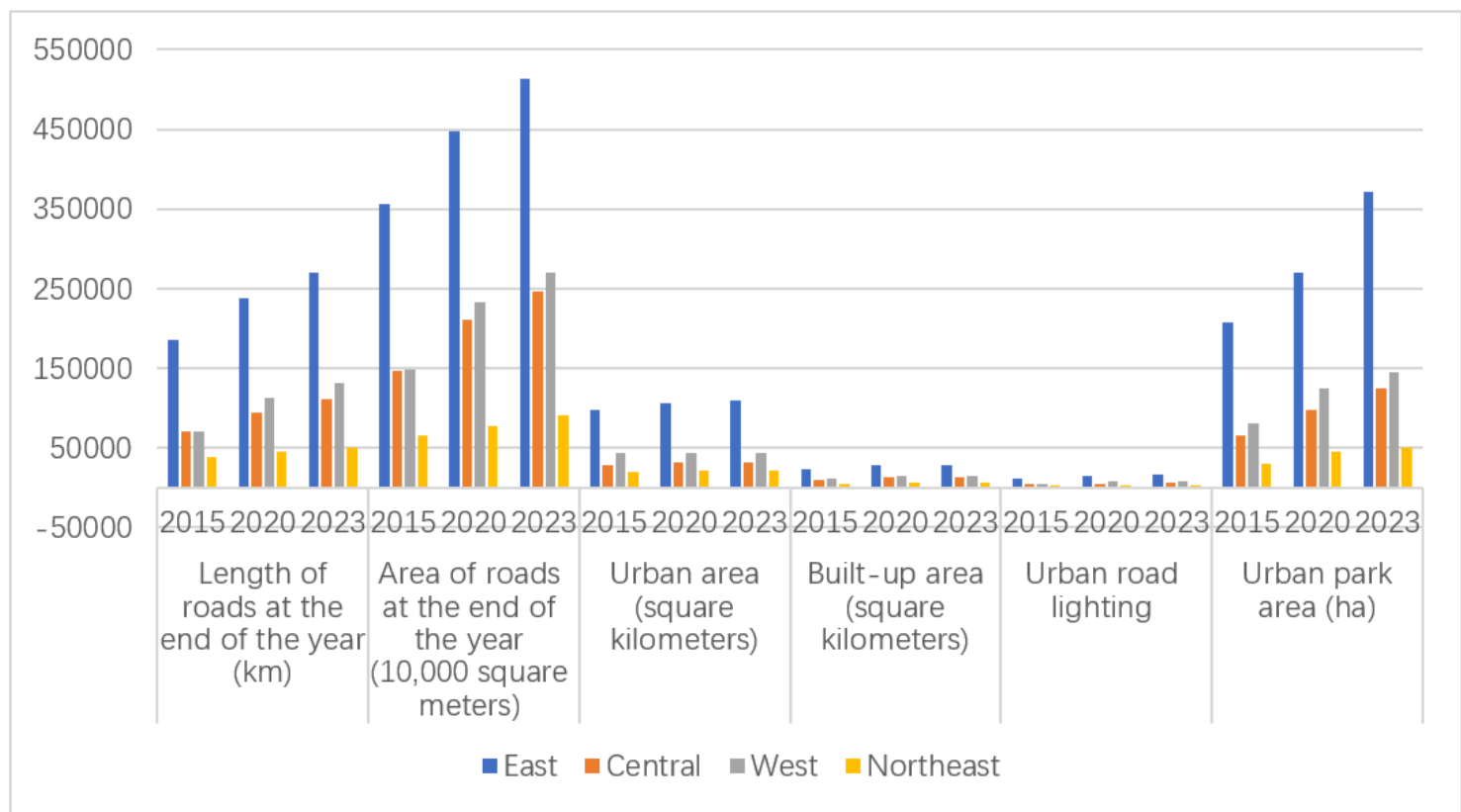


Figure 5

Urban Construction Conditions in Eastern, Central, Western, and Northeastern China

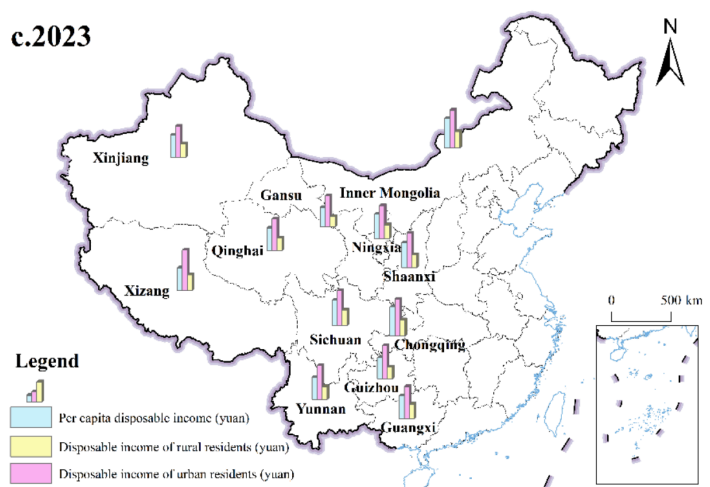
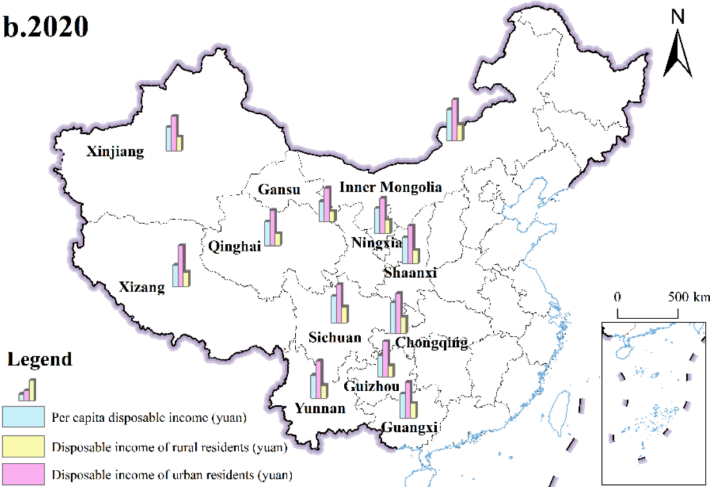
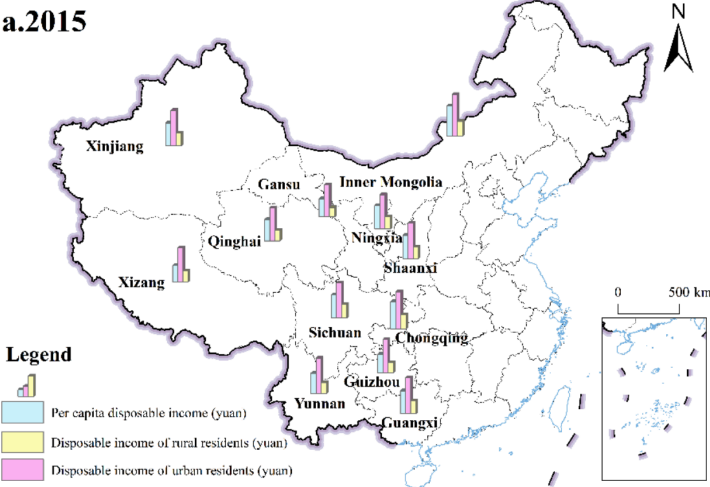


Figure 6

Per Capita Disposable Income of Urban and Rural Residents in Western China (2015–2023)