

Xinjiang's Practice of High-Quality Development: Evaluation System Construction and Measure- ment Research Postprint

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Abstract

High-quality development is the primary task in building a modern socialist country in all respects. Promoting high-quality development in Xinjiang and accelerating the realization of modernization urgently require a scientific and rational evaluation indicator system to reflect and guide the process. This study constructs an evaluation indicator system for Xinjiang's high-quality development with first-level indicators including economic life, resources and environment, innovation and opening-up, regional integration and coordination, agriculture-culture-tourism industry, and eight major industrial clusters. The entropy method is employed to estimate Xinjiang's high-quality development index, the coupling coordination degree model is used to evaluate the synergistic development degree of high-quality indicators, and obstacle degree analysis is applied to identify indicators that constrain Xinjiang's high-quality development. The results show that: (1) Xinjiang's high-quality comprehensive development index increased from 0.172 in 2011 to 0.785 in 2022, indicating a relatively good overall development level. The contribution of opening-up to the outside world, financial and insurance industry, economic development, and agriculture-culture-tourism industry to high-quality development has become increasingly evident, while scientific and technological innovation input-output, human capital, development gap with the national level, and low-carbon development remain challenging tasks. (2) The coupling coordination degree of Xinjiang's high-quality development increased year by year from 0.365 in 2011 to 0.883 in 2022, demonstrating strong correlations among indicators and a virtuous cycle. The average annual increase in the coupling coordination degree of first-level indicators was 0.0715 during 2011-2014, which is 0.0384 higher than that during 2015-2022, indicating a gradually slowing development rate. The synergistic development degree among second-level indicators constituting the two first-level indicators of regional integration and coordination and resources

and environment is relatively low. (3) Analysis of indicators with obstacle degrees exceeding 0.05 over the years reveals that forest coverage rate, natural gas production, financial industry added value, urban per capita daily domestic water consumption, urban daily sewage treatment capacity, RMB deposits of financial institutions, urban registered unemployment rate, built-up area green coverage rate, rural electricity consumption, and chemical fertilizer application amount (in pure nutrients) are factors constraining Xinjiang's high-quality development. Therefore, this study proposes countermeasures and suggestions: optimizing the allocation of scientific and technological resources to enhance the efficiency of scientific and technological input; leveraging latecomer advantages to accelerate integration into the national strategy; and deepening supply-side structural reform to promote industrial structure transformation.

Full Text

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Practice of High-Quality Development in Xinjiang: Construction and Measurement of an Evaluation System

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Abstract: High-quality development is the primary task in building a modern socialist country. Advancing high-quality development in Xinjiang and accelerating its modernization urgently requires a scientific and rational evaluation index system to both reflect progress and provide guidance. This study constructs a high-quality development evaluation index system for Xinjiang using primary indicators including economic life, resource environment, innovation and opening-up, regional integration and coordination, agriculture-culture-tourism industry, and eight major industrial clusters. The entropy method is employed to estimate Xinjiang's high-quality development index, a coupling coordination degree model assesses the synergistic development level of high-quality indicators, and obstacle degree analysis identifies constraints on Xinjiang's high-quality development. Results show that: (1) Xinjiang's comprehensive high-quality development index increased from 0.172 in 2011 to 0.785 in 2022, indicating relatively favorable overall development. Opening-up, financial insurance, economic development, and agriculture-culture-tourism industries have made increasingly significant contributions to high-quality development, while science and technology input-output, human capital, the development gap with national averages, and low-carbon development remain major challenges. (2) The coupling coordination degree of Xinjiang's high-quality development rose from 0.365 in 2011 to 0.883 in 2022, demonstrating strong inter-indicator correlation and a virtuous cycle. The annual average increase in first-level indicator coupling coordination degree was 0.0715 between 2011-2014, which was 0.0384 higher than the growth rate from 2015-2022, showing a gradual slowdown. The

collaborative development degree between secondary indicators constituting regional integration coordination and resource environment is relatively low. (3) Analysis of indicators with obstacle degrees exceeding 0.05 across years identifies forest coverage, natural gas production, financial industry added value, urban per capita daily domestic water consumption, urban sewage daily treatment capacity, RMB deposits in financial institutions, urban registered unemployment rate, built-up area green coverage, rural electricity consumption, and chemical fertilizer application reductions as key factors constraining Xinjiang's high-quality development. The study proposes optimizing science and technology resource allocation to enhance innovation investment efficiency, leveraging latecomer advantages to accelerate integration into national strategies, and deepening supply-side structural reforms to promote industrial transformation.

Keywords: high-quality development; evaluation indicator system; development index; Xinjiang

Introduction

High-quality development is the primary task in building a modern socialist country. At the third Central Xinjiang Work Conference, General Secretary Xi Jinping emphasized the need to promote high-quality development that stays close to people's livelihoods. Xinjiang is currently in a critical period of advancing high-quality development. The autonomous region's party committee and government have convened high-quality development symposiums for the Urumqi-Changji, southern Xinjiang, eastern Xinjiang, and northern Xinjiang regions to strategize for the overall development situation. Scientifically constructing a high-quality development evaluation index system for Xinjiang holds major practical significance for writing the Xinjiang chapter in building a modern socialist country.

Since reform and opening up, China has achieved remarkable economic growth. However, as advantages such as low costs, demographic dividends, and latecomer benefits that drove high-speed growth have weakened, the model of promoting high-speed growth through large-scale government investment is no longer sustainable. The Party Central Committee with Comrade Xi Jinping at its core, standing at a new historical juncture, has made the major decision that China's economy has shifted from a high-speed growth phase to a high-quality development phase. Regarding the connotation of high quality, scholars have interpreted it from macro development strategies and social contradiction perspectives, as well as from comprehensive economic and social advancement angles. However, facing the goals of socialist modernization, understanding high-quality development must be comprehensive, systematic, and in-depth. High-quality development represents the latest development thought from the long-term practical exploration of Chinese Communists—a development concept, mode, and strategy that requires not only improved product quality but also enhanced

development quality. It is not merely an economic issue but also a social construction issue. This study argues that advancing high-quality development in the new era must be based on the new development philosophy, shifting the economy from quantitative high-speed growth to quality-efficiency-oriented high-quality development, focusing on achieving coordinated development of the “five-sphere integrated plan” (economic, political, cultural, social, and ecological civilization advancement), with the goal of meeting people’s ever-growing needs for a better life.

Regional economic development disparities represent an important manifestation of national spatial economics. While economic and social development and China’s regional coordinated development strategy have improved inter-regional imbalances and insufficiencies to some extent, technological progress and restructuring have further expanded regional development gaps during the process of ensuring economic growth. Regional high-quality development still faces numerous challenges. To narrow regional development gaps, the EU has used subsidies and tax incentives to attract high-quality enterprises for various economic activities. To achieve balanced development across China, we must measure regional high-quality development levels to promote comprehensive high-quality economic and social development.

Constructing a high-quality development indicator system is a comprehensive and complex task. Svensson [?] found that changes in factor endowments among U.S. regions affect relative factor prices and ultimately influence regional economic growth. Montfort [?] argued that evaluating high-quality economic development should measure both economic fundamentals (growth intensity, stability, openness, and diversity) and social outcomes (healthcare, education). Domestic literature has systematically assessed high-quality development at provincial [?] and ethnic region [?] levels using methods such as entropy method [?], analytic hierarchy process [?], and principal component analysis [?]. While academic research on high-quality development evaluation is relatively abundant, few studies specifically focus on regional economic high-quality development [?], with most based on national assessments that fail to reflect local characteristics due to different regional economic and social realities. Moreover, specialized research on regional economic high-quality development remains limited. Xinjiang’s high-quality development concerns national reform, development, and stability, providing practical evidence for evaluating high-quality development in ethnic regions.

1.1 Study Area Overview

Xinjiang is located in northwestern China, spanning 73°40′ -96°18′ E and 34°25′ -48°10′ N, with a total area of approximately 1.66×10^6 km², accounting for about one-sixth of China’s total land area. The terrain features a “three mountains sandwiching two basins” pattern. Currently, Xinjiang is in a critical

period of promoting high-quality development. Leveraging its resource endowments, location advantages, and industrial layout, and focusing on forging a strong sense of community for the Chinese nation, Xinjiang vigorously develops characteristic and advantageous industries, accelerates the improvement of its modern industrial system, and continuously consolidates its high-quality development foundation. However, due to historical and geographical factors, numerous shortcomings remain in Xinjiang's high-quality development, urgently requiring an evaluation index system to measure its actual conditions and provide theoretical and practical foundations for accelerating high-quality development.

1.2 Data Sources and Processing

Data were obtained from the National Bureau of Statistics website, Xinjiang Statistical Yearbook, Xinjiang Production and Construction Corps Statistical Yearbook, Xinjiang Statistical Bulletins, Peking University Digital Inclusive Finance Index, and China Outward Foreign Direct Investment Statistical Bulletin. Most data were directly available, while some were calculated from other data. Missing data were predicted using the moving average method, including urban registered unemployment rates, number of major scientific and technological achievements, digital finance coverage breadth, digital inclusive finance index, differences in tertiary industry employment proportions between the Corps and local areas, gasoline production, thermal power generation, and coke production for certain years; and similar indicators for other years. In recent years, Xinjiang's overall social stability has provided a foundation for promoting high-quality development.

1.3 Construction of Xinjiang's High-Quality Development Evaluation Indicator System

Drawing on existing literature regarding high-quality development evaluation systems and following principles of integrity, systematicity, scientificity, operability, and specificity, this study constructs a Xinjiang high-quality development evaluation indicator system comprising 6 primary indicators, 20 secondary indicators, and 56 tertiary indicators. The goal of high-quality development is to meet people's ever-growing needs for a better life, manifested in the "innovation, coordination, green development, openness, and sharing" aspects, achieved through continuous reform and modernization of the economic systems to realize high-quality, efficient, fair, and sustainable development. Therefore, based on the new development philosophy, primary indicators include economic life, resource environment, innovation and opening-up, and regional integration and coordination, with secondary indicators including economic development, financial insurance, income and consumption.

Xinjiang contributes significantly to national food security and important agricultural product supply. As a core area of the Silk Road Economic Belt, Xinjiang must utilize both domestic and international markets to build a high-quality inland and border opening-up highland. Currently in a strategic opportunity

period for high-quality development, Xinjiang urgently needs to clarify its actual development level and shortcomings. Therefore, based on Xinjiang's actual conditions and fully considering the new development philosophy, this study selects 6 primary indicators by leveraging Xinjiang's advantageous agriculture-culture-tourism industries and its deployment of modern industrial clusters. Using entropy method, coupling coordination degree, and obstacle degree models to evaluate Xinjiang's high-quality development will help advance various undertakings and ensure national energy security and social stability while providing practical evidence for evaluating high-quality development in ethnic regions.

Agriculture-culture-tourism industries serve as important carriers for high-quality development. Xinjiang's modern characteristic agricultural industry development continues to release dividends as the industrial base strengthens. As a critical node connecting Eastern and Western cultures, Xinjiang has formed a unique regional culture and boasts rich tourism resources, making vigorous development of culture-tourism industries a means for sustainable development. Therefore, agriculture-culture-tourism industry is selected as a primary indicator, with agricultural industry foundation, cultural industry foundation, and tourism-related industries as secondary indicators.

Industry is the core and cornerstone supporting economic development. Building modern industrial clusters facilitates specialized division of labor and innovation resource aggregation, representing a path toward high-end industrial chains and a key move for achieving high-quality economic development. Centered on the "eight major industrial clusters," Xinjiang continuously consolidates its industrial development foundation to provide basic guarantees for high-quality development. Therefore, eight major industrial clusters are selected as a primary indicator, with oil and gas production and processing, green mining, coal and coal chemical industry, grain and oil, cotton textile and apparel, green organic fruits and vegetables, high-quality livestock products, and new energy and new material industrial clusters as secondary indicators.

1.4 Methods

1.4.1 Entropy Method Among existing methods for determining indicator weights, the entropy method has high dependence on indicators and can comprehensively characterize the information content. Since Xinjiang's high-quality development indicator system consists of macro indicators, using the entropy method to determine weights can effectively compensate for subjectivity in constructing evaluation indicator systems. Following Meng et al. [?], this study determines weights and calculates Xinjiang's high-quality development index:

$$S = \sum_{j=1}^n W_j X_{ij}$$

where S is Xinjiang's comprehensive high-quality development index; W_j is

the weight of the j th indicator; and X_{ij} is the standardized value of the j th indicator in year i .

1.4.2 Coupling Coordination Degree The capacity coupling coefficient, a physics-based metric for calculating correlations among multiple systems, is widely applied in economic and social assessments. While the coupling coefficient can reflect system correlations, it overlooks the development level of the systems themselves. Therefore, coupling coordination degree is used to determine synergistic levels among systems. Following Liu et al. [?], this study calculates Xinjiang's high-quality development coupling coordination degree. When calculating the comprehensive coordination level of Xinjiang's high-quality development, the adjustment coefficient is set to 6; when calculating the coupling coordination level of each primary indicator, the coordination coefficient is set as the number of its constituent secondary indicators, with undetermined coefficients as weights of indicators at each level. Coupling coordination degrees are classified as: dysfunctional stage [0.0, 0.5], barely coordinated (0.5, 0.6], primary coordination (0.6, 0.7], intermediate coordination (0.7, 0.8], good coordination (0.8, 0.9], and premium coordination (0.9, 1.0].

1.4.3 Obstacle Degree Most macro-assessment studies use obstacle degree models to identify constraints. Following existing literature, this study calculates obstacle degrees to measure constraints on Xinjiang's high-quality development:

$$O_{ij} = \frac{(1 - X_{ij})W_j}{\sum_{j=1}^n (1 - X_{ij})W_j}$$

where O_{ij} is the obstacle degree of indicator j in year i .

2 Results

2.1 Analysis of Xinjiang's High-Quality Development Index

Xinjiang's high-quality development index increased from 0.172 in 2011 to 0.785 in 2022, demonstrating significant development achievements [Figure 1: see original paper]. The period can be divided into three stages: 2011-2014 as the first stage, during which Xinjiang's high-quality development grew rapidly with an average annual growth rate of 12.0%, driven by the Western Development Strategy and the expansion of paired assistance programs that laid foundations for high-quality development. 2015-2019 formed the second stage, with slower development (average annual growth of 7.08%) as China's economy entered a new normal facing dual pressures of slowdown and transformation. Xinjiang implemented various measures to break bottlenecks and optimize economic structure, with regional GDP increasing from 926.41 billion yuan to 1,379.76 billion yuan.

2020-2022 marked the third stage, with an average annual growth of 11.7%—the fastest in the evaluation period—as Xinjiang advanced high-quality development centered on people’s livelihoods, leveraging the Silk Road Economic Belt core area to expand opening-up and convert industrial advantages into economic growth.

2.2 Analysis of Primary Indicator Development Indices

All primary indicator development indices showed increasing trends. By 2022, economic life, innovation and opening-up, and eight major industrial clusters reached 0.785, 0.883, and 0.883 respectively, while resource environment, regional integration coordination, and agriculture-culture-tourism industries reached 0.365, 0.365, and 0.785, indicating resource environment as the weakest performer and regional integration coordination as the slowest growing.

Within economic life, all constituent indicators grew, with financial insurance growing fastest, followed by economic development and income consumption, while social conditions were initially high but relatively lower later, suggesting financial insurance and economic development are drivers while social conditions constrain growth. For resource environment, resource endowment, environmental governance, and environmental facilities showed upward trends, while low-carbon environmental protection declined, indicating that while resource advantages strengthened and ecological protection improved, low-carbon development remains challenging. In innovation and opening-up, opening-up performed best, particularly after 2015, followed by the digital economy, while science and technology input-output, innovation foundations, and human capital remained low, with human capital being the lowest, indicating persistent constraints.

Regional integration coordination showed divergent trends: integration with national development worsened, urban-rural integration improved significantly, and Corps-local integration fluctuated around 0.5 with limited effectiveness, revealing an expanding gap with national development. Agriculture-culture-tourism industry indices increased overall, though tourism-related industries suffered major impacts from the pandemic.

Contribution rates to the comprehensive development index during the evaluation period were: economic life 16.749%, resource environment 15.331%, innovation and opening-up 15.984%, regional integration coordination 19.277%, agriculture-culture-tourism industry 13.633%, and eight major industrial clusters 19.026%. Resource environment and regional integration coordination showed decreasing contributions, while economic life and innovation and opening-up showed increasing contributions, indicating these as main drivers and the former two as challenges.

2.3 Analysis of Secondary Indicator Development Indices

Detailed analysis of secondary indicators reveals specific advantages and shortcomings [Figure 2: see original paper]. Within eight major industrial clusters,

high-quality livestock products, green mining, and coal-chemical clusters performed best, followed by green organic fruits and vegetables and new energy/new materials, while grain-oil and cotton textile-apparel clusters had lower indices, indicating substantial room for improvement. Some clusters had higher initial than final indices, with declining contributions, suggesting the need to strengthen industrial foundations and promote transformation.

2.4 Coupling Coordination Level of Xinjiang' s High-Quality Development

Based on primary indicator development indices, coupling coordination degrees were measured . The mean coupling degree of Xinjiang' s high-quality development primary indicators was 0.999, indicating strong inter-indicator correlation. The coupling coordination degree increased from 0.365 in 2011 to 0.883 in 2022, progressing from dysfunction to good coordination, with steadily increasing coordination between development indices and indicator coupling coordination degrees, demonstrating a virtuous cycle promoting high-quality development.

The annual average increase in primary indicator coupling coordination degree was 0.0715 from 2011-2014, 0.0384 higher than the 0.0331 rate from 2015-2022, indicating gradual slowdown. By 2022, economic life and innovation and opening-up reached premium coordination, regional integration coordination, agriculture-culture-tourism industry, and eight major industrial clusters reached good coordination, and resource environment reached intermediate coordination. Annual average increases in coupling coordination degree were highest for innovation and opening-up, followed by economic life, eight major industrial clusters, agriculture-culture-tourism industry, resource environment, and regional integration coordination, indicating relatively low collaborative development among secondary indicators constituting regional integration coordination and resource environment.

Low internal synergy in regional integration coordination stems from deteriorating integration with national development, improving urban-rural integration, and slow Corps-local integration with significant directional differences. Low synergy in resource environment results from improving resource endowment, environmental governance, and facilities but deteriorating low-carbon environmental protection, creating divergent development directions. Other primary indicators show more consistent trends among their secondary indicators.

2.5 Obstacle Factor Analysis of Xinjiang' s High-Quality Development

Analysis of indicators with obstacle degrees exceeding 0.05 across years reveals that 历年障碍因子高于 0.05 的指标都在 10 个以内. The evaluation system contains 56 specific indicators, making those with obstacle degrees above 0.05 highly representative. From 2011-2022, indicators with obstacle degrees above 0.05 included forest coverage, natural gas production, financial industry added value, urban per capita daily domestic water consumption, urban sewage treatment

capacity, RMB deposits in financial institutions, urban registered unemployment rate, and built-up area green coverage. Additionally, rural electricity consumption and chemical fertilizer application reductions appeared 3 and 2 times respectively. Though some indicators had obstacle degrees below 0.05 in certain years, they still constrained development. Some indicators showed large obstacle degrees initially that gradually decreased below 0.05, indicating they are no longer current constraints.

3 Discussion

This study provides a detailed assessment of Xinjiang's high-quality development reality. Lu et al. [?] found Xinjiang's innovation-driven development relatively weak with gaps compared to other regions; this study similarly identifies science and technology input-output and human capital as constraining indicators. These challenges stem from Xinjiang's status as a remote, less-developed region with outstanding issues in talent 队伍建设, institutional reform, and mindset transformation, coupled with backward technology, equipment, and processes that severely impact innovation-driven development. Ma et al. [?] showed Xinjiang's high-quality supply, demand, and development efficiency indices rank in the middle-lower range nationally, while Nie et al. [?] classified Xinjiang as a lagging region through comparisons across 30 provinces. This study finds Xinjiang's development gap with national averages is expanding overall, due to vast territory, large north-south Xinjiang disparities, multi-ethnic settlement patterns limiting inter-regional circulation, spatial economic inefficiency, and unbalanced regional development. Xinjiang's economy relies heavily on resource-driven growth, making the new development philosophy-guided high-quality development subject to environmental constraints and difficult economic transformation, resulting in Xinjiang ranking behind other provincial regions and requiring efforts to catch up. Lu et al. [?] also found Xinjiang's ecological civilization ranking relatively low, requiring strict pollutant control, consistent with this study's finding that low-carbon development remains a major challenge. Xinjiang's relatively fragile ecology, severe desertification, low water resource utilization efficiency, and serious agricultural non-point source pollution contribute to prominent low-carbon economic development issues.

4 Conclusions and Recommendations

4.1 Conclusions

- (1) Xinjiang's high-quality development is improving, with opening-up, financial insurance, economic development, and agriculture-culture-tourism industries making increasingly significant contributions. Science and technology input-output and human capital remain constraining indicators.

Integration with national development is a shortcoming in regional integration coordination, low-carbon development remains challenging, and grain-oil and cotton textile-apparel clusters have substantial improvement potential.

- (2) Strong correlations exist among Xinjiang's high-quality development indicators, with coupling coordination degree increasing from 0.365 to 0.883, demonstrating a virtuous cycle. However, the growth rate of coupling coordination degree is gradually slowing, with relatively low collaborative development among secondary indicators constituting regional integration coordination and resource environment.
- (3) Key constraints on Xinjiang's high-quality development include forest coverage, natural gas production, financial industry added value, urban per capita daily domestic water consumption, urban sewage treatment capacity, RMB deposits in financial institutions, urban registered unemployment rate, built-up area green coverage, rural electricity consumption, and chemical fertilizer application reductions.

4.2 Recommendations

- (1) **Optimize science and technology resource allocation to enhance innovation investment efficiency.** Focus on talent as the decisive factor in innovation by transforming S&T management approaches, granting research institutions greater autonomy, and continuously stimulating researcher creativity. Target Xinjiang's innovation shortcomings by increasing support for basic and applied research, improving R&D financing channels, and introducing diversified funding for technological innovation.
- (2) **Leverage latecomer advantages to accelerate integration into national strategies.** Rely on Xinjiang's resource endowments and location advantages to capitalize on latecomer benefits, actively undertake industrial transfers from paired assistance provinces, address industrial development shortcomings, and narrow gaps with national averages. Recognize the Xinjiang Production and Construction Corps as an important force in Xinjiang's economic development, uphold the integrated Corps-local development approach, and jointly plan and implement major projects, industrial layouts, and public resource sharing.
- (3) **Deepen supply-side structural reforms to promote industrial transformation.** Handle the relationship between economic development and ecological protection according to high-quality development requirements. Advance energy conservation support policies through supply-side structural reforms to promote low-carbon economic development. Simultaneously, strengthen industrial clusters as important indicators of regional economic development by continuously promoting industrial foundation strengthening, efficiency enhancement, and transformation upgrading to advance industrial base modernization and industrial chain

upgrading.

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