ORIGINAL SCIENTIFIC PAPER

CHINESE CITY TIER RANKING SCHEME AS SPECIAL SPATIAL FACTOR OF INNOVATIONS DIFFUSION

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ABSTRACT

This study examines the spatial context of the development and innovation of China's city ranking system. Given China's unprecedented economic and social development and urbanization process, the city tier ranking system has become an important tool for making policy resource allocation and economic strategic planning. This paper examines the spatial context of China's city ranking system, analysing innovative elements, and summarizes the lessons learned drawing conclusions. At the same time, it provides recommendations for future urban development and strategy.

***Keywords**: Innovation, city tier ranking system, urbanization, spatial factors*

JEL: D20, G30
DOI: 10.5937/intrev2400002P
UDC: 005.591.6:711.4(510)
711.4-048.57
COBISS.SR-ID 149523977

INTRODUCTION

As the world's largest developing country, China has experienced rapid urbanization in recent decades and has undergone tremendous changes in a short period of time. At the same time, the Chinese government and academia are looking for effective evaluation and classification mechanisms to effectively manage and plan these growing cities. The result is a city ranking system. The ranking system is not only related to the perception and positioning of the city, but also directly affects the allocation of resources such as capital investment, technology, and talent. The correct handling and use of this instrument is crucial to the long-term development of a city [1].

The purpose of this paper is to examine in detail the spatial background of China's city rating system and the innovations of the system, focusing on important issues that can be worth clarifying. What is the background of the Chinese city rating system evolution? What innovative elements introduced in this plan? What positive effects do these innovations have in practice, and what potential flaws do they have?

Our research work can provide readers with a comprehensive understanding of China's city rating system and serving as a base of valuable reference for urban development in other countries and regions.

METHODOLOGY

In this study, the authors focused on top-down approach deductive research strategy, which means studying the available relevant theoretical literatures as reference base, gathering and analysing data and draw conclusions. The main research methodology was mainly quality method based on secondary research analysing scientific publications, studies, online literature sources. The conclusions and recommendations based on this research findings reflects the authors' own professional views.

Structure of this paper: After the introduction, the historical background and development process of the city ranking system outlined. The connection between the spatial context and innovative elements beyond this evolutionary trend is, and then discussed in detail; in addition, lessons learned summarized. Finally, conclusions and recommendations presented.

HISTORICAL BACKGROUND OF CHINA'S URBAN RANKING SCHEME

Early Urban Division

Initial urbanization and urban division (1949-1978)

At the beginning of the establishment of the People's Republic of China, the process of urbanization was relatively slow. The division of cities is mainly based on administrative level, geographical location, and economic importance. At this stage, the core of urban hierarchy is mainly administrative functions and geographical location [1], [2].

Reforms, Opening and the Reconstruction of Urban Hierarchy (1978-2000)

The reform and opening began in 1978 resulted China's sustainable economic growth. Due to the consequences of foreign investment (FDI), primarily in coastal areas, cities have begun to develop rapidly. During this period, many new cities and special economic zones established. City ranking has gained more role in shaping economic development, population size, and infrastructure construction [1], [2].

New urban strategies and adjustments in the early 21st century (2000 present)

At the beginning of the 21st century, China's urban development has reached a new level. As consequence the continuous growth of the economy, the number of cities has continued to increase in their size and economic power. The government focused on the quality and sustainability of cities and the development of new cities. Environmental protection, cultural heritage, technology, public works all considered at the city level. In addition, the government also encouraged and highlighted the development of cities primarily in the central and western regions.

Overall, from simple appellations and location divisions to more complex analyses, the history of urban development in China shows the development and evolution of urban development in China, as well as the changes and shifts in government policies and attitudes towards urban development. Ma Su. . Although China's urban system presents evolutionary changes, it is influenced by the regulatory system that defines urban dynamics. China's urbanization can be explained by the growth of large cities and the dynamic growth of small and medium-sized cities. This may be related to political divisions, which give cities the role of "engines of modernity management". The evolution of the administrative system and economic specialization also reshaping the urbanisation processes [1], [2], [3].

ADJUSTMENT AFTER REFORMS AND OPENING UP

In 1978, China began to take into practice the reform and opening up policy, marking an important period of the Chinese transition from centrally planned economy to free market economy. In the course of this period, accelerating urban developments, the construction of special economic zones, attracting of FDI, and the large-scale infrastructure constructions were mainly encouraged [2].

At the beginning of reform and opening up, coastal cities such as Shenzhen, Zhuhai, Xiamen, and Shantou were designated as special economic zones (SEZ), involving a large amount of FDI and technology, contributing significantly to the unprecedented development of these cities. The establishment of foreign-funded enterprises in these areas raised employment opportunities and attracted a large number of rural people to move into the cities, resulting in an increase in the rural population. Confirming the initial success of the SEZ and demonstrating China's efforts to eliminate objective poverty and underdevelopment, China intends to promote the further economic development by adding similar favorable policies to 14 "coastal open cities" [4], [5]. Figure 1 shows a detailed map of these cities.

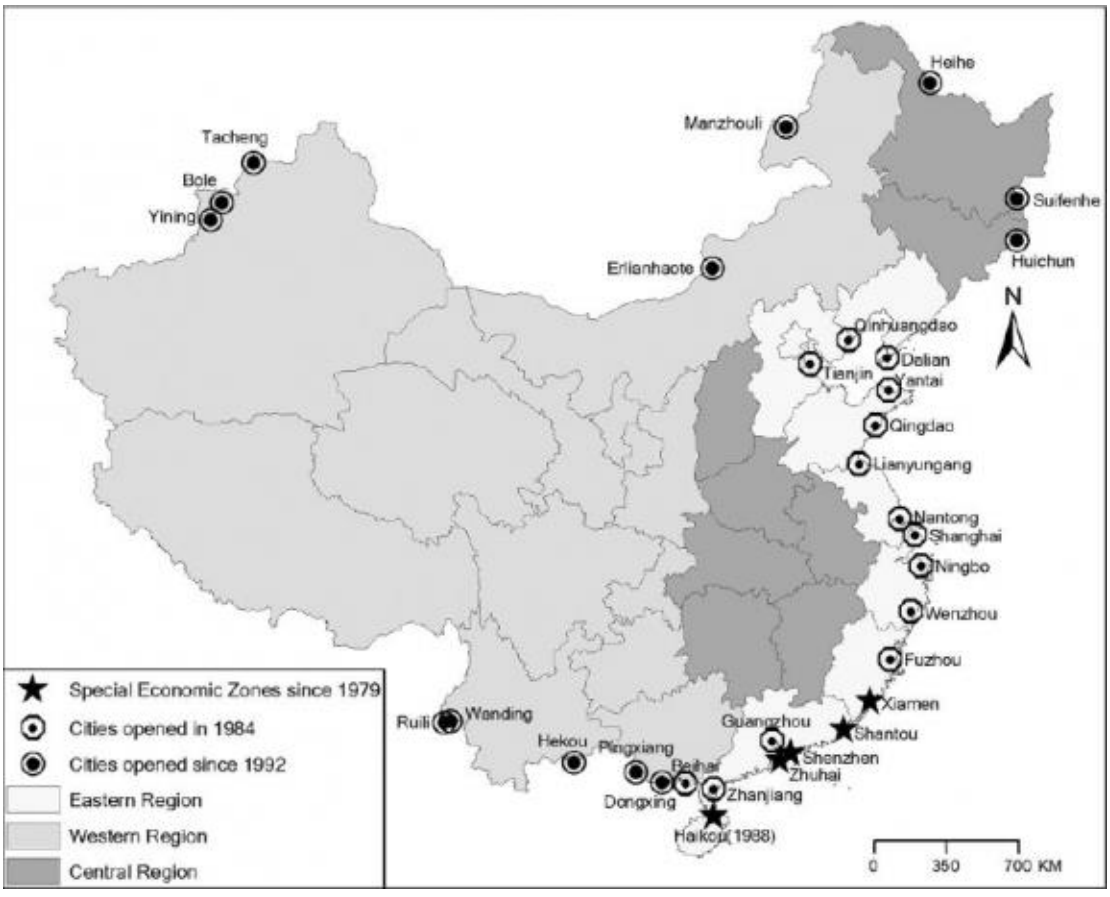

Figure 1. Open cities in China since 1979.
Source: [5]

Besides the SEZ, urban clusters are also developed in China mainly in the in the plains, deltas, and industrial districts between 1995-2010. The Table 1 describe briefly the largest Chinese city clusters.

Table 1. Several Main Chinese urban clusters

Name of the City Cluster	Main characteristics
Northeast urban strip (Harbin-Shenyang-Dalian)	The centre of heavy industry (mining, energy industry, steel industry). This network with horizontal and vertical transportation connects the cities of Changchun, Jilin, Anshan, Fushun, Benxi, Harbin, Shenyang, Dalian, Liaoyang with each others. Currently, due to the depletion of natural resources, urban society faces the challenge of maintaining economic activities and revitalizing industry.
JingJinJi urban cluster (Beijing-Tianjin-Tangshan)	Beijing and Tianjin are the nodes, dominant cities inside this cluster. The highly developed railway/highway infrastructure connects second-tier cities inside this region including Tangshan, Shijiazhuang, Baoding, Qinhuangdao, Langfang, Cangzhou, Chengde, and Zhangjiakou.
Shandong Peninsula urban cluster	In addition to the traditional sectors including agriculture, forestry and fishery, cities in the Shandong Peninsula, with Jinan, Qingdao and Yantai as the main cities, have also achieved rapid development in the electronic information industry, material production, and new materials, means a new growth poles at the eastern coast.
Yangtze River Delta (YRD) urban cluster (Nanjing-Shanghai-Hangzhou)	The economically developed, knowledge and technological centre Yangtze River Delta urban cluster's main mega or large cities are Shanghai, Nanjing and Hangzhou. Other „middle-sized" cities include Wuxi, Suzhou, Changzhou, Ningbo, and Nantong. The Nanjing-Shanghai-Hangzhou-Ningbo railway, the Grand Canal, and the Yangtze River connect these cities to one another by making easier travel and communication.
Pearl River Delta urban cluster	The group of cities surrounding Hong Kong, from Shenzhen and Guangzhou in the north to Macao and Zhuhai in the west, form the Pearl River Delta urban cluster. This cluster, which includes six major cities in Guangdong Province (Foshan, Jiangmen, Huizhou, Zhaoqing, Dongguan, and Zhongshan), is becoming a megalopolis of inter-locking hubs with varying policies related to investment, migration, business, and political freedom.
Southwest urban cluster	This is the largest urban cluster in Western China with dual core structure. The dominant cities, Chongqing and Chengdu, are strong enough to function as major growth poles. Other notable cities within this cluster include Zigong, Luzhou, Deyang, Mianyang, Suining, Neijiang, Leshan, Nanchong, Meishan, Yibin, Guang'an,Ya'an, and Ziyang.

Source: Own edition based on [5], [19]

In this context, the traditional urban population classification appears unscientific and inaccurate, as many emerging cities are developing faster than other large cities. The government and academia began to re-evaluate the way cities are divided, focusing on new indicators such as economic growth, construction, and the introduction of foreign investment. [1] At the same time, in addition to the special economic zones, cities in other regions also began to implement open policies to promote foreign trade and attract foreign

investment. This has led to the rapid development of many cities in the north and west. Overall, since China's reform and opening up, urban planning has undergone many changes and changes, emphasizing real economic activities and human development, rather than just culture and regional management.

Currently, China's city hierarchy system consists of 613 cities, which are divided into four different categories (tier "1" is the highest and tier "4" is the lowest) based on a variety of "flexible" factors including GDP, income level, administrative level and number of inhabitants. Any city may move up or down in the rankings as its development changes over time [5], [7].

City tier system in China is a frame established to classify the Chinese cities. The system helps economic actors make their most optimal financial decisions, expansion and marketing. Categories determined by a variety of factors such as economic development, infrastructure, resources and population growth. China Brand Groups are widely used by companies to manage their market entry strategies. China Briefing looks at how information provided to the relevant cities and how this information can be used to determine whether the system is a useful and valuable tool for investors.

Tier 1 cities – the most developed and desirable locations for foreign investors

Tier 2 cities – still attractive investment destinations, with lower costs and opportunities for growth

Tier 3 and 4 cities – less developed, but with potential for future growth

City tier ranking system gives useful tool in the hand of foreign investors to gain relevant and up-to-date landscape about the Chinese 613 (officially registered) cities. Companies use these parameters to track urban development, market trends, tax policies, incentives.

Table 2. China's City-Tier Classification by GDP, Political Administration, Population

Criteria for city-tier classification	Tier 1.	Tier 2.	Tier 3.	Tier 4.
GDP	Over 300 billion USD	68-299 billion USD	18-67 billion USD	below 17 billion USD
Political administration of the city	Directly controlled municipalities and leading provincial capital cities	Directly controlled municipalities and economically important cities	Provincial capital cities and prefecture level cities	Prefecture-level cities and county level cities
Population	Over 15 million people	3-15 million people	1.5 to 3 million people	Less than 1.5 million people
Examples	Being Sanghai Shenzen Guangzhou	Chengdu Dailan Hangzhou Ningbo Wuhan	Dongguan Guilin Lanzhou Lhasa Nangton	Chanshu Linhai Taixing

Source: Own edition based on [6], [7], [18].

NEW CHALLENGES AND STRATEGIES IN THE 21ST CENTURY

Entering the 21st century, China's urban development process has entered a complex and diverse environment. The process of globalization, rapid technological development, accelerated environmental protection, and the pursuit of higher living standards have brought new challenges and opportunities to urban development [8], [5], [9].

Newly emerging challenges

Environmental issues and sustainability: With economic growth and urbanization, environmental damage and overuse of resources have become major issues. A major challenge is how to ensure environmental sustainability while maintaining economic growth.

Urban overcrowding: Large cities, especially large cities, face serious overcrowding problems. This has led to traffic congestion, soaring housing prices, and forced people to help each other.

Technological change and industrial structure change: With the development of new technologies such as artificial intelligence, big data, and the Internet of Things, traditional industries and workplaces are under pressure to adapt and change.

New strategic approach

"Tailor-made" urbanization processes: social welfare focuses on improving the quality of urbanization, instead of merely quantity. Encourage rural populations to settle down in cities and enjoy the same public service opportunities as others.

Industry and technology-driven upgrading: Support cities to build high-quality green smart cities, encourage research and innovation, including reshaping industrial structures as well.

Regionally coordinated development: Facilitate bottom-up organised cooperation, exploiting complementarity between regions, demolishing administrative boundaries between urban agglomerations and metropolitan areas, promoting economic and social development.

Development of green and ecological civilization: Consider the environmental aspects in urban planning and constructions, give priorities of green buildings, save energy and reduce green house gases (GHG) emissions protecting the environment.

In general terms, Chinese cities in the 21st century face unprecedented opportunities and difficulties. Governments and decision-makers have the responsibility making alignment to these changes implementing "tailor made" relevant strategies and concerted actions to ensure that cities become healthy, sustainable and livable.

Figure 2 below shows the urban population of China in 2010 (millions of inhabitants).

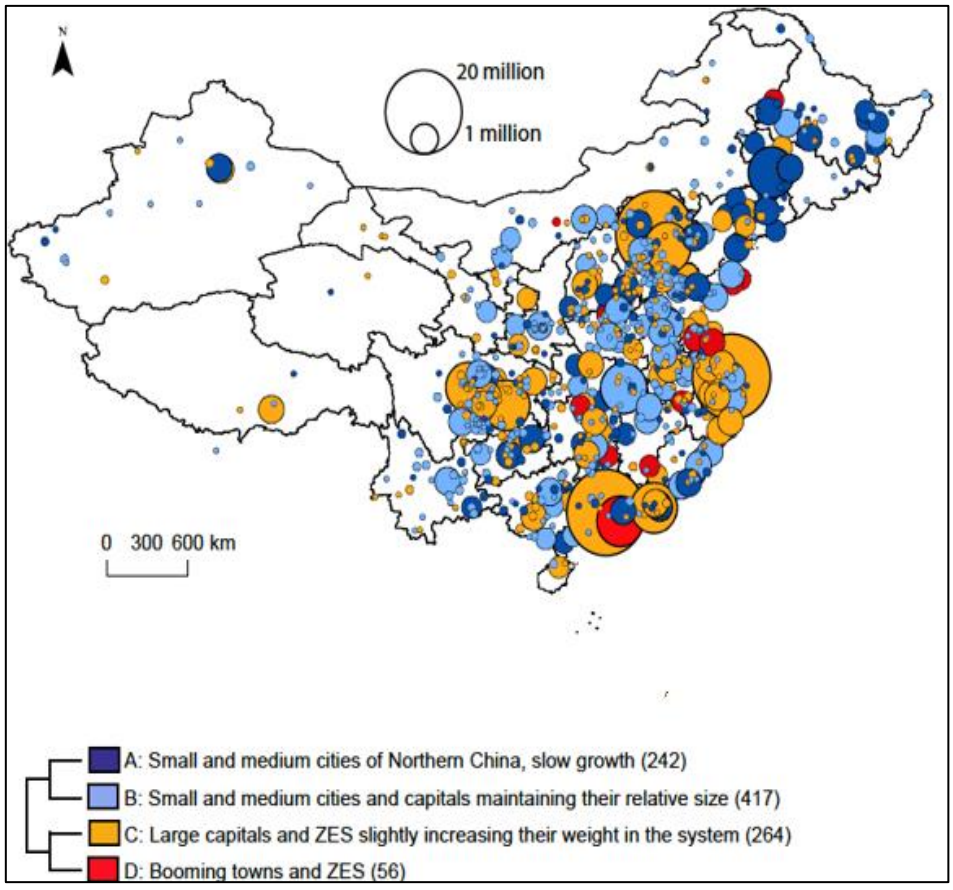

Figure 2. Size of the Chinese cities (million inhabitants, 2010)
Source: [3]

SPATIAL BACKGROUND OF INNOVATION

Geographical Distribution and Resource Allocation

There can be positive matching correlatioon between innovation agglomeration and a city's position in the urban tier system [10].

Geographical distribution

Geographic location has important role in the innovation processes. In the course of the history, technological and cultural innovations have developed and spread within specific geographical regions.

Urban agglomeration effect: Large cities and urban areas, due to their high population density and concentrated industries, tend to form clusters of knowledge and technology, generating and promoting different types of innovation. For example, Silicon Valley and Shenzhen have become centers of global innovation due to their unique geographical and industrial environment [11].

Regional Culture and Tradition: Different local communities often have their own culture and traditions, which can also influence new local activities. For example, the Jiangsu, Zhejiang and Shanghai regions in China have become high-tech, modern manufacturing centers with their original commercial and handicraft industries.

Resource allocation

Resource allocation is another key element impacting on innovation activities and outcomes.

Capital investment: Capital is essential for supporting research and technological innovation. In some regions, a favorable innovative investment and financing conditions has been created due to government policies, venture capital, and industrial fund support.

Attracting talents: Talent is also the key to innovation. High quality teaching standards, availability of educational resources, wide research institution networks, and open talent policies can all attract and maintain high-quality innovative talents.

Industrial chain integrity: Complete industrial chain contribute transformation and commercialization of technology. Some regions, due to their complete upstream and downstream industrial systems, can effectively promote the application of innovative achievements.

The spatial background of innovation can be manifested outcomes of the comprehensive effect of multiple factors. Understanding and utilizing the key factors in these spatial backgrounds is of great significance for improving innovation efficiency and effectiveness [12].

Higher urban tier category means more intensive the human capital, more complete the service industry system, more frequent innovation activities, which makes significantly easier commercialization. The improvement of the urban tier is promoting and speed up innovation agglomeration. The innovation activities correlated with the urban tier, and the country should play the role of high-tier cities and promote the further investment of factors in high-tier cities [10].

THE RELATIONSHIP BETWEEN POPULATION MOBILITY AND ECONOMIC DEVELOPMENT

Population mobility drives labor supply:

When the population flows from rural or underdeveloped areas to urban or developed areas, it provides cities with abundant labor resources, which are the foundation of many modern industries and service industries.

Promoting economic growth:

A large amount of labor migration to cities can meet the demand for rapid industrialization, thereby promoting economic growth. For example, China's economic miracle is partly attributed to the influx of rural labor into cities.

Expand the consumer market:

With the flow of population, the population of cities increases, the consumer market also expands accordingly. New immigrants have brought new consumer demand to cities, further promoting the development of their commercial and service industries.

Talent flow and technological innovation:

In addition to ordinary labor, the flow of talents with educational backgrounds and skills has also promoted technological innovation and economic development. For example, many countries' technology centers and innovation parks have attracted a large number of highly skilled talents both domestically and internationally.

Impact on the original area:

Population outflow may lead to a shortage of labor in primitive areas, affecting their economic development. On the other hand, immigrants often send some of their income back home, which can bring capital inflows to the original areas.

Urbanization and Infrastructure Development:

The urbanization process caused by population mobility requires cities to provide more infrastructure and services, such as housing, transportation, and public services. This demand also promotes economic development.

However, population mobility also brings some challenges, such as overcrowding in cities, environmental pollution, and social inequality. Therefore, guiding and managing population mobility reasonably to ensure sustainable economic and social development is an important task that governments around the world need to face.

There is a complex interactive relationship between population mobility and economic development. Properly guiding and managing population mobility can make it an important driving force for economic development [9].

TECHNOLOGICAL PROGRESS AND URBAN SPACE RECONSTRUCTION

With the rapid progress of technology, the spatial layout and form of cities are undergoing unprecedented changes. The impact of technological progress on urban space is both profound and extensive, covering multiple aspects such as transportation, architecture, infrastructure, and social activities.

Progress in transportation technology

Modern transportation technologies, such as autonomous vehicle, maglev trains and unmanned aerial vehicles (UAV), are reshaping the city's transportation network. These technologies have reduced traffic congestion, improved travel efficiency, and brought more flexibility to urban planning.

Intelligent buildings and green buildings

Technological progress has made buildings more intelligent and environmentally friendly. Intelligent building systems can automatically adjust temperature, light, and ventilation to achieve maximum energy efficiency. At the same time, green building materials and design concepts have also brought sustainability and ecological friendliness to cities.

Digital Technology and Urban Space

Digitalization and internet technology have created new dimensions for urban space. Technologies such as virtual reality, augmented reality, and digital twins have enabled people to simulate and interact in digital space, thereby changing the way urban life is conducted.

Reconstruction of Public Space

With the popularization of mobile communication and social media, the function and significance of public spaces have changed. For example, traditional squares and parks may transform into wireless network hotspots and digital art exhibition spaces.

Ecological Technology and Urban Greening

Ecological technologies, such as rainwater harvesting, green roofs, and vertical gardens, are changing the urban ecosystem. These technologies not only improve the ecological benefits of cities, but also provide livable and leisure spaces for citizens.

Technological progress is profoundly affecting and changing urban space. For urban planners and managers, understanding these changes and effectively applying new technologies is the key to future urban development.

ANALYSIS OF SUCCESS AND FAILURE STORIES

Success Case: Shenzhen

Shenzhen is the most successful city in China since the reform and opening up. It has rapidly developed from a small fishing village into a world-class cutting edge technology and innovation hub. The following are some important reasons for its success [14], [15], [16].

Policy support: As China's first economic center, Shenzhen enjoys many preferential policies and autonomy.

Technology-driven: Shenzhen has attracted many domestic and foreign companies such as Huawei and Tencent, becoming China's "Silicon Valley".

Location: Shenzhen is adjacent to Hong Kong and is the main communication window between China and the global market.

Failure Case: Northeast Old Industrial Base

Compared with Shenzhen's success, this former industrial city in Northeast China has faced challenges in recent decades. Former industrial cities such as Shenyang and Dalian are currently facing problems such as industrial and population decline [13], [17].

Industrial structure: High reliance on traditional wealthy enterprises, lack of industrial diversity and innovation capabilities.

Management system: During the planned economy period, the management system of these cities was static, with no market mechanism and no competition.

Location: Compared with the south-eastern coastal cities, the Northeast region is remote and has a lower level of transportation convenience.

Different urban development modes and supporting policies, land, industrial land, urban management system and other environmental factors will have a significant impact on urban development. Compared with old industrial bases such as Shenzhen and Northeast China, these internal and external challenges should be considered, when designing and implementing urban development strategies to ensure the sustainable and healthy development of the city.

DISCUSSION OF RESEARCH OUTPUTS AND THEIR POSSIBLE IMPACTS

Research results

The evolution of urban governance: From the rapid rise of economic hubs, ucity clusters, and coastal cities in the 20th century to the new urbanism of the 21st century, the practice of urban governance is no longer limited to economic forces or movements. You also focus on urban services, idifferent innovations, and environmental sustainability.

The impact of technology on cities: Cutting-edge technologies, such as digital technology and transportation technology reshaping the space and function of cities. From smart homes to online booking, technology has become a major driver of urban development.

Public policies and structural changes: Governments continue to revise urban planning methods to adapt to rapidly changing economic and social conditions. This modern approach places great emphasis on public works, environmental sustainability, and urban life.

Future trends: With technological progress and globalization, China's city tier ranking system will face new challenges and opportunities. Adaptive policies, innovations and public participation are the key to urban development.

This system in China has transformed from a simple economic and administrative model to a comprehensive, diverse, and dynamic system, indicating crucial changes in China's contemporary urbanization process and new trends in global urban development.

Possible contributions and impacts

Through analysis: This study revealing the complexity of China's urban governance system from a macro perspective. Furthermore, it also points out how innovation and technological development can be applied to this system to ensure its sustainability and adaptability.

The relationship between history and reality: Through a detailed analysis of past successes and failures, you can clearly understand the challenges and opportunities of contemporary urban development, providing guidance for future urban strategies.

Integrating technology with urban development: This study emphasizes the important role of technology and technology in urban development and identifies some unique strategies and tactics that enable cities to fully expolit the opportunities brought by technological progress. Interdisciplinary research methods: This study adopts interdisciplinary research methods such as urban planning, economics, social research, and technology research, with comprehensive and in-depth knowledge. Clarity in policymaking: Through in-depth research on China's urban management policies, policymakers can better understand their impacts and constraints, so to formulate effective and flexible policies.

RECOMMENDATIONS FOR POLICY AND PRACTICE

Strengthen diversified participation:

Involving interested actors, such as government, enterprises, academia, and the public, jointly participate in the formulation of widely accepted, consensus-based urban development strategies to ensure that the interests.

Investing in education, research and development:

Maintain and strengthen the innovation capabilities of cities, it can be essential to investing in education and research and development. The government should closely cooperate with the private sector to make sure that resources effectively spend for technology development and talent management.

Emphasize sustainability:

Focusing on innovative spaces, environmental protection and social justice should be the core element of the future urban strategies. Sustainable urban strategies can contribute to implement long-term economic, social, and environmental goals.

Encourage local experiments:

The central government should provide more autonomy for local governments, allowing them to take into practice different innovations taking inot consideration the local features.

Establish strong data and analysis capabilities:

With the development of big data and artificial intelligence, the government should establish strong data collection and analysis capabilities to better understand the trends and challenges of urban development, and formulate strategies accordingly. For China being the world’s most populous nation, tackling the impending pressures of urbanisation is crucial. More than 500 Chinese cities have said they are pushing for the development of smart cities. Any city is considered to be smart when it can collect and analyse mass quantities of data from a wide variety of industries, from urban planning to garbage collection. In a smart city, a complex network of interconnected sensors, devices, and software have to be built and maintained. As a result, urban areas empower managing challenging issues more effectively from water management to excessive energy consumption to insufficient waste management.

Promoting international cooperation:

Against the backdrop of rapid urbanization and innovation in the world, China should strengthen cooperation with other countries to share its experiences, learn adoptable best practices, and address transnational issues such as climate change.

CONCLUSIONS

In the future, China should strengthen mutually beneficial cooperation among cities, encourage the comprehensive and “tailor-made” development of each city, let each city demonstrating its unique characteristics and values. Medium-sized cities should prevent from stagnation and superficial growth, and should not blindly copying the style and characteristics of famous domestic and foreign cities. It is necessary to find the necessary ways for urban transformation and development, inherit cultural heritage, update the urban appearance exploiting with existing urban advantages. For traditional industries, focus on

digital transformation, innovation and upgrading of traditional industries, support the cultivation of new technologies and the clustering of future industrial sectors. You need to devote more attention and investment to ensure the well-balanced, harmonious sustainable development in all cities.

In the context of globalization, China's urban development and evolution of city ranking system attracting the world's attention. Its success stories, challenges and lessons can serve as a reference base for predicting and directing the future global urbanisation trends.

The Chinese model in global comparison

The Chinese city tier ranking system is special and unique. Compared to the urbanization process in the West, China places more emphasis on the coordination between the central and local governments, rather than simply being driven by market forces. This model ensures the predictability and stability of urban developments to a certain extent.

Global impact of innovation space

Chinese innovation, industrialization and urban development actions, such as Shenzhen's high-tech industrial parks, has become model for the world. The new hub will not only provide a platform for technological and industrial development, but also promote the flow of global talent, capital and knowledge.

Although China has made remarkable progress in developing cities and new districts, it also faces many challenges such as environmental pollution, social inequality, and resource constraints. These stories provide important lessons for cities around the world: urban growth and innovations have to be combined with sustainability and social justice.

China's relations with the world

Global factors such as international investment, international transportation, and climate change have impact on the Chinese urban development policies. In fact, China's urban development strategies and innovation hubs have had significant influences on the world, driving new trends in global urbanization and different innovation.

Globally, China's urban ranking scheme, innovation space, and lessons learned provide references and insights for global urbanization and innovation around the world. At the same time, global factors are also shaping and influencing China's urbanization path and innovation practices.

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Article history:

Received 6 February 2024

Accepted 27 May 2024