Assessing the Evolution and Impact of National Smart City Policies on Urban Clusters in China: A Decadal Analysis of Policy Dynamics and Urban Development

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Abstract
Smart city policies continuously evolve with urban development. Persistent and extensive urbanization affords numerous opportunities to revise and renew smart city policies within China. The varied development levels across cities mean that national policies impact them differently. Therefore, assessing the phased impacts of national smart city policies on diverse urban areas emerges as a critical endeavor. This study compiles and investigates of national-level smart city policies in China spanning from 2013 to 2023. From the cities identified as pilot projects by the national government, 120 smart cities are selected for analysis. These cities are categorized based on their geographical locations and the characteristics of their urban statistical data. The findings reveal that: (a) The emphasis of smart city policies shifts across different stages, with each stage displaying distinctive policy focuses; (b) The effectiveness of smart city policies tends to align positively with the urban economic development level; (c) Cities in less accessible regions often aim to develop in a targeted direction. Therefore, the regular analysis of urban statistical data and the timely revision of smart city policy directions hold significant importance. Moreover, fostering balanced development across various dimensions within smart cities warrants increased focus.
Keywords: Smart City, Urban Policy, Urban Growth, Smart Infrastructure

Introduction

The concept of smart cities is universally acknowledged as a crucial component in urban development strategies across a multitude of countries, highlighting the necessity for integrating advanced technological solutions and innovative management practices to foster sustainable urban growth, elevate the quality of life for residents, and enhance urban operational efficiency(Duygan, Fischer, Pärli, & Ingold, 2022; Law & Lynch, 2019; Pashchenko, 2021; Toli & Murtagh, 2020). Despite widespread consensus on the importance of smart cities, the global interpretations of smart city implementation methods and policies demonstrate significant variation(Caragliu & Del Bo, 2016; Schiavo & de Magalhaes, 2022). This variation can be ascribed to differences in urban dimensions(Nilssen, 2019), stages of development(Guo, Liu, Yu, Hu, & Sang, 2016), socio-economic conditions(Duygan et al., 2022), and cultural backgrounds(von Richthofen, Tomarchio, & Costa, 2019). In more developed areas, the pursuit of smart city projects primarily aims at promoting sustainable development, improving living standards, and enhancing urban functionality(Gil, Carvalho, & Paiva, 2020; Kwak & Lee, 2023; Su, Miao, & Wang, 2022; Zubizarreta, Seravalli, & Arrizabalaga, 2016). Notably, in Europe, such initiatives are distinguished by a commitment to environmental sustainability, social inclusivity, and strengthened urban governance(Kurniawan, Haviluddin, Collantes, Nugroho, & Hariadis, 2022).

Conversely, developing countries are confronted with an array of challenges spurred by rapid urbanization, including inadequate urban infrastructure in remote areas and a reduction in green space in densely populated regions(Antwi-Afari, Owusu-Manu, Simons, Debrah, & Ghansah, 2021; Loureiro et al., 2021; Patil, 2019; Vu & Hartley, 2018). In response, smart city frameworks stand out as essential tools to address these issues, enhance urban management, and spur economic progress. The evolution of smart cities in such scenarios extends beyond technological innovation, symbolizing a strategic necessity for socio-economic transformation. This aims at reducing regional development disparities and boosting urban competitiveness by integrating technology into the urban fabric(Ng, Afari, Owusu-Manu, & Asumadu, 2022; Tan & Taeihagh, 2020).

China stands as a prime example of swift urbanization(Shi, Taubenböck, Zhang, Liu, & Wurm, 2019), with smart city development being intricately woven into the national development strategy since 2013. The commitment to leveraging smart city projects for fostering sustainable urban growth, enhancing the efficiency of public services, and improving citizens' quality of life is clearly observable(Chen & Dagestani, 2023). The Chinese government's strategy to identify and use cities as pilot sites for smart city development aims to utilize these projects as exemplars, thereby guiding and encouraging the broader application of smart city concepts throughout the country(Shen, Huang, Wong, Liao, & Lou, 2018). While significant achievements have been noted in environmental conservation and the improvement of public services, a detailed analysis that clearly articulates the direct effects of these smart city initiatives on urban development remains notably lacking.

Accordingly, this study aims to fill the gap by conducting a comprehensive analysis of the effects that smart city projects have had on the development of 120 cities across China from 2016 to 2022. It involves a meticulous investigation of the distinct impacts that smart city policies have on urban development through various stages of their implementation, along with an evaluation of how policy interventions could be effectively tailored and refined to ensure the sustainability of urban growth. Through this academic effort, the research not only provides critical insights and strategic directions for the planning and management of smart city projects within the Chinese milieu but also offers valuable lessons and models for countries worldwide facing the challenges of rapid urbanization.

Literature Reviews

Entering the 21st century, the concept of smart cities has found its place within the governmental planning of various countries(Borsekova, Koróny, Vanová, & Vitálisová, 2018; Söderström, Blake, & Odendaal, 2021). Defined as a strategic urban planning policy, researchers from diverse sectors alongside governments globally have been probing into defining "the essence of a smart city." With advancements in communication technologies, smart cities were initially recognized for their infrastructural build-up. Through policy-driven initiatives, governments have propelled the construction of the internet infrastructure, thus furnishing cities with an array of services, better resident management and understanding, ultimately enhancing urban competitiveness(Myeong, Jung, & Lee, 2018). Following the comprehensive development of infrastructure, the focus of smart city policies transitioned from transforming societal living through technology to leveraging technology in providing services that elevate the quality of life for residents(Song, Xiao, & Zhou, 2023). Consequently, smart cities are perceived by governments worldwide as an effective approach to addressing urban challenges, promoting a new urban planning policy under the guise of sustainable development. This approach includes (a) an enhanced model of urban management(Grossi, Meijer, & Sargiacomo, 2020; Rachmawati et al., 2019), (b) a more scientific urban planning method(Karvonen, Cook, & Haarstad, 2020; Zhao & Zhang, 2020), and (c) a focus on the improvement of residents' living standards(Liang, Peng, Xing, Lin, & Jia, 2019; Park & Fujii, 2023).

Efficient management models are instrumental in enhancing the government's understanding of local residents, such as through the collection of more data generated in their daily lives(Degbelo et al., 2016), thereby increasing the efficiency of citizen engagement in government affairs (consultations, transactions, complaints, etc.)(Anthopoulos, Reddick, & Acm, 2016). For instance, China began transitioning government services from offline to online in 2019, which has enhanced citizens' trust and satisfaction with the government(Shan, Zhang, Zhang, Tang, & Wang, 2021). In Spain's smart city government projects, a top-down governance model has enabled the Barcelona government to successfully balance the resource allocation of over 200 projects(Díaz-Díaz & Pérez-González, 2016).

Moreover, smart cities represent an innovation in urban planning methodologies. Urban development strategies are often based on government administrators' judgments and plans for the city's future, generally aimed at “solving existing urban problems” and “meeting the needs of urban residents”(Huang, Luo, Zhang, & Li, 2021). Infrastructure is commonly defined as the engineering facilities that provide public services for social production and residents' lives. It constitutes the public service system that ensures the normal conduct of socio-economic activities in a country or region and represents the material foundation upon which society depends for survival and development. Unlike the traditional concept of infrastructure, smart infrastructure is a long-term investment that relies on a stable government structure and requires a steady budget from local governments(Fietkiewicz & Stock, 2015). Smart infrastructure includes data collection and management systems for "urban safety, intelligent transportation, green cities," etc. Government administrators can understand the current status of the city through a vast amount of existing data and predict potential future issues through algorithms, thereby issuing policies to intervene in the city's development direction(Díaz-Díaz & Pérez-González, 2016).

In developed countries, such as Singapore and Australia, where there are more comprehensive urban management systems, smart infrastructure already plays a certain role in city management. Building on this, these cities focus more on improving the quality of life for residents, increasing their participation in city policy-making, and enhancing the city's green spaces and levels of medical service provision, thereby effectively elevating residents' sense of well-being (von Richthofen et al., 2019; Yigitcanlar, Degirmenci, Butler, & Desouza, 2022).

The Characteristics of State-Led Smart City Policies

Smart cities, as a broad and long-term urban planning policy, necessitate national policy direction to guide local governments through phased work. Despite various governments harboring expectations for smart cities, the diversity of such cities entails the involvement of multiple governmental departments in policy formulation and implementation(Mila Gasco-Hernandez, 2022). Thus, in regions like Spain, Singapore, South Korea, and China, initial policy stages commonly faced prolonged formulation periods, the absence of unified standards, and a lack of leading departments(Fang, Wang, & Liu, 2020).

With continuous exploration by countries, through adopting pilot city initiatives, smart city policies are practically applied to urban planning. For instance, the approaches taken by Sejong City in South Korea (2017), the ASEAN Smart Cities Network (2018), and Canberra in Australia (2018) focused on creating smart cities with local characteristics and specific objectives. On the other hand, developing countries like China and India have adopted strategies involving the synchronous development of multiple cities. Taking China as an example, from 2013 to the present, over 100 smart city pilots have been announced, with national policies advising and mandating local governments. The aim is to elevate the overall level of national intelligence, minimize urban-rural disparities, and forge a more efficient government management system(Chen & Dagestani, 2023). Analysis of local government documents and reports from the central government spanning from 2013 to 2023 reveals that smart city policies can be categorized into seven types, as illustrated in Figure 1-A. These categories include "Land Policy, Public Policy, Security Policy, Economic Policy, Environmental Policy, Transportation Policy, and Science and Technology Policy." Each city possesses its unique developmental direction and characteristics, leading to divergent paths of urban development(Borsekova et al., 2018). Given budgetary constraints, local governments selectively prioritize certain policy areas over others through either individual or comprehensive policy initiatives, focusing on specific aspects for targeted development.

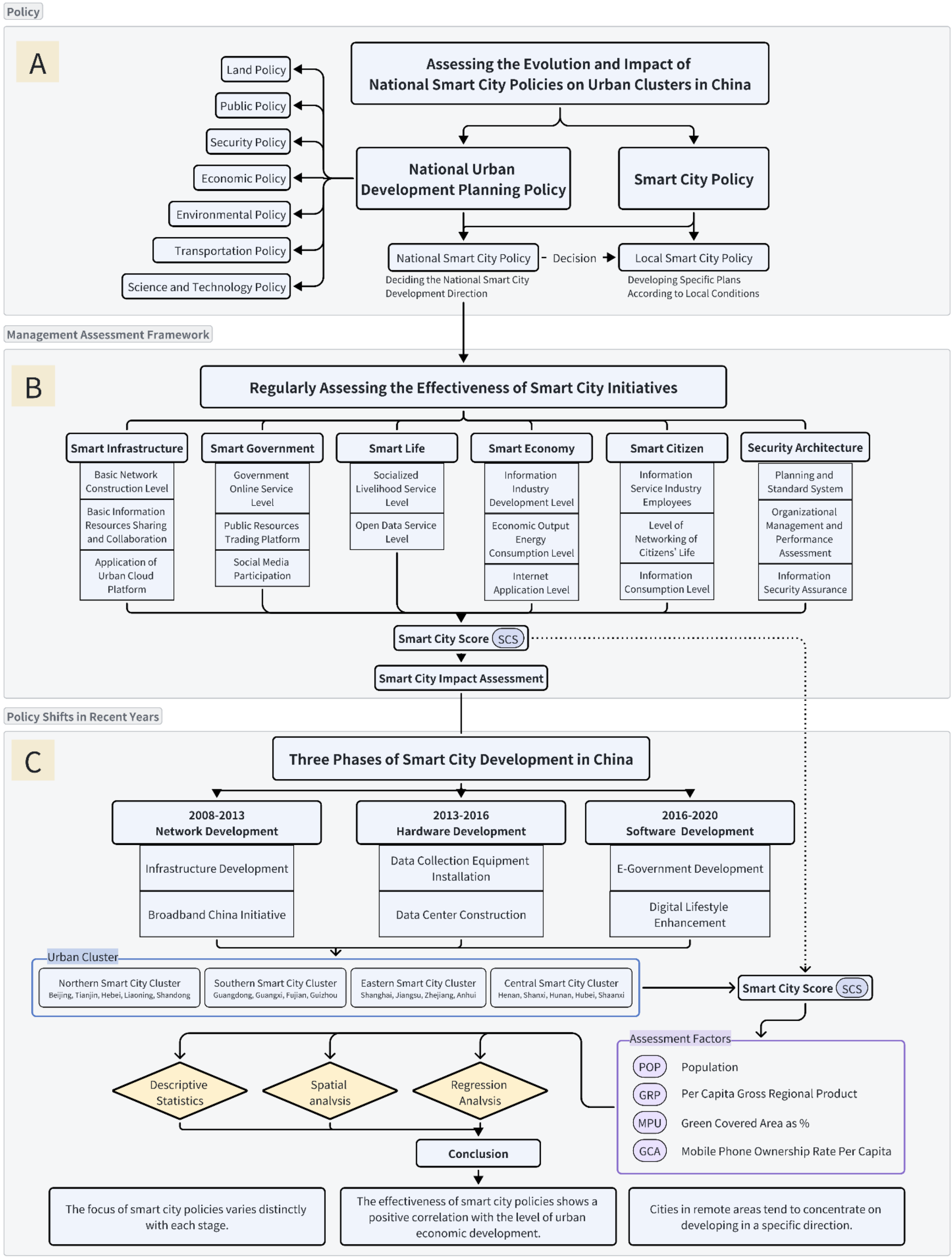
For monitoring urban development outcomes, conducting regular analyses of smart cities is deemed essential. The Chinese Academy of Social Sciences, in collaboration with various local governments, has established smart city evaluation standards to annually assess the level of urban intelligence across Chinese cities. These evaluation criteria are divided into six primary indicators and seventeen secondary indicators (based on the 2016 standards, with slight annual modifications). Through weighted data analysis, annual smart city scores for each city are calculated. (See Figure 1-B) Smart cities represent a comprehensive policy approach. At the national level, smart city policies often require the collaborative efforts of multiple departments. In 2013, the Ministry of Housing and Urban-Rural Development proposed the concept of building smart cities and announced the first batch of pilot cities. Many scholars view this as the inception of the Chinese government's initiative to construct smart cities. However, the massive construction of communication infrastructure in China had already begun earlier. From 2008 to 2013, the continuous development of 3G network infrastructure achieved coverage across all towns and villages in China. In 2016, China initiated the "13th Five-Year Plan," promoting the development of smart cities from a national perspective. This advancement was not limited to the construction of hardware-level smart infrastructure but also included the ongoing development of software aspects, such as e-government services. (See Figure 1-C)

For developing countries, the primary issues concerning smart city projects are the necessity of building smart cities and the costs involved(Ng et al., 2022; Shan et al., 2021). After 2015, China's smart city policies became an integral part of the national urbanization development strategy, aimed at integrating information across departments and government levels, making infrastructure intelligent, public services convenient, and social governance efficient(Chen & Dagestani, 2023). Although the central government has introduced various new measures regarding talent cultivation and enhancing residents' happiness, local government policies still prioritize economic development and improving governmental work efficiency (see Table 1).

Table 1. New Smart City National and Local Representative Policies (through 2022)

Policy Source	Time	Policy Name	Summary of Contents	Policy Type	Applicability Scope	Latest Policy Status
National-Level Policy	2022.01	"14th Five-Year" Digital Economy Development Plan	By 2025, aims are set for the digital economy's core industries to account for 10% of GDP and for traditional industries to undergo comprehensive digital transformation.	Smart Economy	Urban + Rural	○
	2022.04	2022 Digital Village Development Key Points	Continuous advancements in rural digital infrastructure are planned, targeting 5G network expansion and achieving over 60% internet penetration in rural areas.	Smart Infrastructure	Rural	×
	2022.05	Opinions on Promoting Urbanization Construction with County Towns as Important Carriers	Urbanization efforts by 2025 will focus on county towns, steering the development of smart cities for the forthcoming five years.	Smart Infrastructure	Rural	○
	2022.06	Guidelines on Strengthening Digital Government Construction	The promotion of smart city development will center on digital, intelligent upgrades and the innovative integration of urban infrastructures.	Smart Government	Urban + Rural	○
	2022.06	"14th Five-Year" New Urbanization Implementation Plan	Transition to smart urban environments will intensify through expanded digital technology applications in work, education, healthcare, and mobility services.	Smart Infrastructure	Urban	○
	2022.06	2022 Key Tasks for New Urbanization and Integrated Urban-Rural Development	The acceleration of new smart city constructions will emphasize people-centric urban planning, fostering environments that are innovative, resilient, and culturally enriched.	Smart Infrastructure	Urban + Rural	×
	2022.12	"14th Five-Year" Special Plan for Urbanization and Urban Development Science and Technology Innovation	Efforts to enhance digital infrastructure in rural locales will persist, with aims for broader 5G coverage and heightened internet access.	Technology	Urban	○
Northern Smart City Cluster (Beijing-Tianjin-Hebei, etc.)	2022.05	Beijing City Digital Economy Full Industrial Chain Open Development Action Plan	Initiatives to set data standards will be undertaken to cultivate an innovative base for the digital economy's industry chain.	Technology, Economy	Urban	○
	2022.11	Beijing Digital Economy Promotion Regulations	Plans include establishing a comprehensive smart city construction coordination mechanism, aiming for integrated planning and smarter governance.	Smart Governance	Urban	×
	2022.02	Tieling City New Urban Infrastructure Construction Implementation Plan	The development of new urban scenarios will utilize industrial digitalization to foster the integration of digital and real economies, improving public services and governance.	Smart Infrastructure	Urban	○
	2022.02	Digital Qingdao 2022 Action Plan	Setting benchmarks for intelligent urban centers involves creating centralized big data platforms for collecting comprehensive government data.	Smart Governance	Urban	×
Eastern Smart City Cluster (Yangtze River Delta)	2022.01	Shanghai City Comprehensive Promotion of Urban Digital Transformation "14th Five-Year" Plan	Enhancements in smart public services will be pursued to bolster urban living, focusing on healthcare, mobility, and safety through digital innovations.	Smart Transportation, Smart Livelihood	Urban	○
	2022.08	Implementation Opinions of Zhejiang Provincial People's Government on Deepening the Construction of Digital Government	Goals are to achieve full digital coverage in government operations, significantly upgrading governance systems and capabilities.	Smart Governance	Urban	×
Southern Smart City Cluster (Pearl River Delta and Southern Coastal Areas, etc.)	2022.02	Shenzhen City Action Plan for Promoting New Type Information Infrastructure Construction (2022–2025)	By the end of 2025, commitments are to establish a leading, innovative information infrastructure, setting global benchmarks for smart city infrastructures.	Smart Infrastructure	Urban	○
	2022.05	Shenzhen City Digital Government and Smart City "14th Five-Year" Development Plan	Objectives include establishing benchmarks for international smart cities, aiming to become pioneers in the digital world.	Smart Governance	Urban	○
	2022.03	2022 Digital Fujian Work Key Points	Full construction of a new smart city model will proceed, including the creation of digital twin cities and sophisticated urban management platforms.	Smart Governance, Digital Twin	Urban	×
Central Smart City Cluster (Central Plains Region)	2022.03	2022 Henan Province Digital Economy Development Work Plan	Acceleration in the pilot construction of new smart cities is planned, promoting the development of digital twin technologies and supporting city-level initiatives.	Smart Governance, Digital Twin	Urban	×
Other Regions	2022.04	Chengdu City "14th Five-Year" New Type Infrastructure Construction Plan	Construction of a secure and reliable infrastructure system will be crucial for supporting the development of park cities based on new concepts.	Smart Infrastructure, Smart Parks	Urban	○

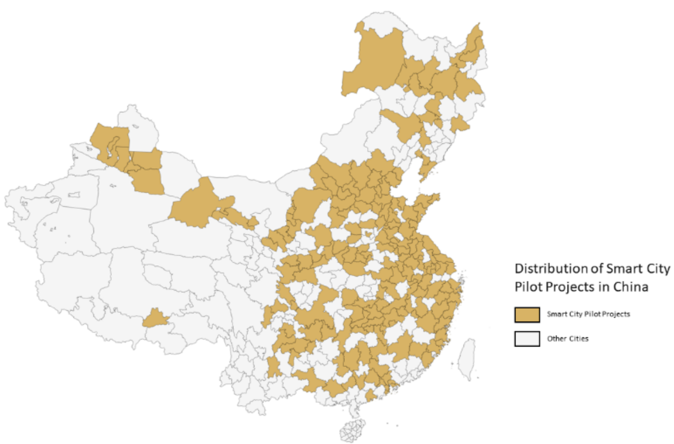
Figure 1. The Structure of The Study

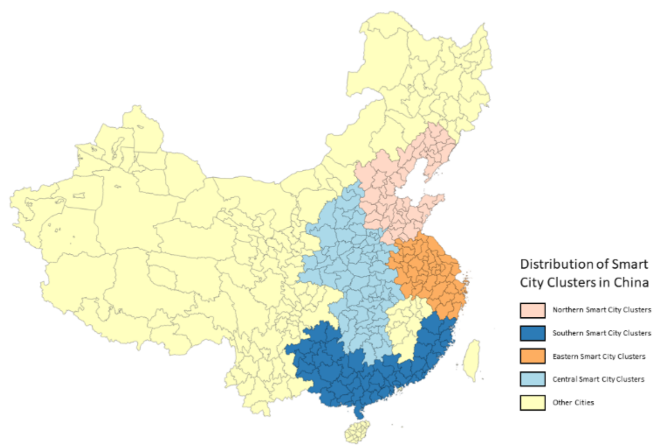


Methodology
Study Area

As the pace of economic growth accelerates and urbanization intensifies, smart cities begin to manifest unique regional traits. To address the disparities in regional development and their effects on the progression of smart cities, this research selects smart city pilots from diverse regions for investigation. China, anchored by its government-driven smart city initiative, provides a fertile ground for this investigation due to 1. An extensive collection of smart city pilot projects. 2. Securing spatial separation among urban clusters to reduce their interdependence. 3. Ongoing updates to smart city policies by both central and local governments, promoting the evolution of smart cities. From China's 333 urban administrative divisions, a total of 198 smart city pilot cities have been identified (see figure 2-1). To mitigate the impact of anomalies in less accessible areas, this study focuses on 87 cities located within four major urban clusters (see figure 2-2).

Figure 2.1 Distribution of Smart City Pilot Projects in China (left)
Figure 2.2 Distribution of Smart City Clusters in China (right)





Data Collection and Processing

The statistical data used in this analysis are all from the statistical yearbooks published by the National Bureau of Statistics of China (2013-2023). Geographic information data are obtained from the World Topographic Map in Esri's ArcGIS and the China National Geographical Information Public Service Platform. Firstly, in order to explore whether there is a geographical correlation in the development of smart cities in China, spatial autocorrelation (Global Moran's I) analysis was conducted on 289 cities with statistical data in four aspects: population, per capita GRP, proportion of green space area, and per capita ownership of mobile devices, to verify the necessity of city cluster analysis.

In this analysis, the Global Moran's I is employed to analyze a single value of spatial autocorrelation within the entire space. The formula for calculating the data is as follows:

$$\boldsymbol{I} = \frac{\boldsymbol{n}}{\sum_{i=1}^{n}\sum_{j=1}^{n} \boldsymbol{wi,j}} \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} \boldsymbol{w_{i,j}\, z_i z_j}}{\sum_{i=1}^{n} \boldsymbol{z_i}^2} \qquad (\mathbf{1})$$

where z_i is the deviation of attribute, $i(x_i\text{-}\boldsymbol{\bar{x}})$, w_i, j is the spatial weight between elements i and j, n is the total number of elements, and S_0 is the aggregation of all spatial weights. The calculation of the z values is based on the following formulas 2 to 4.

$$z_I = \frac{I - E[I]}{\sqrt{V[I]}} \tag{2}$$

$$E[I] = -\frac{1}{n-1} \tag{3}$$

$$V[I] = E[I^2] - E[I]^2 \tag{4}$$

Subsequently, based on geographical location and policy similarities, four key city clusters in China were identified: the Northern City Cluster (Beijing-Tianjin-Hebei and Liaoning, Shandong), the Eastern City Cluster (four provinces in the Yangtze River Delta region), the Southern City Cluster (Guangdong, Guangxi, Fujian, Guizhou), and the Central City Cluster (Henan, Shanxi, Hunan, Hubei, Shaanxi).

Result

This research analyzes four indicators across the domains of economy, environment, technology, and population, specifically focusing on the years 2016, 2020, and 2022, which mark significant policy shifts. The year 2022 serves as the experimental benchmark, with data from 2016 and 2020 used for validation purposes. In the realm of population, the year-end registered urban population (excluding the transient population) is selected. Economically, per capita Gross Regional Product (GRP) is used as the reference standard. Environmentally, the focus is on the area of green spaces within built-up areas, while technologically, the indicator is the per capita ownership of mobile phones. All four indicators have undergone correlation analysis with significant results.

For the dependent variable and use the Smart City Score data issued by the China Academy of Information and Communications Technology in 2016, 2020, and 2022. This data employs a scoring system that includes seven primary and nineteen secondary categories, all derived from local government sources. The scores are presented as percentages to two decimal places.

Analysis outcomes reveal a notable spatial autocorrelation across four indicators, with the probability of such a clustering pattern emerging randomly being under 1%. Therefore, the null hypothesis can be rejected. This observation suggests that areas characterized by higher values in population, economy, green space, and mobile phone usage exhibit a tendency to geographically cluster. As a result, it is deemed essential to assess the effectiveness of smart cities through the lens of urban clusters.

Table 2. Spatial Autocorrelation Analysis Results

Spatial Autocorrelation	Moran's Index	Expected Index	z-score	p-value	Variance
Population (POP)	0.38	-0.00	11.60	.000***	0.00
Per Capita Gross Regional Product (GRP)	0.42	-0.00	12.78	.000***	0.00
Green Covered Area as % (GCA)	0.45	-0.00	25.75	.000***	0.00
Mobile Phone Ownership Rate Per Capita (MPU)	0.07	-0.002	4.6	.000***	0.00

*** $p < 0.001$. * $p < 0.01$. * $p < 0.05$.

Statistical data from four city clusters were analyzed using a linear regression model, with findings for the year 2022 revealing a significance (sig) value of 0.000 and an R^2=0.579, indicating substantial model outcomes. The standard deviation of residuals (Std. dev.) at 0.983, nearing 1, suggests the normality of the data. Additionally, minimal discrepancies between observed and predicted values corroborate the linear regression model's assumption of residual normality.

Multivariate linear regression analysis shows that, in the context of China's smart cities, population and mobile phone ownership rate per capita are significantly correlated with the level of smart city development.

Table 3. Multivariate Regression Analysis Results by Year 2022

Table 3.1 Overall

City-related Indicators	Acronym	Standardized Coefficients	t-value	Sig.	VIF
(Constant)			9.050	.000	
Overall (including the following four types of cities)(n=118)	POP	.333	4.372	.000	1.590
	MPU	.444	7.299	.000	1.011
	GCA	.113	1.588	.115	1.386
	GRP	.343	4.047	.000	1.961

The linear regression analysis of 118 smart city pilot cities in China reveals that smart city scores are significantly correlated with population figures (see Table 3.1). In addition, there is a notable correlation with communication indicators, specifically the Mobile Phone Ownership Rate Per Capita, which underscores the tight linkage between smart city outcomes and the investment in national-level smart city policies (see Table 1). Regarding the development of communication infrastructure, policy investment is closely associated with output results, consistently demonstrating a positive correlation with communication aspects (t=9.443, sig=0.000).

Table 3.2 Northern Smart City Clusters (R^2=0.808 sig=0.000)

City-related Indicators	Acronym	Standardized Coefficients	t-value	Sig.	VIF
(Constant)			3.840	.002	
Northern Smart City Clusters(n=17)	POP	-.363	-1.547	.148	3.449
	MPU	1.190	4.331	.001**	4.728
	GCA	-.184	-1.119	.285	1.689
	GRP	.144	.956	.358	1.429

Table 3.3 Eastern Smart City Clusters (R^2=0.540 sig=0.002)

City-related Indicators	Acronym	Standardized Coefficients	t-value	Sig.	VIF
(Constant)			.939	.358	
Eastern Smart City Clusters(n=26)	POP	-.182	-.687	.500	3.208
	MPU	.631	2.068	.049*	4.262
	GCA	-.012	-.072	.943	1.302
	GRP	.300	1.428	.168	2.018

In focused analyses of urban clusters, significant correlations between technology, communication, and smart city levels were observed in the northern region, centered around Beijing and Tianjin (see table 3.2, t=4.331, sig=0.001), and the eastern region, centered around Shanghai (see table 3.3, t=2.068, sig=0.049). These findings align with the overall national trends in smart city analyses. No significant results were observed for other indicators.

Table 3.4 Southern Smart City Clusters (R^2=0.642 sig=0.001)

City-related Indicators	Acronym	Standardized Coefficients	t-value	Sig.	VIF
(Constant)			1.937	.070	
Southern Smart City Clusters(n=22)	POP	.113	.608	.551	1.648
	MPU	-.170	-.605	.553	3.737
	GCA	-.279	-1.540	.142	1.556
	GRP	1.064	3.454	.003**	4.507

Table 3.5 Central Smart City Clusters (R^2=0.573 sig=0.049)

City-related Indicators	Acronym	Standardized Coefficients	t-value	Sig.	VIF
(Constant)			1.105	.281	
Central Smart City Clusters(n=28)	POP	.036	.120	.905	3.122
	MPU	.031	.086	.932	4.332
	GCA	-.114	-.533	.599	1.564
	GRP	.560	2.130	.044*	2.362

*** p < 0.001. ** p < 0.01. * p < 0.05.

In the southern region, centered around Guangzhou, areas with better economic development correlate with higher smart city levels (see table 3.4, t=3.454, sig=0.003). Similarly, in the central region, there is a clear correlation between "per capita gross regional product" and smart city scores (see table 3.5, t=2.130, sig=0.044). However, environmental indicators, such as the "Green Covered Area as %", do not show a significant correlation with the development levels of smart cities.

Conclusion and Discussion

The research elucidates that national frameworks governing smart cities profoundly shape the course of urban evolution, aiding local authorities in formulating detailed strategies for management and policy execution. However, for local administrations in developing countries, prioritizing economic growth remains essential, alongside the pursuit of more efficacious urban governance models(Browne, 2020). Although smart city national policies have evolved across three distinct stages, a notable eagerness persists among economically prosperous cities to eagerly embrace innovative policies. The generation of quantifiable outcomes from policies may require a certain period, as illustrated by the "green covered area as %" previously mentioned. This necessitates governments to balance the proportion of industrial, commercial, and residential plot development with parks and other green spaces(Anguluri & Narayanan, 2017). Statistical analyses underscore local governments' focus on environmental improvements, technological advancements, and support for small and medium-sized enterprises. In the realm of smart city policy analysis, only 43% of pilot smart cities are located within major urban areas, suggesting that remote or economically vibrant yet isolated cities hold the capacity to drive development in surrounding areas. The quintessence of national smart city initiatives is to ensure equitable access for all residents to the benefits engendered by these policies, with the objective of diminishing the disparities between rural and urban locales, as well as inter-city inequalities. The realization of such equity is predicated on the prioritization of internet (telecommunications) infrastructure as a core component of the smart city agenda across nations and their respective cities.

However, the opportunities for cities to benefit from national smart city policies are not uniformly distributed. For residents in remote areas, access to advanced services like smart healthcare, high-speed railways, artificial intelligence, or digital twins are not deemed crucial. Instead, smart city endeavors customized to local needs and feasible for cost-effective implementation (e.g., public Wi-Fi, emergency medical services) should be central to local authorities' efforts(Yerden, Gil-Garcia, Gasco-Hernandez, & Burke, 2021). Alongside initiatives aimed at economic development, a focus on enhancing smart city services to mirror the unique characteristics of each locality becomes crucial. Additionally, efforts to gather, manage efficiently, and process data should be recognized as the guiding path for the future evolution of urban environments.

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