Exploration of CSPON in Guangzhou: Set-up Tasks, Holistic Proposal, and Practical Reflections on Municipal-Level Network

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Abstract: the China Spatial Planning Observation Network (CSPON) aims to address the demands for integrated, all-factor, and dynamic governance of territorial space in the new era. It promotes local governments' implementation of planning system reforms from top to bottom. Focusing on Guangzhou as a pilot city, the paper proposes solutions and practical explorations for developing municipal CSPON. Firstly, for vertical integration, CSPON should seek to strengthen alignment with the provincial planning system, enhance information feedback mechanisms, and establish a multi-level development unit planning transmission system within the city. Secondly, for horizontal collaboration, CSPON should develop effective data governance systems and standards, improve the multi-stakeholder collaborative system, and refine implementation pathways. Thirdly, for perception and governance technologies, CSPON should advance technology systems, such as "space-air-ground" physical perception and "human-affair-object" social perception, while building intelligent governance capacities for dynamic integration of multi-source heterogeneous data. Fourthly, for smart governance, CSPON should create a model that aligns with operational and business requirements. Reflecting on Guangzhou's experience, the study reflects on problems such as the need for high-quality data, significant financial resources, and exploratory orientation. It concludes with strategic suggestions to integrate and optimize systems, enhance capacity in data governance, and prioritize practical application of governance models.

Keywords: smart city; China Spatial Planning Observation Network (CSPON); spatial planning reform; Guangzhou

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In 2023, the General Office of the Ministry of Natural Resources issued the Work Plan for Building the National Territorial Spatial Planning Implementation Monitoring Network (2023-2027) (hereafter, the Work Plan). It proposed establishing the China Spatial Planning Observation Network (CSPON) and prioritizing four application scenarios: online planning administration, automated territorial-space health checks and evaluation, simulation of complex spatial-governance scenarios, and online public planning services. This initiative further implements the planning-supervision provisions of the 2019 Opinions of the CPC Central Committee and the State Council on Establishing and Supervising the Implementation of a Territorial Spatial Planning System, and is regarded as a major upgrade of implementation supervision based on the "one map" platform[1].

Since reform of the territorial spatial planning system began, the number of relevant studies indexed by CNKI① has risen from fewer than three per year before 2018 to more than ten annually. Existing scholarship addresses conceptual meaning and tasks[2-4], historical development[5-6], types and content[7-9], legal approaches[10-12], supervisory systems at different administrative levels[5,13-16], and information-system frameworks and technical models[17-21].

Compared with planning-implementation monitoring and evaluation mechanisms that emerged in Western Europe in the 1960s[11], however, CSPON remains a recent experiment with a relatively weak foundation. Its role is not yet fully defined, its system architecture is incomplete, and its methods and mechanisms require further development[4-5]. Pilot areas have also yet to reach consensus on its concept and scope of work[5,22]. Local governments already conduct several routine forms of monitoring, including annual health checks and five-year evaluations of municipal territorial spatial master plans, annual surveying updates, and regular monitoring of changes in all geographic-information elements. Yet no study has systematically explained how municipal CSPON systems should be built or function. Drawing on Guangzhou's pilot experience, this paper examines the logic of its construction tasks, the overall system solution, and the priorities of practical application, with the aim of informing municipal-level CSPON development.

1 Construction Tasks of the China Spatial Planning Observation Network (CSPON)

1.1 New Demands for Territorial Spatiotemporal Governance Shape the CSPON Concept

To achieve more integrated national development and protection of territorial space and to raise the digital-intelligent capacity of planning-based spatiotemporal governance, the Ministry of Natural Resources has progressively developed the CSPON concept. The system upgrades the planning-monitoring and early-warning "one map" into a vertically and horizontally connected "one network" for plan preparation and implementation, responding to the new demand for integrated, all-factor, and dynamic governance of territorial space.

1.1.1 Central-Local Planning Conflicts Prompt Stronger Integrated Territorial Governance

From the perspective of central-local relations, China's vast governance scale and workload have produced a historical process of alternating decentralization and recentralization in local spatial governance. Scholars commonly identify four institutional turning points - the founding of the People's Republic, reform and opening-up, tax-sharing reform, and comprehensive deepening of reform - corresponding to four stages: strong centralization, fiscal decentralization, division of central and local responsibilities, and coordinated deep reform[23]. In the third stage, the central government established the market's foundational role in allocating land resources②. This also intensified tensions between central spatial coordination and local spatial governance. Central plans, responding to a complex international environment, emphasized binding national-security objectives such as agricultural and ecological security and major regional infrastructure, whereas local plans, shaped by interlocal competition and performance pressures, tended to prioritize expansionary economic-space development.

After the Eighteenth CPC National Congress initiated comprehensive reform③, spatial planning entered a period of restructuring and integration. Territorial spatial planning reform was introduced as an instrument of holistic governance designed to safeguard ecological security and sustainable development[24]. Strengthening the central government's bottom-line control of security risks and spatial structure, while maintaining targeted local focus, became a key component of a modern system of coordinated central-local territorial governance[25]. The CPC Central Committee and the State Council therefore established a territorial spatial planning system and required supervision of its implementation④, reinforcing the authority of higher-level plans, creating dynamic monitoring, evaluation, early-warning, and regulatory mechanisms, and preventing failures of rigid top-down control or local inaction and misconduct[26].

1.1.2 From Monitoring, Evaluation, and Early Warning to All-Factor Governance of Plan Implementation

As China enters an era of ecological civilization and digitalization, new governance demands have prompted planning authorities to reconsider why plans sometimes fail to work, fit local conditions, or support implementation. Particular attention has turned to insufficient consideration of time, inadequate systemic treatment of development factors, and the absence of effective implementation mechanisms[27]. Territorial spatial planning is a strategic, foundational, and institutional instrument of spatial development and governance. Because it must be forward-looking, scientific, and operational, it requires a new spatiotemporal governance mechanism, reform not only of the plan-preparation system but also of implementation supervision and its legal and technical support[27].

Building on previous monitoring and evaluation practices, CSPON seeks to track implementation and support dynamic plan maintenance. It is not limited to monitoring and early warning; it also provides evidence for plan preparation, approval, amendment, administrative enforcement, and inspection[4], supporting the full process and all factors from implementation monitoring to problem resolution and decision-making[7].

1.1.3 Dynamic Governance from a "One Map" Platform to a "One Network" System

Under the national strategies of Digital China and a smart society, territorial spatial planning is shifting from information platforms toward intelligent systems. The "one map" must evolve from relatively static monitoring into genuinely dynamic control that responds to changing patterns of territorial protection, development, and use[28].

Since 2019, the central government has issued a dense series of guidelines and standards on territorial spatial planning and informatization. These have accelerated the construction of planning-management information systems at ministerial, provincial, municipal, and county levels and strengthened their vertical coordination. Localities have rapidly built platforms for plan integration, dynamic construction monitoring, and timely warning, while experimenting with real-time and periodic acquisition of diverse data[29]. Scholars have further proposed a "one network" that supports supervision and decision-making as well as horizontal and vertical business coordination. One example is a smart-planning framework grounded in ecological civilization, centered on people, and supported by technology and institutional innovation, forming a closed loop of data collection, plan preparation, plan evaluation, intelligent decision and feedback, renewed data collection, and plan adjustment[30]. The resulting CSPON concept aims ultimately at a smart territorial spatial planning system that can perceive, learn, govern, and adapt[1].

1.2 Top-Down Deployment of CSPON Construction Tasks

1.2.1 Organizational Structure

CSPON combines monitoring and supervision. It monitors plan implementation and supervises the entire life cycle from preparation to realization. Vertically connected "one map" implementation-supervision systems at county, municipal, provincial, and national levels form the backbone of the network (Fig.1).

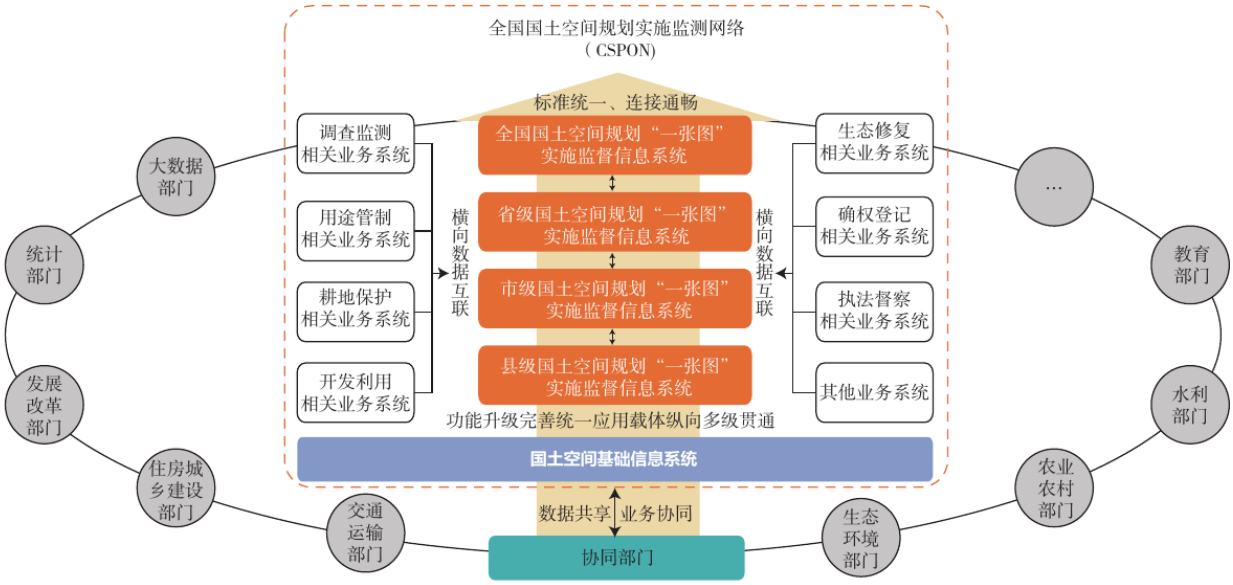

Fig.1 Schematic diagram of the monitoring network for implementing national territorial spatial plans

Under the Work Plan, natural-resources authorities at each administrative level remain the responsible supervisory bodies, without changing the existing division of responsibilities between the Ministry and local departments. Following the principle that the authority approving a plan is responsible for supervising it, the Ministry handles ministry-province connectivity, national policy and standards, and institutional mechanisms, while local departments advance relevant tasks within their mandates. Each level performs statutory supervision at an appropriate scale.

Within this hierarchical system, priorities differ. The central government focuses on national strategies, the implementation of specific policies, and the overall spatial pattern; provincial governments focus on planning zones and their structural relationships; municipal and lower-level governments focus on planning units and parcel use in central urban areas and towns, and on planning zones elsewhere[6].

1.2.2 Construction Tasks

Guided by demand and the principles of economy and efficiency, the national program emphasizes using existing information infrastructure rather than building separate platforms. Priorities include network construction, data governance, model development, integrated applications, and data confidentiality. Tasks are organized at three levels: a business network, an information-system network, and an open-governance network. Pilot areas may tailor tasks to local foundations and management needs, proposing concrete, implementable measures that reflect local priorities rather than pursuing an all-inclusive system[1]. Following applications and multilevel review, the first CSPON pilots were designated in December 2023, comprising one regional pilot, 16 provinces, 29 cities, and one county or district[31].

2 An Integrated Solution for Building a Municipal CSPON in Guangzhou

A municipal CSPON must be driven by governance needs and capabilities at its own level. It should address planning-unit and parcel-level applications, connect vertically with real-time "one map" systems above and below, and establish genuine data interconnection and departmental coordination across municipal business systems. It must also strengthen data-resource technologies and practical smart-governance functions (Table 1).

As a national pilot, Guangzhou has already developed a digital territorial-space framework based on its earlier "one map" experience, summarized as "three forms of comprehensive coverage and five forms of modernization": participation by all departments, coverage of the entire process, and control of all factors; together with digitalized business, standardized processes, networked handling, intelligent governance, and institutionalized management[32]. Practice nevertheless revealed shortcomings, including insufficient support for high-frequency routine work, excessive indicators with limited data availability, and fragmented business systems[33]. Guangzhou therefore intends to use CSPON construction to improve vertical plan transmission and horizontal business coordination, advance perception and integration technologies for massive multisource heterogeneous spatiotemporal data, build dynamic intelligent monitoring and warning, and develop urgently needed governance models.

Tab.1 Key directions for systematic construction of municipal CSPON

序号	关键攻关方向	需攻关的具体内容
1	纵向互联传导体系	按层级、分尺度、明权限的信息和指标传导体系
2	横向协同共享机制	实时连通、协作顺畅的规划业务统管协作机制
3	动态感知监测技术	实时监测数据的资源支撑和高质量数据治理技术
4	实用智慧治理功能	生态文明与人本需求的“数智化”空间治理模块

2.1 Establishing a Vertical Axis for Cross-Level Linkage and Fine-Grained Plan Transmission

Transmission among existing "one map" platforms remains incomplete[34]. Under a supervisory relationship in which authority and responsibility are aligned and the approving level supervises the corresponding plan[35], development-unit levels and boundaries must be designed to support smooth indicator transmission. Guangzhou therefore needs a quantifiable, transmissible, supervisable, and flexibly controlled vertical indicator system; standards for connecting the municipal platform upward to ministerial and provincial systems and downward to county systems[14,22]; and solutions for matching spatial units with indicator decomposition, approval and filing, monitoring, and warning functions[36-37].

2.1.1 Connecting to the Provincial Planning System and Strengthening Information Feedback

Using a government cloud and microservice architecture, Guangdong has built a generic province-city-county system. It replaces the former bottom-up offline reporting model with two-way interaction: downward transmission, supervision, and warning, combined with upward aggregation, feedback, and updating. This supports precise indicator constraints, coordinated warning response, and rolling updates of planning databases at all three levels, while allowing local platforms to add functions for their own needs after completing data entry, aggregation, and updates[14]. Guangzhou must receive both strategic and binding content from provincial plans (Table 2). Strategic content is transmitted proactively and includes target-and-scale and spatial-pattern elements; binding content is transmitted rigidly and includes bottom-line constraints and factor allocation[13]. Guangzhou also plans to strengthen interoperability with the provincial system and enable data feedback from land-use approval, conversion of agricultural land, and illegal-land-use enforcement[38].

Tab.2 The municipal-level planning content that should be aligned with provincial-level plans

传导形式	要素类型		传导要素
主动传导	战略性内容	目标规模类	• 发展定位 • 开发保护目标与战略 • 人口规模和城镇体系 • 跨区域协调要求
		空间格局类	• 国土空间开发保护总体格局 • 主体功能分区
刚性传导	约束性内容	底线约束类	• 底线类：生态保护红线、永久基本农田、城镇开发边界等 • 资源类：森林、耕地、海洋、湿地等 • 历史文化类：国家和省级历史文化名城名镇和历史文化街区
		要素配置类	• 公共服务设施类：基础教育设施、基本医疗设施、基本养老设施、区域性公共设施 • 重大交通设施类：综合交通廊道、重要枢纽场等 • 市政及安全类基础设施：水资源、能源供给安全保障

2.1.2 Unified Business Management and Planning Transmission across the Municipal System

Guangzhou uses the Smart Guangzhou Spatiotemporal Information Cloud Platform as its digital base, combining a territorial spatial information platform with a unified natural-resources data map. This supports approval, administrative management, implementation supervision, and business coordination across the full natural-resources workflow, including platforms such as Suhaoban, Suizhiguan, and government service portals[39]. A unified interoperability module will manage interface registration, authentication, authorization, services, and monitoring, strengthen real-time links among planning and natural-resources systems, connect upstream and downstream business data, and support unified management across municipal, district, subdistrict, and town levels.

For plan transmission, Guangzhou has divided the city into multilevel units with corresponding delineation principles and transmission content (Fig.2). It has established a quantifiable, transmissible, supervisable, and flexibly controlled vertical system along a city-planning district-management unit-detailed plan pathway. Two-way feedback, responsibility lists, a combination of rigid and flexible control, scale tolerance, and dynamic balancing align plan content with administrative authority, spatial boundaries, control depth, and regulatory rigidity[34]. Planning districts transmit the land quotas and development intensity assigned by the municipal master plan and refine road-bounded dominant land-use zones. Management units subdivide districts, incorporate or translate citywide control indicators, and implement monitoring related to bottom-line constraints, resource protection, development scale, and public facilities. Indicator changes generated by detailed-plan amendments are generally balanced within the management unit[40].

Fig.2 Illustration of the process of municipal-level planning requirement transmission

2.2 Building a Horizontal Coordination Network: Institutions, Data Sharing, and Business Connectivity

Horizontal coordination should follow the legal logic of the proposed Territorial Spatial Planning Law⑤ and the interaction of departmental functions, establishing a mechanism for system-wide collaboration and smooth data and business exchange between the municipal natural-resources authority and other departments[10,31]. On the municipal territorial spatial information platform, interoperability modules should connect systems of natural resources, development and reform, housing and urban-rural development, ecology and environment, transport, industry and information technology, public security, and other departments. These links should support data required for monitoring and warning, including integrated government services, natural-resource rights confirmation, real-estate registration, ecological restoration, cultivated-land protection, socioeconomics, and population[28,36].

2.2.1 A Multi-Stakeholder Coordination System and Implementation Path

Guangzhou organizes implementation supervision through municipal-government coordination, city-district linkage, leadership by the natural-resources authority, interdepartmental cooperation, and public participation[6]. The city continues to standardize interdepartmental workflows and facilitate approval of planning and construction projects. For construction projects, a unified project code links approval data throughout the life cycle, from project initiation and land use through engineering, construction permits, completion acceptance, and registration. Business standards identify the review

and approval responsibilities of each department and enable "one-window receipt, parallel review, and integrated processing"[39].

2.2.2 Establishing Data-Governance Institutions and Standards

The Guangzhou Bureau has established a unified catalogue covering current-condition, planning, management, and socioeconomic data[41]. It continues to address uneven data quality, weak spatiotemporal linkage, and security risks in data production, storage, circulation, and management[32]. Future standards and institutions will improve quality from the initial stages of production and database construction, while security, confidentiality, and management rules will cover subsequent production, circulation, sharing, and use. Cross-departmental information-linkage policies will keep horizontal coordination efficient and secure and prevent data quality from becoming a major obstacle.

2.3 Real-Time Dynamic Perception, Monitoring, and Integration of Massive Physical and Social Information

Existing monitoring techniques remain insufficiently spatial and dynamic for fine-grained territorial governance[5]. CSPON therefore requires stronger spatiotemporal data governance and real-time supervision beyond periodic updates to the "one map" platform[42]. Diverse data should be integrated and shared through unified standards and reliable connections, forming a dynamic real-time system capable of detecting territorial change and issuing risk warnings[5]. Priority functions include online management of preparation, approval, implementation, and supervision; dynamic perception; real-time monitoring; automatic warning; scenario simulation; and convenient services[1]. Further research is needed on efficient data access, multisource spatiotemporal fusion, and quality management to support perception, monitoring, and visualization[43-45].

2.3.1 "Space-Air-Ground" Physical Perception and Monitoring

Guangzhou applies next-generation BeiDou satellite-network integration and integrated space-air-ground holographic remote sensing. Higher-precision feature interpretation supports frequent, accurate, and efficient monitoring of crop classification[46], land change[47], marine conditions[48-49], surface deformation[50], building health[51], geological hazards[52], and other physical environments.

2.3.2 "Human-Affair-Object" Social Perception and Monitoring

Using mobile signaling, coordinated aerial-ground collection, camera streams, signal fingerprints, and other multisource spatiotemporal data, Guangzhou has developed finer-grained social-information perception and more accurate digital twins of large numbers of social elements. Applications include population-mobility perception[53], urban-function distribution[54-56], industrial-chain network identification[57], lane-level navigation positioning[58], individual positioning[59], and real-time dynamic mapping between physical and virtual environments[60]. This gives implementation supervision substantive technical support to perceive people as well as physical objects.

2.3.3 An Intelligent Engine for Dynamically Integrating Massive Spatiotemporal Data

Guangzhou continues to develop an internationally advanced all-spatiotemporal-element computing engine. Its self-developed Yunwu engine introduces real-time streaming computation into spatial databases, enabling unified storage and high-performance computation for massive all-factor spatiotemporal data. It supports a full-chain governance system from construction of a static base, through dynamic IoT data access, to fusion computing[61]. A natural-resources spatiotemporal warehouse converts accumulated data into assets and a data marketplace that supports planning, construction, and management applications[62].

2.4 Developing Smart-Governance Modules Closely Aligned with Operational Needs

A new CSPON requirement is to use general artificial intelligence and other emerging technologies in practical municipal workflows. Municipal systems must upgrade around concrete scenarios while expanding the use of AI, big data, cloud computing, and blockchain; building domain-specific foundation models; and developing intelligent tools for assisted plan preparation, automated review, and dynamic warning. The objective is a digital-intelligent territorial spatial planning model consistent with ecological civilization and human-centered needs[4,63-64]. Some cities have already created indicator-model toolkits for land-use efficiency, development-zone performance, implementation outcomes, site selection, assisted plan preparation, extraction of planning conditions, and proposal review[17].

Guangzhou is developing intelligent modules around the Bureau's business needs. These include smart comparison and review of detailed-plan amendments with one-click report export; batch compliance checks and automated transport-plan comparison for sectoral plans; dynamically updated datasets and management and statistical tools for land-preparation programs; integrated 2D-3D verification of rural households, buildings, and land under rural land reform; a 3D smart historic-city module for conservation, inheritance, and adaptive reuse; marine warnings and emergency decision support for storm surges; and foundation-model capabilities supported by sample libraries, greater computing power, knowledge graphs, model research, and integrated tools. Together these improve self-learning, intelligent analysis, and continuous simulation across the planning life cycle[33].

3 Priorities for Building Guangzhou's Municipal CSPON

3.1 Integrating Existing System Clusters and Connecting Business Chains and Platform Interfaces

Guangzhou's first priority is to upgrade the territorial spatial planning "one map" implementation-supervision system by integrating existing planning information systems rather than building a separate platform. The objective is "one planning platform and one data base" for full-cycle preparation, approval, amendment, and supervision (Fig.3). At each administrative level, a common interoperability module will provide unified interface registration, authentication, authorization, service, and monitoring, strengthen real-time connectivity, and support unified management at municipal, district, subdistrict, and town levels. Across municipal departments, the city will use its government information interoperability platform, government data-sharing platform, and public open-data platform to improve system interconnection and information sharing.

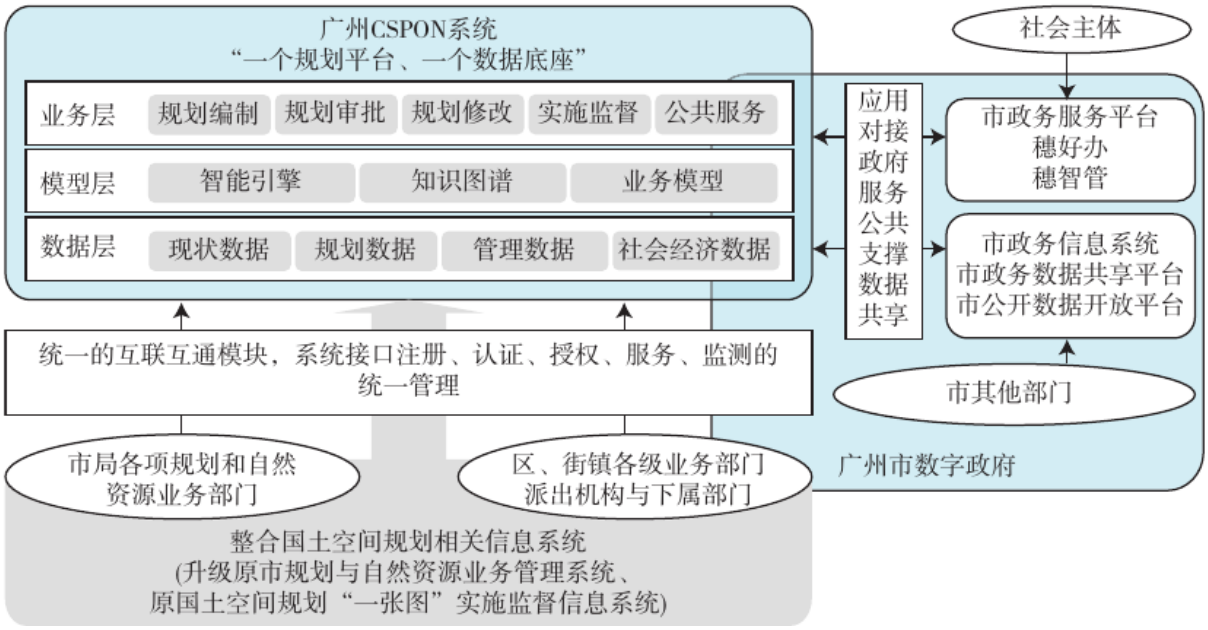

Fig.3 The building of the CSPON system in Guangzhou facilitates the implementation of "one planning platform and one data base"

3.2 Strengthening Data Governance to Resolve Quality and Sharing Problems and Ensure Reliability

CSPON's timeliness, accuracy, and reliability depend on strong data governance. Guangzhou is strengthening three areas. First, it is preparing governance standards and guidelines for collecting, organizing, building, checking, aggregating, and updating current-condition and planning data, while improving acquisition precision and frequency. Second, it is establishing efficient management mechanisms, dynamic maintenance, and quality control; facilitating the flow of economic, social, statistical, and other cross-departmental data; and integrating spatiotemporal big data. Third, it is reinforcing network and data security, improving confidential spatial-information processing, and enabling trusted distribution, controlled use, and traceability throughout the handling of classified information (Fig.4).

Fig.4 The pathway of strengthening data governance in the Guangzhou CSPON system

3.3 Investing around Real Business Needs and Prioritizing Usable Smart-Governance Models

Starting from four core functions - safeguarding resource security, optimizing the territorial spatial pattern, promoting green and low-carbon development, and protecting resource-asset rights[54] - the Guangzhou Bureau is continuously developing smart-governance models. It promotes exemplary tools

at municipal and district levels and is gradually forming a locally distinctive toolkit of accurate, efficient, and low-cost models for territorial planning and governance.

3.3.1 Meeting the Need to Safeguard Resource Security

Guangzhou has developed relatively mature models for monitoring the three zones and three control lines, cultivated-land protection, Eagle Eye low-altitude monitoring, and holographic spatiotemporal ground-hazard surveillance. A land-evaluation model combining remote sensing and AI checks unreported construction annually and verifies compliance with the control lines. For cultivated land, a natural-resource interpretation foundation model, deep learning, illegal-occupation detection, and multisource linkage enable early discovery and disposal. The Eagle Eye system builds a government-inspection drone-port network on Guangzhou's 3D real-scene program. Real-time transmission and AI processing support automatic change detection, hourly target detection, and clue delivery, technically enabling full-city coverage within seven days. Risk-source identification and coupled assessment-warning models also strengthen geological-hazard detection and dynamic monitoring.

3.3.2 Meeting the Need to Optimize the Territorial Spatial Pattern

The Bureau has developed models for public-service coverage, walkability, and functional conformity to improve facilities, as well as transport-accessibility and land-use evaluation models to assist urban development-boundary delineation, spatial restructuring, and precise resource allocation. Mature applications include living-circle evaluation and assessment of transport-territory interaction. A monitoring scenario for coordinating public-transport accessibility with territorial development evaluates the availability of multiple transit modes from residents' perspective, integrates land use, and measures accessibility and capacity. The results support road-network and trunk-route optimization, improve commuting and logistics, and promote high-quality territorial development.

3.3.3 Meeting the Need for Green and Low-Carbon Development

Under the transition toward ecological civilization, Guangzhou is exploring applications both at the front end of high-quality-development indicator evaluation and at the monitoring end of green ecological space. It has localized the United Nations Sustainable Development Goals and embedded all 17 goals in its implementation-monitoring system. For specific ecological spaces, real-time forestry-resource monitoring integrates logging detection, fire analysis, and multisource linkage into a visual smart chief-forester platform, supporting forest protection and ecological restoration.

3.3.4 Meeting the Need to Protect Resource-Asset Rights

Applications respond to needs for revitalizing existing land, integrated asset information, historic-city conservation, and digital approval. Guangzhou has built a database and evaluation system for underused land held by state-owned enterprises; a rapid spatial association model for people, buildings, dwellings, land, and enterprises that supports unified management and precise positioning; and practical tools for retained-land and building inventories, housing-development analysis, and problem annotation. The smart historic-city 3D module uses control-line checks, repair analysis, and historical-change models to improve conservation and reduce illegal damage. Upgraded digital approval includes automated compliance, viewshed, and height-limit analysis, creating scenario-based workflows for more efficient engineering planning, construction, and management approvals.

4 Conclusions and Discussion

By clarifying the logic and tasks of a municipal territorial spatial planning implementation monitoring network, this study identifies four critical directions: vertically connected information and indicator transmission; horizontally connected business coordination and data sharing; dynamic real-time perception and monitoring; and practical smart-governance models. As an early pilot, Guangzhou is using CSPON to address problems in the former "one map" system, including difficult indicator data acquisition, limited support for frequent business tasks, and fragmented systems. Centered on implementation and practical use, it has explored frontier technologies and applications for resource security, spatial optimization, green development, and resource-asset rights.

CSPON construction nevertheless requires high-quality data, substantial public funding, and continued experimentation. Data are dispersed, uneven in quality, difficult or costly to acquire, and can undermine timely and accurate evaluation. Some technical research remains weakly connected to operational work, limiting productivity gains and staff motivation. CSPON's theoretical and practical systems are still being established; pilots began recently and differ in emphasis; foundational standards remain unclear; and Guangzhou's system is not yet mature.

Further work must therefore align administrative and technical chains and synchronize management and technological innovation. First, existing "one map" systems should be upgraded and integrated with planning and construction life-cycle management and technical-review tools, forming a planning preparation-implementation-supervision-update closed loop suited to real business. Second, data-governance capacity should be strengthened through efficient acquisition, spatiotemporal big-data aggregation, a solid real-scene 3D base, and integrated governance of people, households, buildings, land, and industry. Third, application scenarios should remain tightly tied to monitoring needs while upholding human-land harmony and balancing protection with use and constraints with development[65], thereby supporting efficient allocation of scarce resources and high-quality socioeconomic development.

CSPON is an important instrument for the digital transformation and modernization of territorial spatial governance, and a foundational infrastructure for the digital governance of a Beautiful China and a green, intelligent digital ecological civilization. Its completion will have far-reaching significance for the Digital China strategy. Yet it is also a vast and complex system that cannot be completed at once and will require sustained multi-party collaboration and refinement.

Notes

① The search covered territorial spatial planning literature using the keywords “planning implementation supervision,” “planning implementation monitoring,” “territorial spatial planning ‘one map’ implementation supervision,” “territorial spatial planning monitoring,” and “‘one map’ implementation supervision.”

② Interim Regulations on the Assignment and Transfer of the Right to Use State-Owned Urban Land (1990); Decision of the CPC Central Committee on Several Issues Concerning the Improvement of the Socialist Market Economy System (1993).

③ Decision of the CPC Central Committee on Several Major Issues Concerning Comprehensively Deepening Reform (2013); National New-Type Urbanization Plan (2014-2020) and Notice on Piloting the Integration of Multiple Plans in Cities and Counties (2014).

④ Opinions of the CPC Central Committee and the State Council on Establishing and Supervising the Implementation of a Territorial Spatial Planning System (2019).

⑤ The Ministry of Natural Resources included drafting a Territorial Spatial Planning Law in its 2024 legislative work plan.

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