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Shortcomings in the implementation of legal regulations on smart city planning in South Korea

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Abstract
Smart cities have attracted increasing attention from countries around the world, including both developed and developing nations. The emergence of the smart city represents a process of maximizing the achievements of the scientific and technological revolution such as artificial intelligence (AI), the Internet of Things (IoT), and big data to connect, collect, and analyze data, thereby enabling more efficient management of urban resources and services and enhancing quality of life, safety, and convenience for residents in pursuit of sustainable development. South Korea is among the countries that have demonstrated a strong commitment to smart city planning and development, as evidenced by the active promulgation of specialized legal instruments such as the National Land Planning and Utilization Act of 2003 and the Smart City Act of 2017. However, while the implementation of these legal frameworks has produced notable achievements in smart city planning and development in South Korea, it has also revealed certain shortcomings. Accordingly, this article examines South Korea's legal regulations on smart city planning and identifies the key deficiencies and limitations that arise in the course of their implementation.

Keywords: Smart city, smart city planning, south korea

Introduction

South Korea began implementing smart city initiatives in the early 2000s, reflecting a fundamental shift in urban development thinking from an infrastructure-oriented approach toward a more comprehensive model that places quality of life and citizens' lived experiences at its core. Building on the early nationwide establishment of high-speed broadband telecommunications infrastructure, together with the application of Geographic Information Systems (GIS), South Korea gradually enhanced its capacity for data-driven urban management based on spatial information. In this context, the U-City (Ubiquitous City) model emerged as a framework for integrating information and communication technologies (ICT) into urban planning and operation, centered on Integrated Operation and Control Centers (IOCC) that connect Internet of Things (IoT) sensors, closed-circuit television (CCTV) systems, and remote-control devices to support effective governance in areas such as transportation, public safety, housing, disaster prevention, and environmental protection.

Once basic technical infrastructure had been largely established, South Korea's smart city development strategy gradually shifted toward prioritizing the integration and interoperability of systems that had previously operated in isolation. Rather than continuing to expand physical infrastructure, policy efforts focused on developing smart city platforms capable of connecting and coordinating a wide range of public services, from public transportation to crime prevention. Through national-level research and development (R&D) programs, the State established shared technical foundations to integrate stand-alone solutions implemented by local governments, while also providing financial and technical support to promote the adoption of these integrated platforms, thereby expanding both the scope and quality of urban services.

From 2017 onward, South Korea's smart city approach continued to broaden in both conceptual scope and legal framework, reflecting clear influences from models in the United States and Europe, particularly with respect to principles of citizen participation, sustainable development, and enhanced urban governance. At the same time, global discourse surrounding the Fourth Industrial Revolution reshaped the role of smart cities as not only mechanisms for addressing social challenges but also as drivers of innovation-based job creation. In this context, the 2008 U-City Act was revised into the Smart City Act, formally removing the term 'U-City' from the legal system and establishing 'Smart City' as the central legal concept. Smart cities were subsequently identified as one of the key drivers of national innovation-led growth, accompanied by the adoption of a Smart City Promotion Strategy and the implementation of national pilot projects in Sejong and Busan, thereby laying the foundation for the coordinated development of both smart city models and the smart city industry in South Korea.

Legal regulations on smart city planning in South Korea

An examination of the above development phases reveals that South Korea places considerable emphasis on the planning and development of smart cities; however, this emphasis is manifested primarily through national policies and sector-specific legislation rather than being directly incorporated into the general urban planning framework. In 2017, South Korea enacted the Act on the Promotion of Smart City Development and the Smart City Industry (Smart City Act), which provides for the designation of pilot smart cities (such as Sejong and Busan Eco Delta) and promotes the deployment of smart city services, open data, and advanced technologies. In practice, smart city projects in South Korea are implemented through government-led initiatives and project-specific detailed plans, rather than on the basis of a distinct concept of 'smart city planning' embedded within the national planning system. Consequently, smart cities in South Korea are generally understood as a particular model of urban development realized through high-technology pilot districts rather than as a new, independent tier of statutory urban planning.

The National Land Planning and Utilization Act of 2003

Following its revision in 2003, the National Land Planning and Utilization Act has played a central role in South Korea's urban planning system by establishing a unified planning framework applicable to the entire national territory, thereby eliminating the former distinction between urban and non-urban areas. The Act provides a comprehensive regulatory framework for urban planning activities, encompassing the scope of regulation, the various types of plans, and the substantive content of each planning instrument. It also clearly delineates the competent authorities responsible for plan formulation, together with the procedures for plan-making, with particular emphasis on mandatory public participation and consultation with local councils. Compliance with these procedural requirements is binding on administrative authorities; where violations occur, urban plans may be declared unlawful and annulled through administrative litigation.

In order to enhance the effectiveness of land-use management and control, South Korea has established a highly developed urban planning system structured in a clear hierarchical order, designed to guide and regulate land-use decisions at different levels. Pursuant to the National Land Planning and Utilization Act, this system is organized from top to bottom, comprising the National Plan (Gukgagyehoek), Regional Plan (Gwangyeokgyehoek), Urban Master Plan (Dosigibongyehoek), and Urban Management Plan (Dosigwalligyehoek). In terms of authority, the National Plan is formulated by the central government, specifically the Ministry of Land, Infrastructure and Transport (MOLIT); regional plans fall within the competence of provincial governments, while urban master plans and urban management plans are prepared by local governments and submitted to provincial authorities for review and approval.

The Smart City Act of 2017

Recognizing the need for a dedicated legal framework for smart city development, South Korea initially enacted the U-City Act in 2008 and subsequently revised and refined it into the Smart City Act in 2017 to address the shortcomings of the earlier legislation. Whereas the previous legal framework primarily focused on the development of information and communication technology (ICT) infrastructure in newly developed urban areas, the revised Act significantly broadened its regulatory scope by adopting a more comprehensive approach. It allows the participation of multiple categories of stakeholders in smart city projects and covers the entire project lifecycle, from construction to management, operation, and the promotion of innovation-driven industries. At the same time, the notion of 'smartness' is no longer confined to newly built urban areas, but is also extended to existing cities undergoing regeneration and transformation processes.

The new policy framework further emphasizes the role of citizens in addressing urban challenges and highlights flexibility as a core principle in order to accommodate diverse local conditions and characteristics. Overall, the Smart City Act 2017 established a crucial legal foundation by mandating the formulation of a Smart City Master Plan and by creating key institutional arrangements, including the National Smart City Committee, support bodies for nationally designated smart city pilot projects, smart city project advisory councils, and associations of smart cities, together with a system of decrees and detailed regulations designed to ensure effective implementation and oversight.

Firstly, regulations on smart city planning by levels

In the context where smart cities are increasingly established as a core orientation of contemporary urban development, there arises a need to design a planning mechanism that is unified while remaining sufficiently flexible to adapt to the rapid pace of technological change. Based on this understanding, South Korea's Smart City Act 2017 established a multi-tiered planning system that ensures close linkage between strategic directions at the central level and concrete implementation at the local level.

At the national level, the Minister of Land, Infrastructure and Transport is responsible for formulating the National Smart City Master Plan on a five-year cycle. Pursuant to Article 4 of the Smart City Act 2017, this master plan focuses on assessing domestic and international trends in smart city development, identifying the conditions necessary for implementing the smart city model, and formulating visions, principles, and phased roadmaps for implementation. It also clarifies mechanisms for mobilizing and allocating financial resources as well as the operational framework for relevant projects. The national master plan must ensure consistency and coherence with other national development plans and strategies, notably the National Land Use Master Plan and the National Informatization Master Plan established under the Framework Act on National Informatization. This interlinkage helps maintain policy coherence, optimize resource allocation, and promote the integrated development of digital technologies and physical urban infrastructure. To date, South Korea has adopted four National Smart City Master Plans, which serve as key policy instruments enabling the State to proactively respond to market dynamics and technological advancement.

At the local level, based on the strategic framework established by the central government, provincial and municipal governments are authorized under Article 8 of the Smart City Act 2017 to formulate Local Smart City Plans within their respective jurisdictions. These plans are tasked with concretizing objectives and targets set at the upper level and must ensure consistency with existing urban planning instruments, particularly comprehensive urban plans and urban management plans under the National Land Planning and Utilization Act. A notable innovation in South Korea's smart city planning governance is the formal recognition of private-sector initiatives in proposing smart city projects, reflecting a shift from a top-down administrative model toward a public–private partnership approach characterized by bottom-up interaction. Accordingly, private enterprises are no longer passive recipients of public investment decisions but are empowered to proactively propose technological solutions and innovative business models. Where a private-sector proposal is selected, the competent public authority may formulate or amend the Local Smart City Plan to establish the legal basis for project implementation.

Secondly, regulations on the National Smart City Committee and Smart City Project Advisory Councils

At the central level, the National Smart City Committee serves as the key decision-making body in the smart city domain in South Korea. Pursuant to Article 23 of the Smart City Act 2017, the Committee consists of no more than 30

members. Institutionally, the position of Committee Chair has evolved: it was initially held by the Prime Minister, transferred to the Minister of Land, Infrastructure and Transport in 2015, and, notably, since the amendment of Article 23(3) in 2020, South Korea has adopted a co-chair system. Under this model, at least one of the co-chairs must be an individual with extensive expertise and practical experience in smart cities, or a private-sector expert with in-depth knowledge of regulatory sandboxes and innovation-driven industries. Functionally, the National Smart City Committee plays a strategic coordination role throughout the entire smart city development cycle. Its core responsibilities include reviewing the National Smart City Master Plan, overseeing the implementation of national-level smart city projects, coordinating interests and responsibilities among central ministries and between the central and local governments, and mobilizing and allocating state support resources effectively.

At the local level, Article 24 of the Smart City Act 2017 further institutionalizes the principle of public–private collaboration by mandating the establishment of Smart City Project Advisory Councils for each specific project. These councils comprise representatives of public authorities, experts, and residents, thereby helping ensure that the planning and implementation processes are not merely formalistic but genuinely reflect societal needs and the specific characteristics of local communities.

Thirdly, regulations on national smart city pilot projects

Pursuant to Article 35 of the Smart City Act 2017, to promote technological development, service innovation, and the realization of smart city models, the Minister of Land, Infrastructure, and Transport is empowered to designate areas that meet statutory conditions as national smart city pilot projects. This mechanism creates real-world testing spaces for innovation activities. On this legal basis, South Korea selected two representative pilot areas in 2018: the 5-1 Living Area in Sejong Administrative City and Eco-Delta City in Busan, each reflecting a distinct development approach.

Specifically, Sejong is envisioned as an integrated, zero-emission, human-centered city, with a focus on seven key innovation areas, including smart mobility systems, AI-based healthcare and education services, integrated urban data platforms, and mechanisms to enhance citizen participation in urban governance. By contrast, the Eco-Delta City project in Busan leverages its riverside geographical advantages to develop a climate-adaptive urban model, emphasizing efficient management of water and energy resources, while pioneering the integration of fintech technologies into public administration to encourage energy-saving behavior and enhance social inclusiveness.

Both pilot projects are implemented through public–private partnerships via the establishment of special-purpose entities under Article 36(2) of the Smart City Act 2017, combined with the application of special legal provisions allowing for the relaxation or temporary suspension of generally applicable regulations in key areas such as personal data protection, autonomous vehicles, unmanned aerial vehicles, and telecommunications. This flexible legal mechanism plays a decisive role in dismantling regulatory barriers inherent in rigid governance models and in creating a safe testing environment for new technologies prior to large-scale commercialization. Overall, the Sejong and Busan pilot projects clearly reflect a shift from infrastructure-centric urban management toward data-driven urban governance, underscoring the importance of system interoperability, regulatory flexibility, and local specificity in the development of effective and sustainable smart city models.

Fourthly, regulations on the regulatory sandbox mechanism in the smart city sector

South Korea's regulatory sandbox mechanism in the smart city sector is designed to address legal challenges arising from the cross-sectoral nature, high level of innovation, and rapid development of smart city technologies and services. Through amendments to the Smart City Act in November 2019, the State allows for the temporary relaxation or exemption of certain legal provisions within defined scopes, conditions, and timeframes, thereby creating a controlled testing environment before the completion of the legal framework and wider application.

This mechanism comprises two forms: smart innovation projects and smart demonstration projects, corresponding respectively to technologies that are already legally recognized but face implementation barriers, and emerging technologies that are not yet legally permitted due to potential risks and therefore require assessment under controlled conditions. Initially, the regulatory sandbox was limited to designated areas, primarily major cities and national pilot projects. However, following the March 2021 amendment to the Smart City Act, its scope was expanded nationwide, allowing any locality to implement sandbox projects without the need to designate special zones, while simplifying registration procedures and shortening preparation periods.

Sandbox projects may be implemented for a maximum period of four years and may be extended once for up to two additional years if legislative amendments have not been completed. The implementation process is designed as a closed-loop cycle, encompassing rapid identification of legal conflicts, project review and approval, implementation management with state support, and post-project evaluation feeding into legal reform. Alongside regulatory relaxation, South Korea has established a robust risk-control mechanism, granting the Ministry of Land, Infrastructure and Transport authority to assess impacts on public safety, the environment, and personal data protection, while requiring enterprises to secure liability coverage through insurance or other appropriate measures. Overall, the regulatory sandbox mechanism serves as a key legal instrument enabling South Korea to strike a balance between fostering innovation and safeguarding social interests, thereby enhancing the adaptability of the legal system to the rapid evolution of smart city technologies.

Remaining shortcomings in the implementation of legal regulations on smart city planning in South Korea

Although South Korea has achieved significant accomplishments in research and pilot implementation of smart city models, the actual process of implementation continues to reveal numerous challenges as these initiatives expand from experimental stages to nationwide application. In practice, three core issues have become increasingly apparent, including: (i) limited coordination among different levels of government, (ii) shortcomings in the integration and sharing of urban data, and (iii) imbalances in public–

private partnership (PPP) arrangements. Identifying and addressing these bottlenecks is of crucial importance for the scalability and sustainability of smart city models, not only for South Korea but also for developing countries seeking to draw comparative lessons.

Firstly, a notable challenge arises from the relatively strong reliance on centralized planning and coordination mechanisms led by the central government. This approach enables the State to mobilize and allocate resources on a large scale while ensuring nationwide policy coherence. However, in practice, a highly centralized governance model tends to constrain the scope for innovation at the local level, particularly in contexts where local governments possess limited technical capacity, human resources, and fiscal autonomy. Many local authorities are required to implement projects based on standardized templates designed by central authorities, resulting in technological solutions that are not fully aligned with local socio-economic conditions, urban structures, or residents' needs. To address this limitation, recent research and policy developments in South Korea indicate a growing emphasis on decentralized experimentation, whereby local governments are granted greater autonomy to initiate pilot projects tailored to their specific contexts, while central ministries assume a supportive role by providing institutional frameworks, initial funding, and technical guidance. The Smart City Challenge Program represents a typical example of this approach, as it enables local governments to cooperate with start-ups and test technological solutions on a small scale before broader implementation.

Secondly, insufficient institutional coordination among different levels of government and across ministries remains a major barrier to effective smart city implementation. Although the Ministry of Land, Infrastructure and Transport is designated as the central coordinating authority, in practice, various ministries continue to implement smart city-related programs and projects within their respective mandates. This situation leads to overlapping functions, fragmented allocation of resources, and a lack of interoperability in data and technical standards. Consequently, the overall effectiveness of policy implementation is reduced, while coordination and monitoring costs increase. At the local level, although local governments are formally identified as the primary actors responsible for implementing smart city initiatives, they often lack specialized technical expertise and sufficient fiscal autonomy, making them highly dependent on central government funding and directives. This dependence not only limits flexibility in policy design and execution but also restricts the ability of local authorities to respond promptly to urban issues arising from local realities.

Thirdly, ensuring unified and comprehensive data integration across urban systems continues to present a significant challenge in South Korea's smart city development process. Although many local governments have invested in the construction of Urban Data Platforms (UDP), in practice, these systems often operate in isolation and lack interoperability due to their reliance on proprietary technical standards established by technology providers. The root cause of this fragmentation lies in the absence of a unified national legal framework governing data architecture, technical standards, and urban data governance. While the Smart City Act 2017 sets out a general policy orientation toward data integration and the promotion of open data, implementation has been uneven across localities, resulting in limited data utilization, duplication in technology investment, and difficulties in comparing and evaluating policy impacts across regions. Moreover, increasing requirements for information security and personal data protection further complicate the data integration process. Although South Korea possesses advanced digital infrastructure, public trust in the collection, management, and use of data by public authorities remains fragile, particularly in light of several large-scale data breaches and cyberattacks in the past, thereby raising the need for a delicate balance between technological innovation and the protection of individual rights.

Fourthly, imbalances in the allocation of power and risk between the public and private sectors persist as a prominent issue in smart city–related public–private partnership (PPP) models in South Korea. In practice, large technology conglomerates such as LG CNS, Samsung SDS, and KT Corporation play a dominant role in many national pilot projects due to their superior financial capacity, technological expertise, and implementation experience. However, this cooperation structure also reveals notable limitations, as public authorities, particularly local governments, often bear the majority of legal and political risks. At the same time, private enterprises retain substantial control over core data assets and technological platforms. Such dependence may undermine the autonomy of local governments in policy adjustment and weaken mechanisms of public accountability. At the same time, the smart city market tends to become highly concentrated around a small number of large corporations, creating significant barriers to entry for small and medium-sized enterprises. As a result, local innovation ecosystems may be narrowed, reducing the diversity and flexibility of technological solutions. In response, some local governments have introduced policy instruments such as regulatory sandboxes and open challenge programs to encourage the participation of new actors. Nevertheless, for these initiatives to achieve substantive effectiveness, stronger institutional support from the central government remains necessary, particularly in ensuring fair competition and improving market access for small and medium-sized enterprises.

Conclusions

Overall, South Korea has established a relatively comprehensive and flexible legal framework for smart city planning and development, most notably through the Smart City Act 2017, a multi-tiered planning system, and controlled pilot mechanisms designed to promote innovation while managing risks. Nevertheless, the implementation process continues to reveal significant shortcomings, particularly the heavy reliance on centralized coordination by the central government, limitations in institutional coordination and urban data integration, and imbalances in public–private partnership arrangements. These limitations indicate that the core challenges of smart city development lie not merely in technological advancement but primarily in institutional design and governance capacity. South Korea's experience, therefore, suggests that sustainable smart city development requires the close integration of technological innovation with legal reform and urban governance reform, rather than a narrow focus on technically driven or short-term pilot projects.

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