Strategies for Improving Urban Land Use in the Context of New-type Urbanization

Jiaheng Li[1, a], Lianyi Song[2, b, *]

[1] School of Management, Tianjin University of Traditional Chinese Medicine, Tianjin 301617, China

[2] The Second Affiliated Hospital of Tianjin University of Traditional Chinese Medicine, Tianjin 301617, China

[a]2919098200@qq.com, [b, *]244067857@qq.com

Abstract

New-type urbanization is a core strategy for China's modernization, bearing the development tasks of expanding domestic demand and promoting growth, while also facing urgent needs for transformation and quality improvement. As of the end of 2025, China's urbanization rate of permanent residents reached 67.89%, which still shows a significant gap compared to developed countries. However, the extensive development model of traditional urbanization has triggered problems such as low land use efficiency, disjointed planning, and prominent supply-demand contradictions, which have become key obstacles to the implementation of new-type urbanization. As the material foundation and spatial carrier of urbanization, the efficiency of land utilization directly relates to the sustainability of urbanization; therefore, targeted optimization and improvement are urgently needed. Taking the current status of urban land use under new-type urbanization as a starting point, this paper conducts a systematic analysis from three aspects-the intensity of land use, the planning system, and technical support-to explore implementation pathways for improving urban land use efficiency. It constructs a "Planning-Intensification-Smart" trinity improvement framework. With intensive land use as the goal, measures are formulated across four dimensions: ideology, institutional design, technology integration, and planning coordination. Based on land use planning, the planning system is optimized by enhancing the scientific nature of compilation and perfecting flexible control mechanisms. With smart cities as technical empowerment, full-process precise management of land use is achieved by relying on remote sensing, GIS, and digital technologies. This study provides practical pathways and relevant theoretical references for the optimization of urban land use in China.

Keywords

New-type Urbanization, Urban Land Use Improvement, Intensive Use, Smart City, Land Use Planning.

1. Introduction

Sustainable urbanization has become a global consensus. Urbanization is not only a major challenge facing China today but also a difficult problem for the contemporary world; it is a complex and important socio-economic issue. As the fastest urbanizing developing country, behind the 67.89% urbanization rate, China faces special challenges distinct from those of developed countries. Factors such as the urban-rural dual land system and dependence on land finance have led to typical problems in land utilization, such as extensification, disjointed planning, and prominent supply-demand contradictions. Land is the foundation for the existence and development of a city, providing the spatial venue for various urban economic

activities [1]. The mismatch and inadaptability between current backward land management and the needs of rapid urban expansion, along with the resulting contradictions, are becoming increasingly serious. Against this background, seeking a new path of transformation is urgent.

Consequently, the 18th National Congress of the Communist Party of China explicitly proposed the "New-type Urbanization" strategy. New-type urbanization is an inevitable requirement for building a moderately prosperous society in all respects, a major force for promoting coordinated urban-rural development in China, and a significant strategy for promoting common prosperity for all people [2]. Its core is to break away from the traditional urbanization's dependence on land expansion and turn towards quality improvement and connotative development. Land plays a pivotal role in the urbanization process; it is not only the material foundation and spatial carrier of urbanization but also the core support of urban economic activities, closely related to the rights and interests of groups such as demolition households and land-expropriated farmers. Efficient and intensive utilization of land resources can guarantee the sustainable development of urbanization, and effective land supply can also ensure the smooth progress of urbanization [3]. However, problems such as non-standard land requisition, unreasonable planning, and low utilization efficiency currently existing in urban land management have become key obstacles hindering the implementation of new-type urbanization.

Therefore, this paper focuses on the core contradictions between new-type urbanization and urban land use. By analyzing the status quo and problems of land use, it constructs multi-dimensional improvement strategies, aiming not only to provide solutions for the optimization of urban land use in China but also to offer Chinese experience for other developing countries in coping with land difficulties during the urbanization process.

2. Research Status

2.1. Urban Land Use

Urban land use mainly refers to the status of urban construction land, including industrial, transportation, commercial, cultural, educational, health, residential, and other lands. It is the basic form of urban layout, reflecting the regional differences of internal functional zones in the city. Before development, urban land only possesses natural attributes, including soil fertility, slope, direction, soil bearing capacity, and permeability [4].

The fundamental task of land use is to rationally organize land utilization, implement land use control and total quantity control of construction land, and thereby achieve macro-control and micro-management of land. Liu Xinwei and Wu Chuguo pointed out that land can not only promote the healthy development of the urban economy but is also an indispensable material basis for steadily advancing the urbanization process. From this point, we can see the great significance of land and land utilization for urbanization [5].

With the continuous advancement of urbanization, problems in China's land resource utilization have become increasingly prominent, leading to increasingly serious waste of land resources. The existing land resource management models in some urban areas have seriously affected industrial development [6]. Xing Qin and Yang Ch conducted in-depth discussions and elaborations on land utilization issues and phenomena such as severe occupation of cultivated land, low degree of land intensification, many abandoned and idle lands, and intense conflicts in land requisition and demolition, demonstrating some land problems existing in China's urbanization process [7].

Faced with these problems, some scholars have begun to seek the causes. For example, Zhao Qing analyzed the utilization and management problems of land resources during the urbanization development process and concluded that there are extensive land utilization modes, unreasonable land use structures, prominent contradictions between urbanization

construction and cultivated land protection, and increasingly obvious land supply and demand contradictions in China's urbanization process. She also briefly discussed the causes and roots of the above problems [8].

Regarding the waste of land resources, some scholars have also sought answers from the perspective of the system and government. For instance, Zhang Dongling, Wang Yanxia, and Liu Min believe that the low efficiency of land use is largely due to the government's special status in the land market. It is precisely because of this special status that there is a lack of government role in the land market. Under China's unique land system, local governments use their monopoly position in the land market to use land as a bargaining chip and welfare to attract merchant investment and promote the landing of relevant projects, aiming to obtain fiscal revenue. At the same time, to obtain fiscal revenue, the government is more willing to introduce projects with short cycles and quick returns, and therefore relaxes the review of merchants, leading to serious duplication of construction projects and causing the idleness and waste of land resources [9].

2.2. Intensive Urban Land Use

The meaning of intensive land use requires people to utilize land in a saving, concentrated, and efficient manner to improve land use efficiency and benefits. Zhang Tingting pointed out that we should take improving the efficiency and benefits of land use as the core, not simply understand it as blindly increasing building density, reasonably distinguish the modes and goals of land use, and recognize the four characteristics of intensive urban land use, including the dynamic nature of the utilization process [10]. Zhang Xiaomei proposed that intensive land use is not just blindly pursuing land utilization, but requires full consideration of various factors and value systems, striving to reflect the maximum economic value of land, finding reasonable and perfect intensive land planning content, and realizing the improvement of economic benefits [11].

In terms of the level and status analysis of intensive urban land use, Chen Weixiao diagnosed the obstacle factors of intensive land use based on measuring the intensive land use level of national central cities through the obstacle degree model [12]. At the same time, taking Chongqing City as the research object to infer the whole from the part, Wang Yan explored the universal problems of intensive urban land use in China, mainly discussing the management problems existing in intensive urban land use, and summarizing them as follows: insufficient development and utilization of land space; absence of special land use planning, weak planning foundation, and disjointed planning management; weak related law enforcement and supervision, imperfect market mechanisms, and low allocation efficiency [13].

2.3. Urban Land Use Planning

Urban land use planning is the overall arrangement and layout made in space and time for the development, utilization, governance, and protection of land within the city, according to the requirements of national sustainable economic development and local natural, economic, and social conditions [14].

Urban land use planning is the top priority of land management work, determining the general direction of urban construction for a period to come. It makes plans and arrangements for the entire city's land use, environmental protection, and land development, optimizing the land use structure, thereby achieving efficient management of land use, balancing urban land supply, and providing sufficient land guarantees for urban construction [15]. Therefore, when compiling urban land use planning, urban planning and management personnel should fit the actual situation of current urban planning and construction and future needs, explore effective land use planning countermeasures, and lay a good foundation for the sustainable development of urban land use [16].

Regarding the existing problems of urban land use planning, although Ji Hongwei and Wang Jingchen published different documents, both roughly summarized the problems existing in urban land management regarding land use planning, and their views were consistent, such as: the goals of land use planning are not yet clear; stakeholders are not fully considered; and a complete guarantee system has not yet been formed [17]. Liu Fei made a more detailed division of the problems in urban land use planning and summarized them as: imperfect relevant laws and regulations; problems of unbalanced urban development; imbalance in planning; insufficient detail of data and weak awareness of sustainable development [18].

Aiming at specific causes, Zhuang Jianping pointed out that first, the mismatch between legislation and execution leads to ineffective planning; second, due to numerous factors affecting land use, planning at all levels is not unified and lacks a global perspective; third, the implementation mechanism is not in place; fourth, the objects of regulation are not clear and lack scientific nature [19]. Hu Tao, Liu Zexin, Zhang Xiao and others pointed out that planning is planning for future things, and predictions of the future cannot be absolutely accurate. Therefore, in land use planning, we must first attach importance to uncertainty. Second, there is the issue of planning quality; planning lacks scientificity and rationality, and there is strong arbitrariness in compilation. As mentioned above regarding government problems, officials arbitrarily use land to pursue their own political achievements, destroying the original land use planning. Finally, there are also problems of unreasonable coordination, which is due to insufficient preparation work before compilation, and the compilation lacks scientific nature [20].

2.4. Smart Cities and Land Use

The construction of smart cities is a new type of urban development model. Its "newness" lies in its wisdom, high efficiency, vividness, precision, safety, orderliness, and harmonious coexistence between man and nature. In the *14th Five-Year Plan* New-type Urbanization Implementation Plan issued by the National Development and Reform Commission, the plan explicitly proposed to take the construction of new-type cities as an important task for China's new-type urbanization development during the "14th Five-Year Plan" period. As a type of new-type city, the smart city is also an important part of China's new-type urbanization construction and has played an important role.

As the saying goes, "Urban construction, planning first" [21]. Planning is an important prerequisite and foundation for urban construction and a prerequisite for subsequent implementation. Therefore, land use planning under smart cities is an important foundation for promoting smart city construction.

In the context of smart city construction, land use planning encourages scientific analysis of urban land resource conditions, functional layout, support systems, etc. Supported by systematic, structured, and intelligent technologies and tools, it solves various problems of urban land use with systematic, smart, and dynamic thinking to formulate scientific and reasonable smart city land use planning schemes. By embedding the concept of "smart" into urban land use planning, traditional land planning theory is deepened, expanded, and updated. Revolving around the city's own level and land use demands, it measures local conditions to reflect the city's characteristics; revolving around the "nerve" construction of smart city land use, it focuses on information technology and the Internet of Things to improve the emphasis on construction planning; subsequent planning gradually expands to the field of smart land applications, enhancing the quality of land spatial functions and the sustainable development capability of land use [22].

In addition, digital technology is a key support for improving the refined level of land resource management. Relying on technological empowerment to realize intelligent and precise land use management can reduce management costs and improve decision-making efficiency [23].

Through technologies such as satellite remote sensing, drone inspections, and the Internet of Things, urban land use is assisted in promoting its transformation from an extensive type to an intensive type and from a scale expansion type to a connotation improvement type.

3. Current Problems of Urban Land Use

3.1. Low Land Use Efficiency and Insufficient Intensification

China's urban land use presents characteristics such as "fast total expansion, low efficiency, structural imbalance, and large regional differences." The blind expansion of urbanization has led to urban construction land significantly exceeding urban needs, with relatively serious phenomena of inefficient use and idleness [24]. In addition, the constraint role of territorial space planning has not been fully exerted, leading to prominent land use structural imbalance problems. The proportion of industrial land is too high, while the proportion of ecological and public service land is insufficient, and urban functional supporting facilities are not perfect.

3.2. Shortcomings in Land Use Planning

First, the scientific nature of compilation is insufficient. Planning is mostly based on static predictions, not fully considering the uncertainty of urban development, and lacks full consultation with stakeholders, leading to a disconnect between planning and actual needs. Second, the rigidity of execution is insufficient. Local governments arbitrarily adjust planning for investment promotion or short-term political performance, with frequent occurrences of illegal land occupation and duplicate construction. Third, laws and regulations are not perfect, and the processes of planning compilation, approval, and supervision lack clear legal norms, with weak law enforcement and supervision. Fourth, the traditional urban land planning concept is "growth first," emphasizing scale guarantee while neglecting intensive control, causing a large amount of resource waste, and needs to transform to a concept of "diversified balance" [25].

3.3. Weak Technical Support and Low Level of Intelligence

Most urban land use still relies on traditional management models, leading to fragmented land information and a lack of a unified digital database, which results in a lack of precise data support for planning decisions. Dynamic monitoring capabilities are insufficient, and the supervision of idle land and illegal land use is lagging. In addition, the application of technologies such as GIS and the Internet of Things is limited to single links, failing to achieve full-process smart management, and administrative efficiency is low.

4. Improvement Strategies for Urban Land Use

This study is based on the core logic of the "Planning-Intensification-Smart" trinity, constructing a multi-dimensional, collaborative improvement strategy system. Land use planning is a crucial component of spatial planning work and the main basis for land use activities in urban and rural construction [26]; planning is the prerequisite for a project to start. Smart cities act as the catalyst and lubricant between the two. Through modern technical means such as big data, Geographic Information Systems (GIS), and AI algorithms, they provide technical support for urban planning and land management through spatial analysis and dynamic monitoring[27]. Intensive land use is an important content of territorial space planning and governance, having important theoretical and practical significance for improving the quality and efficiency of new-type urbanization and promoting the sustainable use of land resources [28]. Land use planning serves as the foundation, intensive land use as the goal, and smart city technology as the enabling tool; the three support each other and work together.

4.1. Improvement of Intensive Urban Land Use

(1) Ideologically persist in land saving and intensive use

Starting from ideology, we must abandon the traditional extensive land use model. From the government to enterprises, we must strengthen the awareness of saving and intensive land use and the thought of sustainable development. Establish a scientific development concept of "Economy-Ecology-Society" coordination, promoting the transformation of land use from "scale expansion type" to "quality improvement type," from "relying on human investment" to "relying on technological innovation," and from "growth priority" to "diversified balance" [29].

(2) Institutionally establish an intensive land use indicator system

Deepen land use system reform and establish an intensive land use indicator system to fundamentally solve the problem of indiscriminate occupation and abuse of agricultural cultivated land in urban development, and promote the intensive use of construction land through the reform and innovation of the land supply mechanism. Through investigation and research, establish a set of land intensive use indicator systems as soon as possible. This indicator system should be comprehensive, suitable for China's national conditions, and reflect many aspects such as urban per capita land standards, urban plot ratio, and urban land output benefits. We must ensure that the various indicator systems that are conducive to both urbanization construction and intensive land use are truly implemented, so that the contradiction between construction land and cultivated land protection is fully alleviated.

(3) Technologically integrate smart city technologies

Integrate the concept of smart cities into urban land use, combining technologies such as the Internet of Things and artificial intelligence with intensive land use. Through digital means, realize real-time updates and sharing of land information to precisely grasp the current status of land use; use algorithmic models to optimize the land use structure and rationally configure the proportions of industrial, residential, and ecological land [30]; through big data, build land use efficiency evaluation models and decision support systems to conduct simulation deductions and benefit assessments of different land use schemes [31].

(4) Planning-wise formulate comprehensive land use planning

Finally, formulate scientific land use planning policies and long-term effective management mechanisms, give full play to the coordinating role of land planning, and make overall arrangements for the total amount, spatial distribution, and implementation timing of urban construction land, clarifying the land use proportions and layouts of different functional areas. In addition, establish and improve constraint, assessment, evaluation, and supervision mechanisms to form a "planning-execution-supervision-feedback" closed-loop management to effectively promote the development of intensive land use in China.

4.2. Improvement of Urban Land Use Planning

(1) Enhance the scientific nature of land use planning compilation

The compilation of land planning schemes should be scientific and reasonable, based on the realistic needs of urban economic, social, and ecological sustainable development. In the process of formulating land use schemes, both constructiveness and foresight must be considered. Before compilation, extensively solicit opinions and suggestions from all sectors of society, conduct in-depth investigation and analysis of the mainstream direction of urban construction and development, and actively coordinate the relationship between urban construction and economic development and ecological protection while doing a good job in urban land use planning to meet the established requirements of urban development. During the compilation process, it is also necessary to fully demonstrate the service functions of urban construction by implementing intensive management of urban commercial areas, green areas, industrial areas, and industrial zones, clarifying different functional areas of the city,

determining construction land and environmental protection land, and fully demonstrating scientificity and practicality [32].

(2) Perfect the flexible control mechanism of land use planning

Adhere to the combination of rigid constraints and flexible constraints. Formulate relevant land management regulations for problems such as land waste, environmental pollution, and unreasonable use, and make specific development plans for land management. Incorporate indicators such as the total scale of construction land and construction land consumption per unit of GDP into the performance assessment of local governments. At the same time, combined with reality, formulate specific land use planning. We must scientifically adjust based not only on population but also on economic levels, adhere to the "people-oriented" development concept, adapt measures to local conditions, actively explore methods of mixed land development and reasonable conversion of uses, and allow stock land to adjust uses, increase plot ratios, and optimize functional layouts under planning control [33].

(3) Promote smart city planning

Apply Geographic Information Systems (GIS) to urban land planning. Through GIS technology, collect, store, and analyze data such as natural land attributes, ownership, and utilization status to provide precise support for planning compilation. At the same time, use big data to build a dynamic monitoring platform to track the implementation of planning in real-time and discover problems such as illegal land use and planning disconnects in a timely manner.

4.3. Integration Paths for Smart Cities and Land Use

(1) Use remote sensing technology to strengthen information collection

Current urbanization development has entered a new stage, urban scale is increasingly large, urban spatial structure and land resource patterns are more complex, and land use types are diverse. These problems bring greater challenges to refined planning management, and the timeliness requirements for urban land use monitoring are becoming increasingly prominent [34]. Remote sensing technology, with its macroscopic observation perspective and multi-temporal imaging capability, effectively improves the identification accuracy of urban land use changes, providing solid technical support for urban planning management, ecological assessment, and sustainable development strategy formulation [35].

(2) Promote the full-process application of GIS technology

He Li pointed out that applying GIS technology in the context of smart city construction to land use planning can solve the scientific problems of land planning and design, coordinate the overall planning, and lay the foundation for subsequent land use planning compilation work through the analysis of relevant data; it can also solve uncertain factors existing in the land use system [36]. GIS technology can collect, store, and manage data. It can not only conduct in-depth analysis of the current status of land use but also directly enter relevant content into the database. The development of GIS technology provides better services for land use planning and design and promotes related planning research work [37]. Relying on GIS technology to build a land use spatial database, integrating multi-dimensional information such as topography and landforms, land ownership, planning purposes, and utilization status, through the database and GIS spatial analysis functions, it is possible to optimize the land spatial layout, avoid disordered expansion and duplicate construction, and carry out dynamic monitoring of the actual situation of urban land planning and utilization, reducing a large amount of ineffective workload.

(3) Advance the digital transformation of land use

Integrate information technologies such as remote sensing, geographic information systems, big data, artificial intelligence, cloud computing, and the Internet of Things to build a "Digital Land." Through data collection and database construction, conduct precise surveys and

statistics of land resources to grasp land spatial distribution and use structure, providing data support for intensive land use; through real-time data collection by the Internet of Things, data processing by cloud computing, and optimization of planning schemes and utilization strategies by artificial intelligence algorithms, finally predict land supply and demand trends, optimize land structure, reduce resource waste, and promote the full-process management of land use, ultimately realizing a modern governance model transformation from "artificial extensive control" to "data-precise driving."

5. Conclusion and Outlook

With the advancement of the new-type urbanization process, the deepening of urban planning and economic development processes, urban land use presents characteristics of complexity and diversity. Current urban land use faces the synergistic constraints of planning absence, insufficient intensification, and technical lag. The three major problems are intertwined, and single-dimensional improvement is difficult to fundamentally break the dilemma. Based on the background of new-type urbanization, this paper systematically analyzes the current problems of urban land use and constructs a "Planning-Intensification-Smart" trinity improvement framework. Through land use planning providing directional guidance for intensive use, and smart cities providing technical support for both, it jointly promotes the improvement of land use efficiency. This study constructs a collaborative improvement framework based on qualitative analysis but lacks quantitative assessment of the implementation effect of the framework and does not fully consider the impact of policy factors on strategy implementation, so there are deficiencies in comprehensiveness. In the future, it is urgent to carry out extension research with greater breadth and depth. Through sample research and empirical analysis, verify the universality of the framework. Through domestic and international model comparison, systematically analyze the adaptability of land use models in developed countries to China's national conditions. And focus on policy impact to explore the landing nature of strategies, ultimately improving land use efficiency and promoting the new-type urbanization process.

References

[1] Zhu, T. M., Yang, G. S., & Wan, R. R. (2009). Research progress on intensive urban land use at home and abroad. Economic Geography, 29(6), 977–983.

[2] Zhang, Q., & Li, S. Q. (2023). New-type urbanization strategy under the goal of common prosperity. Journal of Xi'an Jiaotong University (Social Sciences Edition). Retrieved April 29, 2023, from the online version.

[3] Lv, J. (2014). Outstanding problems faced by China's new-type urbanization construction and relevant policy suggestions. Modern Business, (23), 77–78.

[4] Tao, Z. H. (2000). Discussion on several basic issues of intensive urban land use. China Land Science, 14(5), 5.

[5] Liu, X. W., & Wu, C. G. (2013). Establishing and sound public participation mechanisms for land remediation. Land and Resources Information, (7), 37–40.

[6] Xu, H. (2022). Problems and countermeasures of land use management in the process of urbanization. Southern Agriculture, 16(14), 136–138.

[7] Xing, Q., & Yang, C. (2015). Analysis of rural land use problems in the process of new-type urbanization. China Market, (39), 217–218.

[8] Zhao, Q. (2019). Problems and countermeasures of land use management in the process of urbanization. Western Resources, (1), 167–168.

[9] Zhang, D. L., Wang, Y. X., & Liu, M. (2022). Policy driving effect of new-type urbanization on urban land green use efficiency-Empirical test based on 280 prefecture-level cities. Urban Problems, (4), 45–54.

[10] Zhang, T. T. (2020). Discussion on land saving and intensive use in China's new-type urbanization process. Journal of Anhui Agricultural Sciences, 48(8), 242–244.

[11] Zhang, X. M. (2021). Land management and land saving and intensive use. China High-tech, (1), 107–108.

[12] Chen, W. X., Bi, X. W., & Liang, L. T. (2019). Evaluation of intensive land use in national central cities and diagnosis of obstacle factors. Areal Research and Development, 38(3), 113–118.

[13] Wang, Y. (2023). Analysis of current status of intensive land use planning and management in Chongqing. Agricultural Development and Equipment, (2), 86–87.

[14] Yang, Z. J. (2021). Discussion on the connection between urban planning and land use planning. Chinese Science and Technology Journal Database (Full Text) Engineering Technology, (1), 2.

[15] Ji, H. W. (2020). The role and countermeasures of land use planning in urban land management. Residential & Real Estate, (32), 123, 136.

[16] Xu, J. Z., Zhang, W. Z., & Liu, X. F. (2022). Discussion on the role and countermeasures of land use planning in urban land resource management. Science and Technology Information, 20(22), 108–111.

[17] Wang, J. C. (2021). The role and countermeasures of land use planning in urban land management. Residential & Real Estate, (22), 8–9.

[18] Liu, F. (2021). The role and measures of land use planning in urban land management. Urban Residence, 28(2), 207–208.

[19] Zhuang, J. P. (2016). Legal problems existing in China's general land use planning and suggestions. Economist, (11), 72–73, 75.

[20] Hu, T., Liu, Z. X., & Zhang, X. (2017). Problems existing in the compilation of land use planning in China. Resource Saving and Environmental Protection, (1), 87–88, 90.

[21] Deng, M. Y. (2015). Smart city and smart urban planning. Journal of South China University of Technology (Social Science Edition), 17(3), 49–56.

[22] Xu, M. X. (2019). Application of GIS technology in land use planning and design under the background of smart city construction. China Manganese Industry, 37(4), 112–115.

[23] Wu, Y., Rong, X., & Wang, S. H. (2026). Research on strategies for improving urban land resource use efficiency. New-type Urbanization, (1), 175–176.

[24] Huang, Y. K., Yuan, M., Liu, M. J., et al. (2025). Strategy and practice of optimal utilization of land resources in the context of the new era. China Rural Science and Technology, (10), 60–62.

[25] Cheng, J. X. (2025). Urban land use planning from the perspective of sustainable development. Residential & Real Estate, (36), 86–88.

[26] Liu, S. J. (2023). Research on functional area land use planning from the perspective of multi-plan integration. Residential & Real Estate, (Z1), 96–98.

[27] Jia, W. H., Li, W. W., & Zhang, W. (2025). Research on strategies for improving urban land use efficiency in Jiangsu Province in the new era. Shanghai Real Estate, (11), 35–38.

[28] Zou, L. L., Zhang, L. J., Liang, Y. F., et al. (2022). Scientific cognition and research framework of territorial space functions in the new era. Journal of Natural Resources, 37(12), 3060–3072.

[29] Wang, L. H. (2025). Strengthening land resource management to promote land saving and intensive use. New Agriculture, (5), 62–63.

[30] Yuan, M., & Liu, Y. L. (2014). Optimal allocation of land use based on multi-agent genetic algorithm. Transactions of the Chinese Society of Agricultural Engineering, 30(1), 191–199.

[31] Deng, M. Y. (2025). Smart deduction of Guangzhou's territorial space based on complex system models. City Planning Review, 49(9), 55–65.

[32] Guan, H. S. (2022). Analysis of the impact of urban planning and land planning on the expansion of urban construction land. Chinese Science and Technology Journal Database (Full Text) Engineering Technology, (3), 4.

[33] Zhou, J. (2026). Research on optimal allocation of stock construction land and urban land planning practice. New-type Urbanization, (1), 173–174.

[34] Bian, Z. Q., & Zhang, Q. H. (2025). Dynamic evolution, spatial differences, and convergence of green use efficiency of land in resource-based cities. Journal of Soil and Water Conservation, 39(2), 325–337, 377.

[35] Luo, Y., & Lai, J. Z. (2026). Monitoring and analysis of urban land use change based on remote sensing technology. Intelligent Building & Smart City, (1), 39–41.

[36] He, L. (2022). GIS technology application strategy of land use planning under the background of smart city construction. Urban Architecture Space, 29(1), 121–123.

[37] Wu, B. (2020). Application of Geographic Information System in Land Use Planning. Metallurgy and Materials, 40(2), 94, 96.