Exploration of the Logic of Zoning Implementation and Rule Construction for Detailed Territorial Spatial Planning Goals

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Abstract: As the focus of territorial spatial planning has shifted to detailed planning.zoning and useclassification have become primaryinstruments for implementingplans to achieve planning goals. The paper explores the intrinsic connection betweenplanning objectives and land zoning and classification tools by analyzing differenttypes of planning goals, development attributes, and rationales of zoning. It distin-guishes between "control zoning" and "regulatory zoning" based on planning actions,their respective features, and applicability in planning control. The paper clarifiedthat regulatory zoning is used to achieve bottom-line objectives, while control zoningis aligned with development objectives. Therefore, the paper proposes the adoptionof a dual zoning structure, encompassing use-regulation and development control,with statutory use zoning and policy planning being compiled in concert. This sys-tem aims to construct a coordinated mechanism that can balance rigid bottom-linecontrol and development flexibility, promoting detailed planning as an implementa-tion tool with both stability and adaptability.

Keywords: detailed planning; control zoning;regulatory zoning; goal; rule

As the preparation of the master plan for land space comes to an end, promoting the preparation of detailed plans and implementing the objectives of the master plan as soon as possible has become the center of gravity of planning governance.2023 The Circular of the Ministry of Natural Resources on Strengthening and Standardizing the Supervision and Management of Planning Implementation explicitly states that “special plans such as urban design and urban renewal plans shall not be used to replace the master plan for land space and detailed plans as the basis for planning and approval of various development, protection and construction activities”. The Circular of the Ministry of Natural Resources on Strengthening and Regulating the Supervision and Management of Planning Implementation clearly states that “no special planning such as urban design and urban renewal planning shall be used to replace the overall and detailed planning of national land space as the basis for planning and approval of all kinds of development and protection and construction activities,” once again reaffirming the status and role of the detailed planning of land space. However, as a legal type of planning, the detailed control plan (hereinafter referred to as “control plan”) under the urban and rural planning system has been frequently revised in practice, seriously harming the authority of legal planning and reflecting the limitations of its rule of law thinking and implementation path. Many scholars have conducted multi-dimensional discussions on the reform of control plan[1], the exploration of the preparation of detailed planning of land space[2], the conduction dilemma and optimization measures[3], and the experience of local implementation of control[4]. How to overcome the problems of detailed planning in urban and rural planning and to expand and strengthen the use control function of detailed land space planning in order to meet the demand of planning management of the whole area, whole elements and whole life cycle becomes an important issue in the planning transition period. This paper attempts to discuss the technical tools and behavioral logic of detailed planning of national land space at the level of basic planning theory, analyze the basic concepts

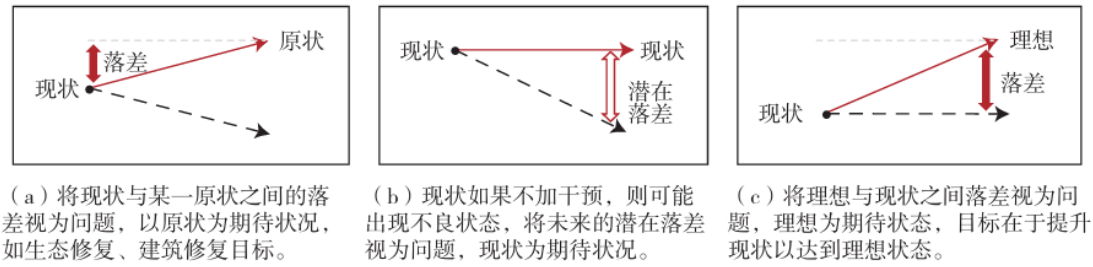
of the types of planning objectives, the attributes of development rules and the logic of planning zoning, and distinguish the two types of planning behaviors, namely, “control zoning” and “regulation zoning”. It distinguishes between the logic of “control zoning” and “regulation zoning”, explains the attributes, characteristics and scope of application of the two types of zoning as a planning control tool, and explores the logic and structure of zoning for detailed planning in line with the objectives of territorial spatial planning in order to provide a theoretical framework and reform proposals for the control of territorial spatial use.

1 Categorizing the objectives of planning

Planning is essentially a rational consideration prior to action and involves the consideration of a set of interrelated decisions and actions to ensure that they are harmonized with a stated purpose or intent and ultimately fit with a specific goal[5]. Establishing planning objectives is a central component of planning[6], however, research addressing the attributes and forms of planning objectives has been lacking[7]. Therefore, it is necessary to identify the attributes of planning goals and their constructive logic.

1.1 Types of Problems and Formation of Objectives

The birth of modern urban planning is a response to a series of urban problems caused by market failure. A problem is the gap between expectations and the current situation, and the severity of the problem is the degree of the gap[8]. The choice of which problems to address and the extent to which they should be addressed as planning objectives directly influences the methods and technical tools used to implement the plan. Problems can be categorized into three types based on the purpose of solving them and when they occur: restoring the status quo ante, preventing potential risks, and pursuing desirable goals. See Fig 1.



（a）将现状与某一原状之间的落差视为问题，以原状为期待状况，如生态修复、建筑修复目标。

（b）现状如果不加干预，则可能出现不良状态，将未来的潜在落差视为问题，现状为期待状况。

（c）将理想与现状之间落差视为问题，理想为期待状态，目标在于提升现状以达到理想状态。

Fig.1 Three types of issues and goal setting

In terms of the expectation of overcoming the problem: the first two regard the status quo or the status quo ante at a certain point in time as the expectation, and the goal is to maintain or return to a certain state of the original, so the main measure is to correct the error in response to the real problem; while the pursuit of the ideal type regards an ideal state as the goal, and has a future-oriented nature. From the point of view of the time when the problem occurs: only the problem of restoring the original state type has already occurred, the latter two status quo is considered to be no problem, but preventing the potential type is that there may be potential problems in the future, and therefore need to be intervened in order to maintain the status quo; and the pursuit of ideal type of the problem is different, the status quo itself is not a problem, and the problem depends on whether or not the ideal standards in the future will be met.

The planning practices of the United Kingdom and the United States of America have had a more far-reaching impact on the formation of planning systems in countries around the world. Both the British city planning scheme and the American zoning law are designed to regulate or manage land use, building volume and form in the public interest. However, the evolution since then has been marked by significant differences in the definition of the types of problems and the setting of planning objectives, and therefore the ways and means of planning to overcome them have been very different. In short, the early public health and workmen's housing laws in the UK were a reactive response to an uncontrolled urban order, and when this approach failed to solve the problem of mixed site layout brought about by the industrial revolution, and the physical environment continued to deteriorate, more proactive models of the ideal city, such as the idyllic city, were developed[9]. Special solutions to urban problems are goal-oriented in an ideal state, and the construction of urban development goals is inevitably influenced by the experience and values of planners, and is intentional and subjective. This makes the ideal city vision advocated by early planners present opposing poles, such as Corbusier (Le Corbusier) 1925 Paris architectural planning program advocating high-density development, and Wright (Frank Lloyd Wright) 1935 proposed wide acres of cities advocating decentralized layout.

The United States also experienced the same problems of urban disorder brought about by the Industrial Revolution in the second half of the 19th century.In 1909, Washington hosted the first National Conference on City Planning, which promoted the widespread dissemination and application of the German zoning experience in the United States[10]. The original purpose of zoning is not based on the goal of an ideal city, but is rooted in the reality of the problem, the purpose is to avoid nuisance and defense of property rights, to solve the problem of externalities of land development, which lurks in an important zoning rules, that is, “to exclude those who are undesirable people or types of land, so as to protect the status quo”[11]. In the early 20th century, zoning in the United States had the following four main goals[12]: (1) to prevent potential threats to public health and safety; (2) to maintain the quality of streets and open spaces; (3) to protect the character and value of an area; and (4) to improve the efficiency of the government and reduce the abuse of power. Overall, zoning is geared toward correcting existing problems and shifting from after-the-fact remediation of nuisance ordinances to prevention of potential problems in order to maintain the existing order.

Comparatively speaking, the 1947 British development plan was born out of the pursuit of the ideal city, and thus took a more proactive approach to realizing the expected urban spatial form; while the American zoning was based on experience and lessons learned, and was committed to protecting the status quo and ensuring that new development projects would not degrade the spatial quality of the status quo, which was oriented to preventing potential threats, and also a passive regulatory attitude. The development planning system constructed by the British Planning Act 1947, although not based on an ideal city model as the planning goal, is still based on the predicted and intended spatial state as the basis for planning and management and the approval of the development project standards, that is, to 'envision' as the planning goal; the U.S. zoning does not set the shape of the future, and does not provide for the future of how it must be, but rather to the status quo as the benchmark, requiring new development projects to be based on the status quo as the goal. Rather, it takes the current situation as the benchmark and

requires that new development projects not degrade the existing spatial quality. These differences in problem selection and goal attribution have led to the tendency for British plans to be known for their flexibility, while American zoning is known for its certainty.

1.2 Stability of Bottom Line Goals and Change of Developmental Goals

Restore the status quo ante and prevent potential problems of these two goals expectations correspond to the formation of a bottom-line goals, is based on the behavior of the subject in order to achieve the minimum expected goal and to avoid changes in the direction of things to the bad set[13], the status quo or the original state of the attributes and characteristics of the minimum expectations can be set through the analysis of the facts of the investigation of the depth of the goal of the standard, and therefore have a relative certainty and objectivity, such as the New York zoning Article 11-20 clearly defines the minimum requirements[14], this requirement has been established since 1961 and continues to this day, is the most important part of New York zoning. Article 11-20 of the New York zoning clearly defines the minimum requirements of the regulations[14], this requirement has been established since 1961 to continue to this day, is the most basic bottom line principle of the New York zoning. The original section is quoted below:

11-21 Prescribed Minimum Requirements

In the interpretation and application of this Resolution, the following provisions shall serve as minimum requirements:

(a) As set forth in the introduction to this Resolution and in the legislative intent of the zoning districts and other provisions, the minimum requirements of the regulations are to enhance and protect the public health, public safety, and public welfare; and

(b) The adverse condition provisions for existing conditions provide for incremental improvements.

It is clear from this that the bottom line goal of New York zoning is that all development cannot be worse than the status quo. The bottom-line goal itself has the property of stability, which has enabled U.S. zoning to remain stable for a long period of time, but at the same time, this reactive response to real-world problems has attracted a great deal of criticism, with critics arguing that zoning has not been effective in facilitating the growth of the city, and has even impeded its growth[15-16].In the twenty-first century, New York has prepared several rounds of comprehensive plans to establish a proactive vision. Zoning will also be more integrated into the goals of comprehensive planning and community planning in the future, and will become an implementation tool for planning.

The goal of pursuing an ideal state is a developmental goal. Ideals are subjective constructs, and therefore cannot be derived directly from analyzing the current situation. Just as there is no absolute standard for a good lifestyle, the ideal urban form is only a value judgment, and there are both high and low standards for the ideal. In other words, developmental goals are dynamic and subjective. In the stage of rapid urbanization and rapid economic growth, the objectives of the control plan are often based on the development-oriented objectives constructed on the basis of the ideal of the future, which are characterized by specific, stage-by-stage, and will

change to different degrees with the change of time and the subject matter, and the contradiction between the ideal state preset by the planners and the ideal state envisioned by the developers of the real market may arise. In reality, most of the frequent adjustments to the control plan are due to changes in the "objectives", which may be manifested in changes in the demand for land use and development intensity, resulting in the readjustment of the boundaries of land parcels or development indicators. Therefore, if the control plan only focuses on specific development objectives, the development rules constructed accordingly will inevitably show specific and particular characteristics.

Admittedly, although bottom-line and developmental objectives can be strictly distinguished conceptually, in reality, the two types of objectives are often mixed together. Just as a car moves forward as the bottom line of driving, the bottom line goal is the continuous operation of the engine to maintain, the driver driving can be fast or slow, but can not go backward; then the stability of the bottom line goal is manifested in the continuous forward movement; it can be seen that the bottom line goal is not some kind of constant state, but rather a kind of constant rules and standards. Since the 18th Party Congress, General Secretary Xi Jinping has repeatedly emphasized the importance of bottom-line thinking in different fields of work. With the in-depth advancement of the reform of territorial spatial planning, a number of relevant documents have also explicitly pointed out that it is necessary to unswervingly adhere to the bottom-line thinking in the work of territorial spatial planning, and to effectively implement bottom-line control measures[17]. However, in the existing academic discussions on national spatial planning, there is still a lack of research on the scientific connotation of the bottom line and how to realize the methods and ideas of the bottom line. Some scholars directly regard the "control line" in planning as the bottom line of planning[18], ignoring the scientific connotation of the bottom line, and the "control line" delineated by planning may be the boundary line of a certain type of space, and it can only be a certain element of the bottom line control, rather than the bottom line control. All or equal to the bottom line target. Therefore, there is an urgent need to distinguish, at the theoretical level, between technical methods and tools for adapting to bottom-line and developmental objectives, in order to better meet different needs.

1.3 Difference in attributes between planning control and rule-based control

The space use behavior of any one actor may directly generate externalities or potential externalities, negative externalities are prone to cause contradictions and conflicts between neighboring uses, which is the main reason why modern cities need to be regulated by public intervention in the form of planning or law. This problem of public intervention there are two kinds of control logic, Hayek distinguished between two kinds of control under the social order: "goal theory (teleocracy)" and "rule of law (nomocracy)"[19], the former order under the In the first order, the rules are "laws" as a specific order, and in the second order, the rules are abstract, universal rules of behavior based on the laws of nature, which are formed by the interaction of all members of the community and are observed by them[20]. A general rule followed by everyone is not the same as the order itself, since it does not necessarily presuppose the existence of a person who issues it[20]. Moroni[21] introduces this idea into the field of planning, considering that the regulatory approach, governed by the ultimate goal, is a "patterning-instruments", which directly generates the social order by defining the structure of the city and the functions of its

components in order to implement a detailed and differentiated approach to the development and use of the land[22]. The rule-governed approach is a “framework-instruments” that only establishes or excludes certain interrelationships between functions and indirectly generates social order through abstract, general rules.

Since the 20th century, most countries have developed comprehensive, integrated and statutory land-use plans from the top down in a “goal-oriented” way, forming a model of planning control[22]. At the beginning of the 21st century, there is a quiet change in planning thinking, with an increasing tendency to utilize norms, rules, and abstract principles as the main control tools [22-24], in order to better respond to the needs of the community[22].] to better cope with the complexity and self-organizing order of cities. Some scholars[25] have suggested that planning regulation should be used in such a way as to control only the behavior of the public sector, and that what is needed for the behavior of individual members of society is not planning, but regulation. In a seminar on goal theory and rule of law theory, the idea that rule of law theory is the preferred method for adapting to complex self-organized systems was generally accepted[26]. For China, the rule-based transformation of the detailed planning of territorial space has also gradually become a consensus[27-33]. However, at the level of control logic, there is still a lack of implementation paths on how to realize the rule-based transformation of detailed planning.

2 Logical relationship between zoning implementation of planning objectives and rules

Since the release of Several Opinions of the State Council of the Central Committee of the Communist Party of China on Establishing a System of Territorial Spatial Planning and Supervising Its Implementation in 2019, zoning classification and implementation of use control for the entire territorial space has become a basic guideline for national planning and management, and as a tool for planning implementation, detailed planning in which zoning of the plan and classification of the use have become a key technical method, the reform of the use control of the territorial space should be fully articulated with the basic idea of zoning classification of spatial control in territorial The basic idea of zoning classification spatial control in spatial planning[34]. Firstly, the act of planning itself manifests itself as land use zoning and use classification, such as each specific plan is for the zoning and classification of the planning area; secondly, the planning results must include land use zoning planning map; thirdly, the act of preparation of statutory planning manifests itself as specific zoning and classification based on the given standard of land use zoning and classification. It can be seen that zoning classification is not only a universal planning behavior and general planning method, as a planning behavior norms and guidelines for the use of classification and land use zoning standards have also become an institutional planning technical tools[35].

Zoning is a special type in the sequence of planning behaviors, and the logical relationship between zoning behaviors and the preceding and following sequential behaviors of planning determines the essential characteristics of zoning results. The behavioral sequence relationship between planning objectives, development rules, and zoning types determines the type of planning and its attributes, for example, the behavioral sequence of China's control plan preparation is to directly implement the objectives to specific parcels, and to formulate the development conditions of the parcels according to the requirements of the objectives, and to

qualify the construction projects through the development conditions of the parcels, and the logic of the behaviors is manifested as follows: “Objectives Its behavioral logic is expressed as follows: “Objectives -Division of parcels (zoning) -Parcel development rules”. The behavioral sequence of zoning in the United States is to transform the goal into the development rules for different types of construction projects, and then zoning based on the rules, then the planning and zoning is clear about the spatial scope of the applicable rules, and the result is that the same type of rules apply to the zoning of the development and construction of a standard and requirements, and the logic of its planning and behavior is “Goal - Development Rules The logic of planning behavior is “target-development rules”. The fundamental difference between control regulations and zoning is that the order of zoning and rule establishment is not the same, which leads to different results and effects of zoning. The order of planning behavior, the logical relationship between the behavior determines the nature of the planning work, as well as the characteristics and substance of the results of the planning work.

2.1 The procedure of zoning behavior in China's control regulations and its logic: formulating objectives - dividing land parcels - establishing indicators and requirements for development and construction with land parcels as control units

The control plan is a typical tool for using zoning as a control of development in China. The general procedure of the preparation of the control plan is to define the planning area in advance, establish the overall development objectives of the planning area by combining the objectives of the master plan and the real needs, and then decompose the overall objectives of the established planning area and implement them into the important construction projects and parcel uses, and determine the road traffic and urban infrastructure to support the development objectives, which is manifested in the double subdivision process of objective decomposition and planning area division. For example, in Beijing, through the “master plan - zoning plan - planning unit - control plan / township territorial spatial planning”, indicators such as population, land use and building scale are decomposed and finally realized in the comprehensive implementation plan. Implementation planning realizes fine control[36]. The spatial scope of the plan is divided into “layers” from municipal space, districts, and clusters of land parcels, and the goals and targets are finally implemented into land parcels.

Purely in terms of the logic of planning behavior, master planning and detailed planning is isomorphic, are the process of translating the objectives and requirements of planning to a specific spatial area, the difference is that the planning results of the spatial scale is different. The purpose and role of the control plan is to categorize and implement the objectives and requirements of the master plan, and in-depth plot-scale construction indicators, which serve as the basis for “control”, including both the “plot indicator” control of the architectural form and the “planning permit” control of the development and construction behavior. “Planning license” management, the role of plot index is mainly to provide for the content of the planning license. It can be seen that the control plan is the basis for development management, through the zoning and plot development control indicators to constrain the management behavior of planning permission, this behavior established for the purpose of management procedures and their logical links can be called “control zoning”.

Control emphasizes the control of the management subject on the planning object, which means that the land development and utilization activities are subject to the directional constraints of the specific control subject, and the zoning in the control plan is only a prelude to the case-by-case approval and management. In the multi-level government system of “city-district-town”, the control plan is organized and prepared by the lower level government of the district/town, and the municipal government is responsible for approving the plan. However, the district and town governments do not prepare the control plan as a whole in accordance with the scope of the administrative district, but according to the current and realistic development needs and management needs, the control plan is divided into zones and phases. However, the district and township governments do not prepare the control plan as a whole according to the administrative area, but rather according to the current and realistic development needs and management needs in different areas and stages. The scope of preparation of each control plan project as a “zoning” to implement the planning objectives and management requirements is not specifically defined, and may be a specific functional area, or a more complete development unit, or just to make up for the shortcomings and deficiencies of management, or even the emergence of a specific parcel of land “plot control planning”. Parcel Controlled Planning”. This logic of control zoning that serves specific management objectives leads to huge differences in planning results, not only are the control indicators for similar parcels different between different planning zones, but even the indicators for two neighboring parcels of the same type of use in the same planning zone may be different, for example, for the same neighboring parcels with the same “R2”, one has a plot ratio of 2, while the other has a plot ratio of 2, while the other has a plot ratio of 2, while the other has a plot ratio of 2. For example, in the case of the same “R2” adjacent parcel, one floor area ratio is set at 2, while the other is set at 3. The reason for the difference may be a simple, differentiated aesthetic interest. If the scope of a single control plan is regarded as an independent control zone, then the full coverage of the control plan is only the result of putting together one control zone after another.

It can be seen that the zoning behavior of the control regulations generally exists in the process of planning, both the selection of the planning scope and the cutting of parcels of land are the decomposition of the overall planning objectives, the zoning is a tool for managers to achieve the management objectives, and the results of the zoning directly serve the management rather than regulating the development and use of activities on the land.

2.2 The zoning behavior procedure and its logic in American zoning: establish land use rules consistent with the goals based on a certain consensus or goal, and then implement the specific rules into specific zoning districts through negotiation

The control plan is a tool borrowed from China's special historical development period[37], and the formulation of the control plan is largely borrowed from the experience of American zoning[38]. This also makes some scholars in the early days think that the control plan is zoning, and there is not much difference between the two. However, with the deepening of the research and understanding of the United States zoning, more and more scholars have noticed that the essential difference between zoning and control regulations is the difference between the type of “law” and “planning” [39-41].

In fact, the “law” and “planning” is not a simple form and effectiveness of the difference, the essential difference is the development of the purpose of the act and the logical relationship between the sequence of behavior. As mentioned earlier: the control plan is “goal - division of parcels (zoning) - rules”, while the zoning adopted a similar but fundamentally different “goal - rules -Zoning”. Euclid zoning ① as an example to illustrate the basic logic of zoning behavior[42], first, to establish the objectives and claims of zoning, such as the protection of the environmental quality of single-family residential areas; second, the objectives and claims into the rules of land use, in order to achieve the purpose of protection, the first rule is to determine the rules are only allowed to build single-family residential, excluding other land uses; third, the negotiation of the delineation of space areas for the application of this land use rules, in the specific land use rules, the land use rules are applied in a specific area, and the land use rules are applied in a specific area. Thirdly, the spatial area to which the land use rules apply is negotiated, and in the process of zoning, those who accept the land use rules are zoned into that category, and those who do not accept the land use rules are zoned out, and whether or not to be categorized into a certain land category depends mainly on the will of the residents and not only on the current land characteristics.

In the behavioral sequence of planning objectives, development rules, and zoning types, zoning is the last step and is the implementation of residents' wishes. The goals and rules in Euclidean zoning are still specific and particular correspondences, which are transformed into general correspondences in New York zoning, such as The City of New York, Zoning Maps and Resolution, 1961, where the purpose of zoning is “safety, health and welfare”[14], and the corresponding land use rules are summarized in three areas: land use, building height, and building setbacks and spacing. This establishes an adaptive framework between zoning purposes and zoning land use rules, and most cities refer to these general zoning rules to carry out specific zoning activities for specific planning objects. The process of spatialization of rules or such rule-based zoning can be collectively referred to as “regulatory zoning”.

In a nutshell, unlike the control plan, which first divides the land parcels and then establishes the rules, the zoning behavior logic of zoning is to establish the land use rules first and then divide the land, which means that the abstract rules are used to respond to the abstract purposes. The categorization of purposes is converted into the categorization of rules, which results in the formation of zoning codes and rule systems. Once a systematic system of rules is established, the act of zoning is the spatialization of rules, a repeatable act. Whether it is the simplest and most straightforward Euclid zoning, or New York zoning, which provides an effective reference model for the planning and management of many cities in the world, as well as Los Angeles zoning, which pioneered the contemporary zoning revolution, the establishment of its regulatory zoning is a rule first. Zoning is not only the decomposition, deepening and spatialization of legislative purposes, but also a means to achieve them[39].

2.3 Difference in attributes and scope of application between control zoning and regulatory zoning

In summary, due to the different types of problem definition, control zoning and regulation zoning form different planning goal orientations and ultimately apply different behavioral logics

and rule systems (Fig 2). The control zoning rules constructed on the basis of ideals or blueprints with changeable attributes are more specific, and because they are directed at specific objects, they can quickly respond to the particular problems of a specific area and lead to corresponding actions; however, they are not universal, are not effective for the same kind of events, and are difficult to be used as a holistic control tool. In contrast, regulatory zoning based on bottom-line objectives focuses on the construction of general rules of relationship, providing a regulatory framework for general land use behavior, and therefore has a higher degree of stability and fairness. However, at the same time, the formulation of most general rules often requires a gradual trial-and-error process and relies on the prudent thinking and experience accumulation of countless people, thus making it difficult to quickly realize a response to real problems.

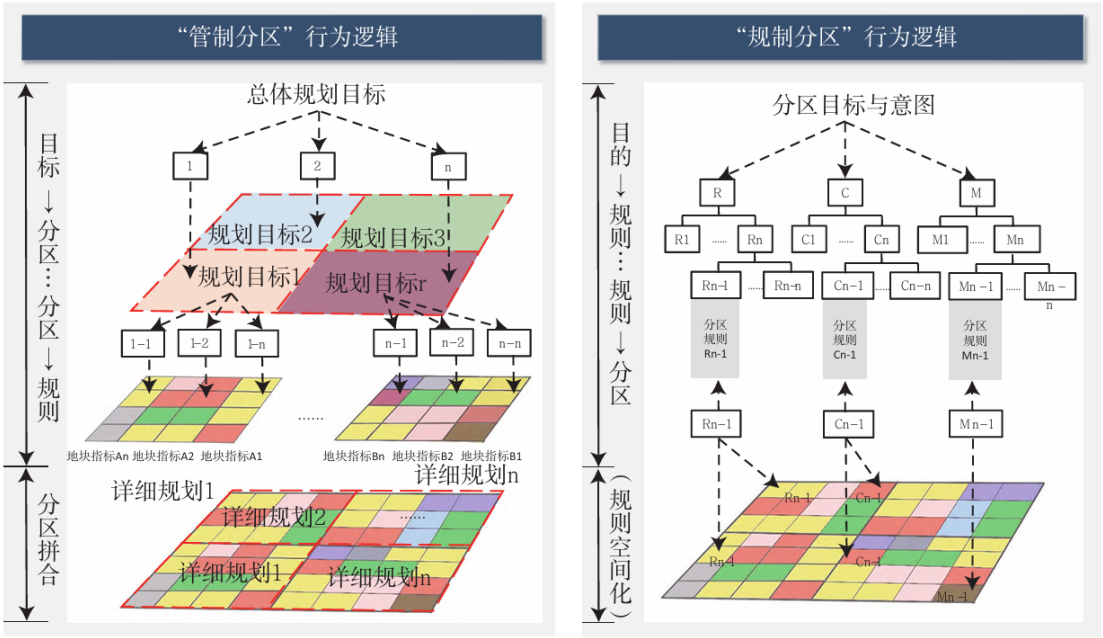


Fig.2 Comparison of the logic of "control zoning" and that of "regulatory zoning"

For China's homeland spatial governance system, both control zoning and regulation zoning are indispensable[29]. Territorial spatial planning not only contains specific, staged, region-specific urban development goals, but also establishes constant multiple bottom-line goals, such as safeguarding ecological security, food security, and homeland security. On the one hand, local governments as the main body of development continue to bear the responsibility and obligation of spatial development, the responsibility of land grant and development control in established urban and rural planning needs to be retained and improved, the effectiveness of the control plan as a tool feature of zoning control has been verified historically, and it needs to be retained as a type of control tool applying to a specific object and a specific range in the comprehensive toolbox of territorial spatial planning; on the other hand, the Detailed territorial spatial planning needs to concretely implement the requirements of the bottom-line objectives of the upper plan, and the bottom-line objectives require the establishment of regulatory zoning, and the regulatory purpose is difficult to be achieved by the control method.

3 The dual structure of regulation zoning and control zoning of detailed land space planning

The control details and amendment details of urban and rural planning correspond to construction land management and construction project management respectively, and the land space planning of “multi-planning” includes the management contents of urban and rural planning and land use planning, so the detailed land space planning should at least satisfy the use control of land use planning, the construction land management of urban and rural planning (land use permit) and the planning management of construction projects (land use permit).) and planning management of construction projects (construction project planning permission), and the zoning classification as the basic policy of land space management should also be reflected in the detailed plan. As an implementation plan, the detailed plan should not only implement the bottom line requirements of the upper plan, but also implement the development objectives of the upper plan as well as the realistic development demands, and the synergistic operation of the regulatory zoning and control zoning becomes the key to the effectiveness of the detailed plan.

3.1 The use of regulatory zoning as the implementation of the bottom line of the basic regulatory tools

At present, China has not yet formed a set of perfect land development and use control rules system, therefore, how to realize the bottom line constraints will still be the difficulty of the future use control. This paper proposes to take the use regulation zoning as the bottom line management tool, and take the lead in establishing the use zoning rule system, first of all, to construct the generalized use rules responding to the bottom line type of objectives, in fact, through the zoning work of the detailed planning to implement into the use zoning reflecting the corresponding objectives, that is, the process of spatialization of the rules of use classification. For example, local governments can deepen the zoning types and objectives based on the Guidelines for Zoning and Use Classification of Municipal and County Territorial Spatial Planning, refer to the experience of use zoning rules in various countries, and prioritize the construction of the rule system of use regulation zoning in conjunction with the existing use control policies and demands (Fig. 3 and Fig. 4), and the key is to establish a logical relationship between different types of zoning, which is the basis and the basis for the use of regulation zoning as a territory-wide tool. The key is to establish the logical relationship between different zoning types, which is the foundation and prerequisite for regulatory zoning to be used as a territory-wide tool[33].

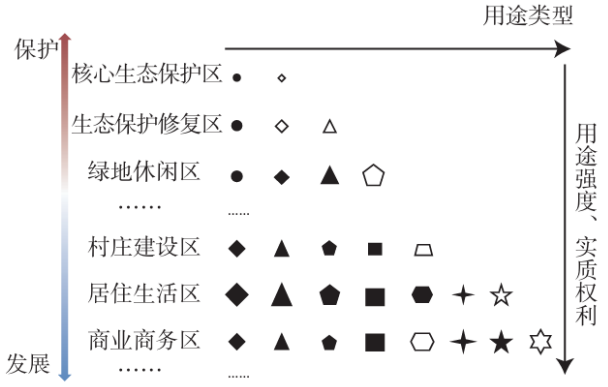


Fig.3 The logic of the use-regulatory zoning

Note: The various shapes in Fig 3 represent different types of uses; the size of the shapes represents the intensity of the use; the hollowness of the shapes represents that the rights need to be granted by a license, while the solidity of the shapes represents that the rights are granted

directly by the rules, i.e., without a license.

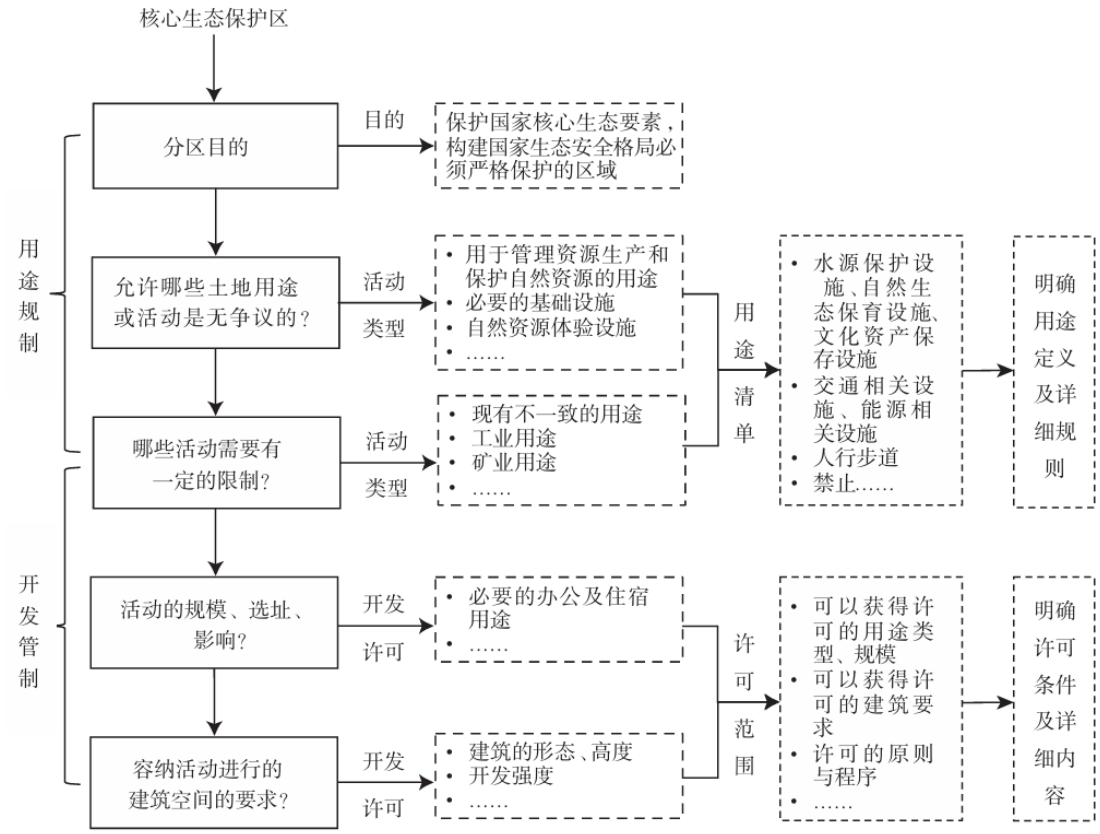


Fig.4 Construction for zoning rules: the example of core ecological protection areas

3.2 Development control zoning as a control tool for the implementation of regional development planning

The development and construction behaviors to implement specific development goals are often piecemeal and time-lagged, and are inevitably at a different level from the use-regulation zoning that implements the bottom line. The purpose and role of control zoning is to implement and coordinate specific development and construction projects, such as industrial parks, residential new towns, urban renewal and redevelopment, and other area development and construction plans. As long-term development and construction projects, the objectives and requirements of land use will change with the differences in the problems faced in different periods of development, and the control zoning based on the goal-oriented approach must change accordingly. However, the change of use in the control zoning district is often localized rather than holistic, and thus development control zoning districts are not necessary to cover the whole area. Development control zoning districts can exist as overlay zoning districts on top of use regulation zoning districts, which avoids the need for rezoning as new needs arise and is a tool to increase the flexibility of regulation zoning districts.

3.3 Structural relationship between use regulation zoning and development control zoning

In the past, under the background of coexistence of multiple regulations, the root cause of the “multi-regulation conflict” lies in the overlapping of multiple public powers between different

levels of government and departments, which leads to the conflict between the planning objectives and the control content, and the formation of the game of planning authority. The conflict of multi-regulation can only be minimized when a unified use-regulation zone covering the whole region is established as the bottom constraint and the land use rules are integrated. In addition, the existing and future development planning content can be converted into development control zoning, which will be superimposed on the basic use regulation zoning, to establish supplementary rules, forming a development control zoning and use regulation zoning superimposed zoning pattern. See Fig 5.

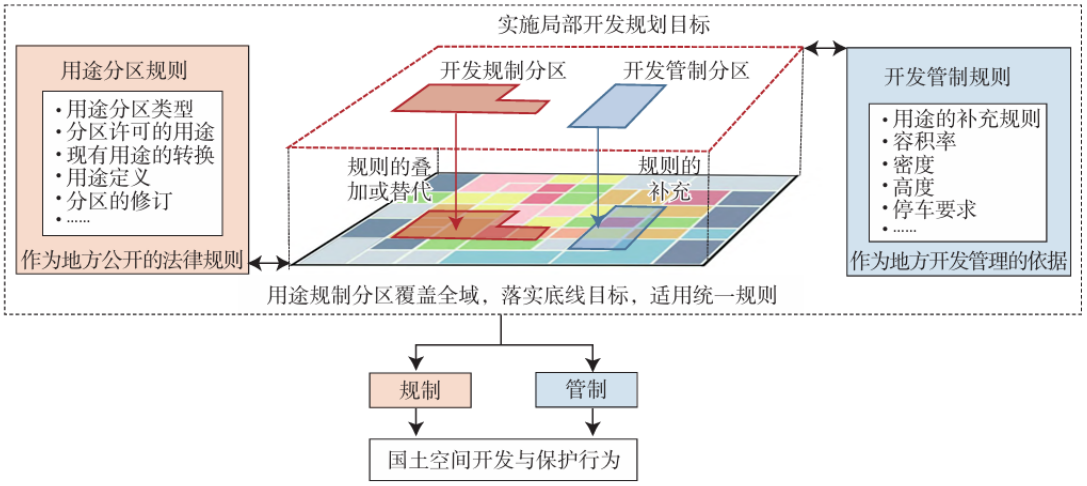


Fig.5 Dual zoning structure and the synergistic relationship

Development control zoning, as a basis for administrative management, should be harmonized with use regulation zoning, with the synergistic model that the control zoning cannot contravene the regulation zoning and has the right to request adjustments to the regulation zoning. First, “do not violate” is not to break the bottom line requirements in the use level, but the development rules can be used for the use, development standards for the formulation of supplementary rules to achieve specific development goals. Secondly, the function of the regulatory zoning district is that the “regulatory zoning district approved by the legislative procedure” can replace the regulatory zoning district in the planning scope, that is to say, the “regulatory zoning district with reference to the regulatory zoning district” is the revision and supplementation of the regulatory zoning district. That is to say, “regulatory zoning prepared and approved with reference to regulatory zoning” is an amendment and supplement to regulatory zoning. Therefore, when the upper zoning district is already a development zoning district, the rules of the upper zoning district can be superimposed on or replace the basic use rules. The synergistic process between the two is manifested in the process of legislation or law revision.

4 Synergistic Implementation Path of Control Zoning and Regulatory Zoning in Detailed Territorial Spatial Planning

4.1 The first stage: establishment of a two-tier structure based on use regulation zoning districts

The first stage of the transformation of detailed planning is to build an implementation route based on the rules mentioned above, taking the lead in establishing the zoning type and rule system of use-regulation zoning, and then completing the spatialization of the zoning rules in

conjunction with the territorial spatial planning, i.e., completing the formulation of the use-regulation zoning map. The use regulation zoning map can be gradually completed with the preparation of the detailed national spatial planning, matching the objectives in the national spatial planning with the type of use regulation zoning, establishing the correlation between the zoning rules and the specific space through the zoning code, and completing the correlation process of objective/purpose-rule-zoning. With the completion of the detailed planning, a map of use regulation zoning covering the entire space is finally formed (Fig 6). It is worth noting that there is a significant difference between the full coverage of the use regulation zoning and the full coverage of the original control plan. As mentioned earlier, the control regulations are first zoning, and then establish the rules of control zoning logic, control regulation full coverage is only a patchwork of control zoning. Use regulation zoning is based on the unified use of rules under the zoning, even if different detailed planning scope, as long as it is named the same kind of use zoning code means that their use rules are consistent. As a result, detailed plan use control can become a holistic and systematic regulatory tool.

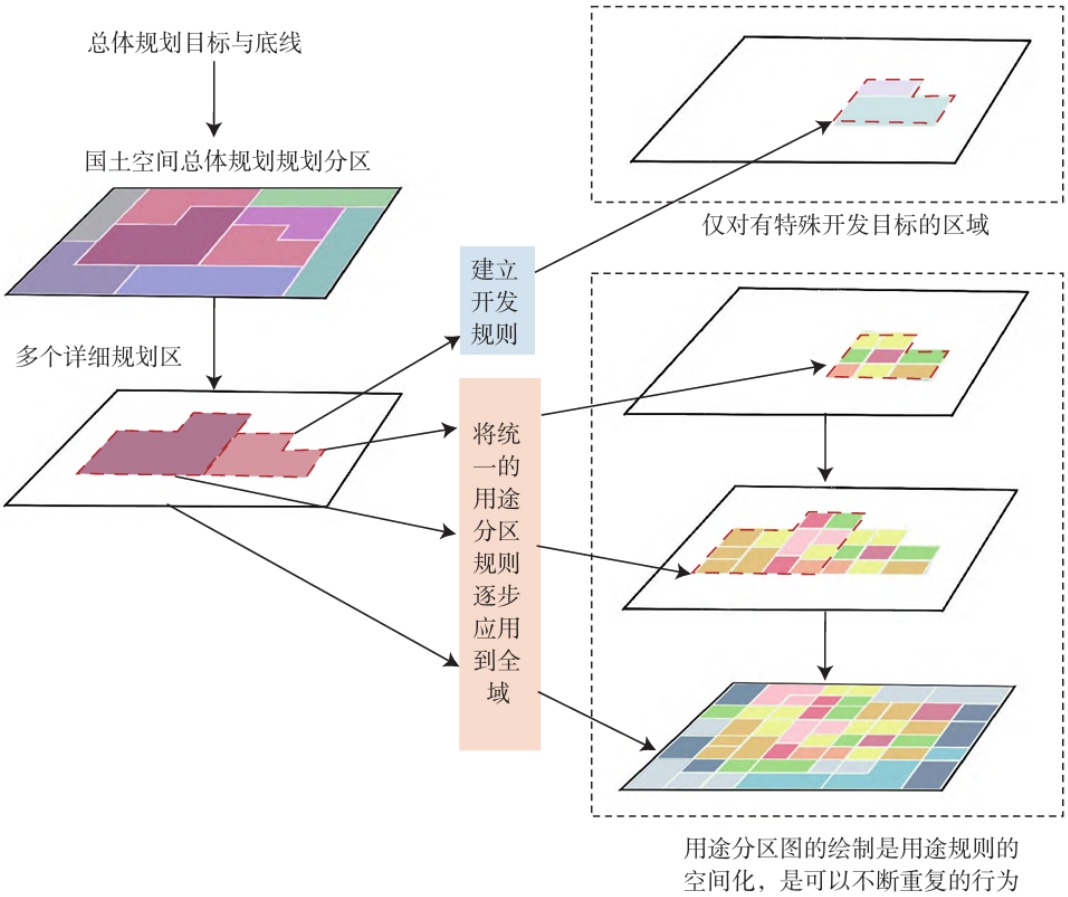


Fig.6 Processes of drawing detailed zoning maps

In addition, in the process of detailed planning, apart from formulating use regulation zoning districts for realizing basic bottom-line type objectives, development control zoning districts can also be established for specific areas in conjunction with the development objectives of the district as well as the needs of other special planning such as renewal planning, urban design and historical preservation planning. The development control zoning district is a supplement to the

basic use rules, and implements additional use, form, intensity and other development rules to realize specific zoning objectives, which can be regarded as a continuation of the original zoning pattern of the control plan. A two-tier structure based on use regulation zoning is thus gradually formed in the detailed planning.

4.2 The second stage: establishing a two-tier structure based on comprehensive regulatory zoning.

The regulatory zoning based on the use dimension is the most probable regulatory zoning dimension in China, and it is also the planning and implementation tool most capable of directly realizing the demand for spatial use control of the national territory. International experience has also shown that use-based zoning is often the foundation and core of comprehensive zoning. When China's use regulation zoning is gradually established and perfected, the stability and adaptability of development control zoning can be further integrated and incorporated into use regulation zoning, so that the use regulation zoning can be transformed into comprehensive regulation zoning, improve the dimension and depth of land use rules, and promote the gradual enhancement of the capability of land space governance. However, it is undeniable that there are always short-term and specific development goals in the process of urban development, and planning management always needs more flexible control methods to quickly respond to real problems. Therefore, no matter how perfect the comprehensive regulatory zoning is, regulatory zoning will still always exist.

Under this evolutionary path (Fig 7), the control dimension and application scope of development control zoning will be gradually reduced, and detailed planning will gradually coordinate a wider range of public and private interests, ecological protection, and urban and rural development issues with more comprehensive regulatory zoning. At the same time, the bottom line of use will gradually be upgraded to a multi-dimensional and comprehensive bottom line, such as the bottom line of public space, the bottom line of historical preservation, and the bottom line of urban renewal, etc. In general, the comprehensive regulatory zoning will gradually reduce the dimensions of control and scope of application. Overall, the establishment and improvement of comprehensive regulatory zoning needs to take into account the specific urban development situation and needs, and is a continuous evolutionary process.

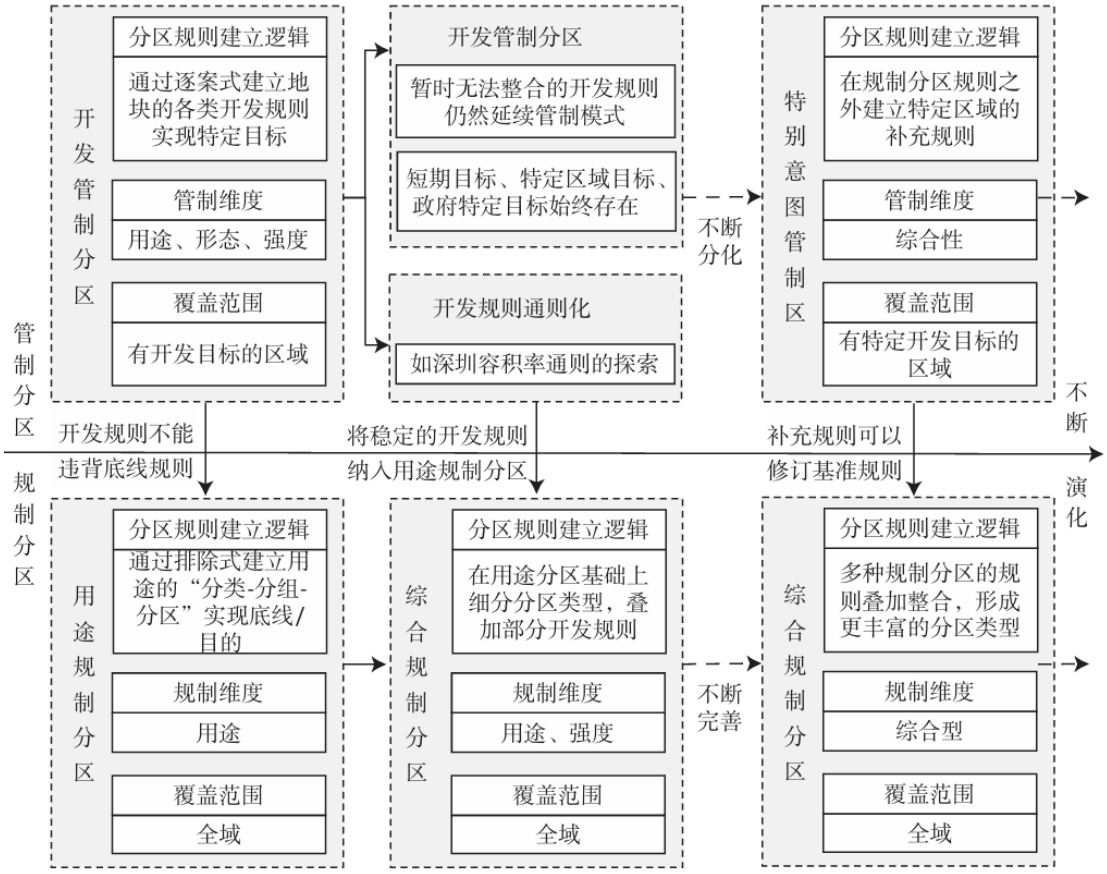


Fig.7 The evolutionary path of control zoning and regulatory zoning

5 Conclusion

Improving the land space use control system is of great significance in promoting the modernization of the spatial governance system and governance capacity, and detailed planning, as an important hand in implementing the land space objectives and implementing the use control, is urgently needed to construct a coordinated operation mechanism of rigid control of the bottom line and flexible control of the development objectives, so as to ensure the standardization and flexibility of the land space utilization, and to promote the refinement and high efficiency of the spatial governance. The difference in the attributes of bottom-line and development goals determines that detailed planning must have the dual attributes of regulation and control. Regulatory zoning is a specific combination of the three planning behaviors of “target-rule-zoning”, which is essentially a spatialization process of rules, and its results are used as a governance tool to respond to the management of the whole area and the bottom line; while the development control zoning is a historically tested and effective technique oriented to the urban and rural construction goals and the development control zoning is an important element in the planning process. Development control zoning is a historically tested and effective technical tool for urban and rural construction objectives. Therefore, this paper proposes that, based on the zoning of use regulation, the development rules that can be transformed into rules in the attributes of the control regulations should be separated continuously, and the formulation and use of the control regulations should be transformed into the rule of law from the logic of legislation, so that the detailed planning of the national land space can become a comprehensive

governance tool that implements the goal of the overall use control and has stability.

In general, the technical problems inherent in regulatory zoning can be improved and optimized in a scientific and rational manner, and technical tools are universal when the purpose and needs are consistent. However, on the other hand, the target attributes carried by regulatory zoning are often local, reflecting the development and protection visions of specific groups, which means that the contents and forms of regulatory zoning vary under different systems and cultures, and the types of regulatory zoning and the system of rules adapted to our country's uses still require local practice and exploration.

Notes

① The zoning of Euclidean Village is a typical representative of traditional zoning in the United States, and the zoning ordinance covering the whole village was first enacted in 1922, and the formation process of the zoning district is detailed in reference[42], and the historical information of the zoning ordinance and the zoning map can be found in the following website: https://www.cityofeuclid.com/ euclidean-zoning--historic-documents.

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