

A Natural Resource Assets Planning System and an Implementation-Oriented Compilation Model of Assets Planning from the Perspective of Territorial Spatial Planning

WANG Zhaoyu, ZHOU Yu

Abstract: Promoting the value preservation and appreciation of natural resource assets is an intrinsic objective of territorial spatial planning. However, territorial spatial planning still lacks adequate measurement of asset value, and natural resource asset planning needs to play a stronger supplementary role. This study argues that planning is a key mechanism for promoting the value preservation and appreciation of natural resource assets, and that territorial spatial planning plays a decisive role in allocating value appreciation for such assets. The core purpose of natural resource asset planning is to achieve financial balance between value-added activities and allocation of resource assets within a defined spatial and temporal scope through integrated protection, utilization, and allocation of resources and assets. It should be positioned as a specialized plan related to territorial space, including municipal and county overall allocation plans and specific allocation-unit plans, supplemented by asset-package project implementation schemes that refine planning and implementation pathways. Implementation-oriented natural resource asset planning consists of allocation unit planning plus asset-package project implementation schemes. It should be connected with detailed planning through interactive feedback, ensuring that the rights layout, inputs, and outputs specified in asset planning are coordinated with the land-use layout and control indicators determined by detailed planning, and clarifying implementation pathways for asset preparation, fund balance, approval procedures, supply conditions, financing channels, and revenue sharing.

Keywords: natural resource assets planning; allocation unit; compilation model; implementation guarantee; value preservation and appreciation

For a long time, natural resources in China were managed by category and allocated in a fragmented manner. This caused mismatches between rights and responsibilities for resource protection and use, and made it difficult for the value of different resources to be linked and released [1-2]. The establishment of the Ministry of Natural Resources, together with the unified exercise of owner responsibilities for state-owned natural resource assets and unified control over all territorial-space uses and ecological protection and restoration, integrated major function zone planning, land-use planning, urban-rural planning, and other spatial plans into a unified territorial spatial planning system. This was a major strategic arrangement by the CPC Central Committee to shift territorial-space governance from segmented control to integrated governance under the framework of ecological civilization [3-5]. Territorial spatial planning arranges the development and protection of the entire territory [6], and promoting the value preservation and appreciation of natural resource assets is a meta-rule for building the territorial spatial planning system [7].

At present, territorial spatial master plans have largely completed compilation and approval. Through the delineation of three zones and three lines, the clarification of land and sea use, and the identification of major construction projects and ecological restoration projects, these plans have made concrete arrangements for the protection and use of all-element natural resources across the territory. Yet these arrangements mainly focus on balancing the scarcity of natural resources with the unlimited needs of socioeconomic development. They still lack an effective answer to how limited spatial resources can generate maximum functional value and promote the preservation and appreciation of natural resource assets. How to formulate rules and plans for the

coordinated allocation of natural resource assets has therefore become a key issue for natural resource departments in fulfilling the two unifications.

Research on natural resource asset planning is still exploratory. Existing studies mainly discuss planning goals, positioning, systems, objects, and responsible actors. On goals, a basic consensus has formed that natural resource asset planning should plan the protection and use of natural resource assets, address how assets are allocated during the planning period, whether costs and returns are balanced, and how returns are distributed, thereby promoting value preservation and appreciation [8]. On positioning, scholars have examined the relationship between natural resource asset planning and territorial spatial planning from the perspective of the core responsibilities of the two unifications and the separation of two rights. Some studies place the two plans as parallel and independent in the planning system [9], treat them as supports for owner rights and regulator rights, and position natural resource asset planning as a specialized plan in the national development planning system [10-11]. Others view the two types of planning as mutually supportive and position natural resource asset planning as a specialized plan within territorial spatial planning [8,12].

On planning systems, a four-level and three-type framework has been proposed from the perspectives of entrusted agency subjects and linkages with territorial spatial planning. The compilation hierarchy covers national, provincial, municipal, and county-level asset plans [13]. The types include overall plans for state-owned assets across the whole territory, specialized plans for specific functions, resources, or links [14], and asset allocation unit plans for specific areas [15-16]. On planning objects, studies mainly focus on existing state-owned natural resource assets and incremental assets during the planning period, while some scholars also argue that collectively owned natural resource assets requiring overall coordination should be included. On responsible actors, because the pilot scheme for the entrusted-agency mechanism of state-owned natural resource assets explicitly requires exploration of protection and use planning as a duty of agents exercising owner responsibilities, most studies hold that natural resource asset planning should be organized by the entities that represent or act on behalf of owners within their scope of authority [13,15].

In addition, some studies have explored how territorial spatial planning should respond to the resource-asset perspective in compilation, implementation, monitoring, and evaluation. They propose integrating property-right sorting, asset preparation, asset allocation, value accounting, and benefit analysis from natural resource asset planning into the territorial spatial planning system [16-17]. In December 2024, the Ministry of Natural Resources issued Opinions on Promoting the Realization of Ecological Product Value through High-Level Protection and Efficient Use of Natural Resources, which proposed exploring the compilation of natural resource asset allocation schemes and strengthening coordination and feedback with territorial spatial planning. However, existing research still needs to clarify the relationship between natural resource asset planning and territorial spatial planning, especially under the premise that master plans, related specialized plans, and detailed plans generate differentiated asset effects and serve as statutory bases for use control and spatial value allocation.

The functional positioning, system architecture, and implementation pathway of natural resource asset planning remain insufficiently clear. At the same time, studies of the planning system have not adequately answered whether plans at different levels and of different types have enough depth to calculate a coherent asset account, nor have they clarified for whom planning creates value, over what spatial scope value appreciation should be defined, and through what logic the value preservation and appreciation of natural resource assets can be realized. Based on the meta-rule of planning and its operating logic in promoting the value preservation and appreciation of natural resource assets, this paper analyzes the role and shortcomings of territorial spatial planning in asset appreciation, proposes the positioning and system of natural resource asset planning from the

perspective of coordination with territorial spatial planning, and further sets out an implementation-oriented compilation model and implementation guarantees.

1 The role of planning in preserving and increasing the value of natural resource assets

1.1 The circular logic of value preservation and appreciation of land resource assets

Over the past four decades, China's economic growth has been driven to a great extent by urbanization. The principal driving force of urbanization did not come from enterprises or from the central government, but from local governments [18]. The main impetus for local government investment came from the capacity to finance through land and create cash flow. State ownership of urban land, collective ownership of rural land, and the management mechanism that separates land ownership from land-use rights created institutional conditions for urban governments to monopolize the primary land market [19-20].

Urban governments have formed a circular logic of value appreciation in which land resources are valorized, land assets are capitalized, and capital drives a new round of capitalization of land resource assets. Specifically, urban governments determine land use and intensity through urban planning, clarify the value of land with different uses, locations, and capacities, and then transfer part of the owner rights by supplying land and identifying holders of land-use rights. In this process, the capitalization of land assets is mainly reflected in three aspects: after supplying operational land, the government obtains a one-off land conveyance income; after land is supplied, users develop industries and create continuous cash flow, from which the government receives tax revenue; and land-use-right holders obtain part of owner rights, use land to produce goods or provide services, and may also trade or mortgage land-use rights to obtain revenue or financing.

After gaining returns from the capitalization of land assets, the government turns land resource development and construction into public supporting facilities and state-owned assets, and then allocates new land resources to promote another round of asset capitalization of state-owned land resources. In this cycle, land resource assets evolve from current value to planned value, transaction value, and then product value or operating value. Planning determines spatial differences in land value and, through the planning-permit mechanism, supports urban government financing, revenue generation, service provision, financial balance, and return acquisition by assigning land with different uses and intensities [21].

1.2 Territorial spatial planning and the value appreciation of natural resource assets

Natural resources are basic elements of human survival, production, and everyday life. Under different degrees of development and use, they possess resource, asset, and capital attributes. Resource attributes refer to the natural functions and environmental properties that provide the material basis and spatial carrier for socioeconomic development. Asset attributes refer to the rights to use resources, the responsibilities to protect them, and the economic properties that can generate returns for right holders. Capital attributes refer to the circulation and appreciation properties of assets [22]. In 2018, the Plan for Deepening the Reform of Party and State Institutions assigned the two unifications to natural resource departments. The core purpose of the unified exercise of owner responsibilities for state-owned natural resource assets is to preserve and increase the value of state-owned natural resources. The unified exercise of all territorial-space use control and ecological protection and restoration means that changes in use and ecological restoration of both state-owned and non-state-owned territorial space fall within the authority of natural resource departments [7].

Natural resources, assets, and capital all depend on fixed territorial-space carriers. Under the multiple-plan integration system of territorial spatial planning, planning arranges development and protection activities for all elements across administrative regions. The role logic through which planning increases the value of land assets should therefore be extended to all natural resource assets. Promoting the value preservation and appreciation

of state-owned natural resource assets is a meta-rule for building the territorial spatial planning system [7]. Society grants government the statutory authority to exercise spatial use control through conversion approval, permit issuance, and other legal procedures; accordingly, government bears the responsibility to create value for society through the implementation of planning institutions [23].

As a public policy that aggregates the consensus of government, market actors, and rights holders, coordinates development and security, and provides the basic basis for development, protection, construction, and unified use control, territorial spatial planning is the carrier for implementing and organically integrating the two unifications. It is also the public-power instrument through which governments at different levels represent the state in regulating development and protection activities attached to all territorial space. Its core proposition is to coordinate development and security from the perspective of overall public interest, seek a balance between the scarcity of spatial resources and unlimited demand, and regulate externalities in resource development and use so that limited spatial resources can realize maximum functional value [2,24].

Promoting the appreciation of natural resource assets is therefore part of the inherent mandate of territorial spatial planning. Its function is to clarify spatial development baselines and control requirements and to unify the goals of safeguarding national security, supporting national development, and promoting the appreciation of resource assets through optimized spatial-resource allocation [24].

1.3 The decisive role of territorial spatial planning in allocating value appreciation for natural resource assets

Because natural resource assets have spatial attributes, territorial spatial planning, as the statutory basis for development, protection, construction, and unified use control, plays a decisive role in allocating value appreciation for natural resource assets. This role appears both in the macro allocation of spatial development rights among governments at different levels and in the micro allocation of spatial value to specific parcels [25]. It is mainly expressed in three aspects.

First, planning determines the total quantity, baselines, boundaries, and rights scope of development and protection space for administrative units at different levels. Territorial spatial master plans at all levels define, from top to bottom, the total amount of cultivated land and permanent basic farmland, ecological protection redlines, the expansion coefficient and total scale of urban development boundaries, forestland totals, and other constraints in pursuit of food security, ecological security, and optimized production layout. These mandatory indicators and rigid baselines determine the total amount and layout of spatial development rights available to each level of government. By delineating urban construction land and village construction land boundaries, planning also clarifies the property-right scope of state-owned land, including existing, proposed, and potentially state-owned land, and collectively owned land during the planning period [2].

Second, planning determines the spatial layout and location of land with different uses and functions. Municipal, county, and town territorial spatial master plans clarify the layout of different land-use functions through functional-structure organization and optimization. Detailed plans further define parcel boundaries for different land-use functions on the basis of land layout optimization and supporting facilities within specific units. They adjust and optimize the original spatial rights layout and distinguish operational land, such as commercial, residential, and industrial land, from public-interest land, such as green space, public services, and infrastructure. In this way, master plans and detailed plans generate a second differentiation of natural resource asset value by distinguishing public-interest and operational land uses.

Third, planning determines control conditions for the development and use of land with the same type of function. Detailed plans calculate facility carrying capacity and implementation costs within specific units and specify control indicators such as floor-area ratio, green-space ratio, building coefficient, and supporting

facilities. They thereby assign differentiated value to land with similar functions [26] and generate a third differentiation of natural resource asset value allocation.

The value of natural resource assets is affected by resource quality and by key factors such as spatial location, land-use type, development capacity, and supporting facilities. Territorial spatial planning is the statutory basis for determining these factors. It determines the overall scale, nature, type, distribution, and spatial value differentiation of assets, and controls the spatial carriers attached to natural resource assets through legal procedures such as conversion approval, access management, and permits. It thus plays a decisive role in assigning value to natural resource assets and influences the ownership, usufructuary rights, spatial location, and relationships of specific parcels (Fig. 1).

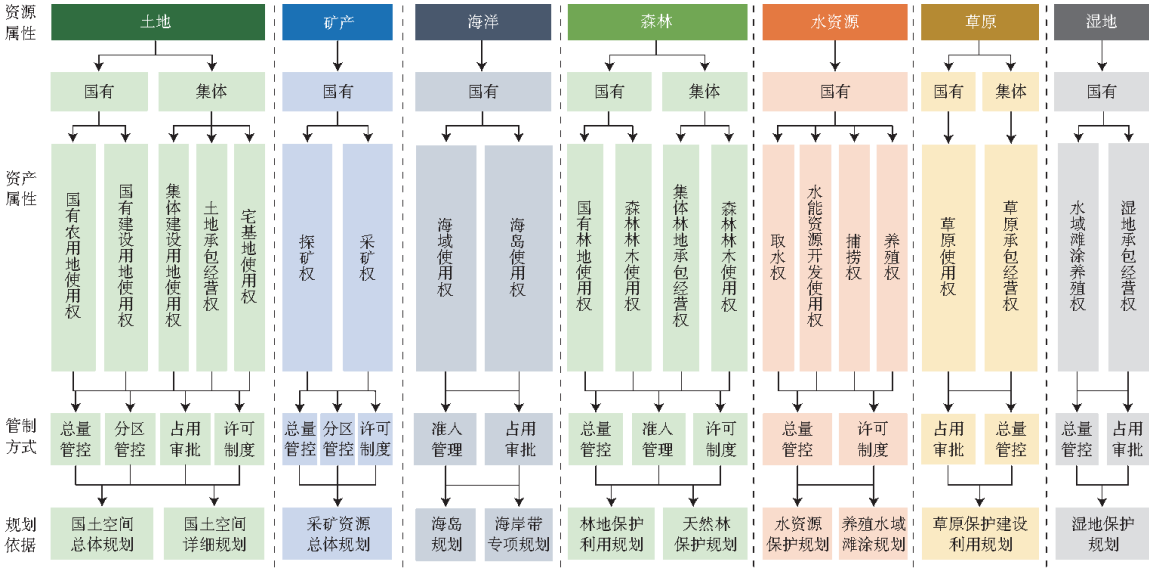


图1 自然资源资产开发利用与国土空间管制关系

Fig. 1 Relationship between natural resource development and use and territorial spatial planning.

2 A natural resource asset planning system from the perspective of coordination with territorial spatial planning

2.1 Shortcomings of territorial spatial planning in preserving and increasing the value of natural resource assets

The work logic for preserving and increasing the value of natural resource assets can be summarized as resource and asset inventory, value assignment through planning, integrated preparation for implementation, market transaction of assets, distribution of transaction revenue, product sale and operation, and distribution of product revenue (Fig. 2). In the five-level and three-type territorial spatial planning system, territorial spatial master plans and detailed plans are statutory bases for urban-rural development and construction, improvement and renewal, protection and restoration, and the issuance of planning permits. They are the main planning carriers for promoting the appreciation of natural resource assets. By clarifying attributes such as construction and non-construction, state-owned and collective, and public-interest and operational resources and assets, planning is also able to distinguish service, revenue, and financing land in terms of urban operating financial balance [21]. This is essential for balancing the cost of resource asset preparation and the return from appreciation.

Non-construction land, represented by cultivated land, gardens, forestland, and wetlands, is generally improved through public expenditure, such as improving cultivation conditions and implementing ecological restoration,

and realizes economic value through agricultural and ecological-product transactions. Among construction land, public-interest land for administration, public services, transport, utilities, green space, and open space is mainly developed through public expenditure to serve residents and enterprises. Operational land such as industrial and commercial land generates one-off land conveyance income through bidding, auction, and listing, and can also generate continuous tax revenue through investment attraction and industrial development. Residential land mainly brings one-off conveyance income for government and more prominently performs a financing function.

In the process of implementing natural resource protection and use according to planning, existing property-right relationships need to be adjusted and reconstructed, and integrated preparation must be carried out through public expenditure. It can be seen that the land-use types allocated by territorial spatial master plans are critical to balancing public expenditure and revenue within a local government's administrative area and planning period. Promoting the appreciation of natural resource assets therefore requires the calculation of a large account in planning. Yet existing approved master plans mainly determine land-use arrangements on the basis of resource endowment, spatial layout optimization, project implementation needs, and other technical rationalities. They are insufficiently connected with inventory work at the front end of the value-appreciation chain, and they lack accounting for whether land-use structure adjustment can support financial balance and thereby promote resource asset appreciation.

Detailed plans define the boundaries of different land-use types and control indicators such as development intensity. They are the most direct and concrete basis for restructuring property-right relationships in space and are crucial to whether development and protection actors can balance costs and returns within a specific area. Detailed planning must therefore calculate a small account. As spatial development in some leading cities enters the stock-based stage, detailed planning for urban renewal units has created an implementable pathway of asset inventory, rights reconstruction, planning-based value assignment, supply-led appreciation, and revenue distribution for increasing the value of urban internal land resource assets. This pathway needs to be extended to a compilation and implementation model for all natural resource assets within specific units.

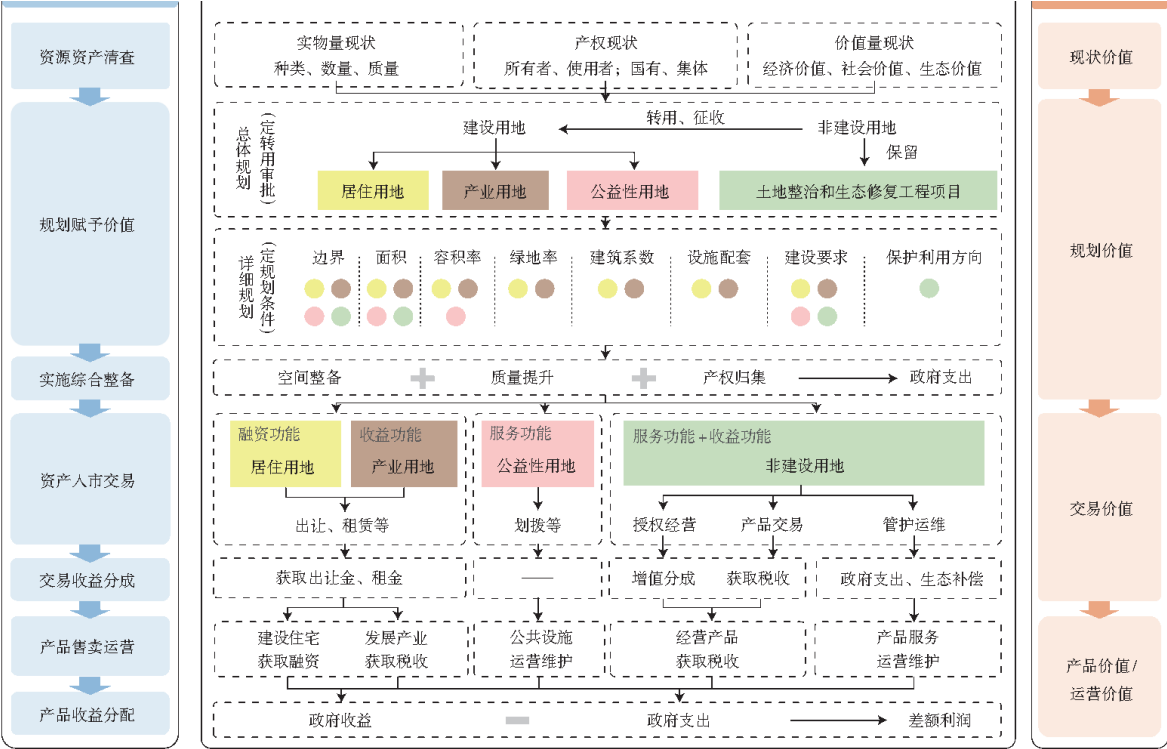


Fig. 2 Planning rationale for the value preservation and appreciation of natural resource assets.

2.2 The supplementary role and system construction of asset planning for natural resource asset appreciation

2.2.1 Positioning of natural resource asset planning

The core purpose of natural resource asset planning is to promote the value preservation and appreciation of natural resource assets through their protection and use. According to the Opinions of the CPC Central Committee and the State Council on Establishing a Territorial Spatial Planning System and Supervising Its Implementation, territorial spatial planning includes master planning, detailed planning, and related specialized planning. Related specialized plans are specific arrangements for spatial development, protection, and use that embody particular functions and involve spatial use. Natural resource assets possess spatial-carrier attributes. Whether such planning concerns the protection and use of state-owned resources or the selection and allocation of assets, it cannot be separated from the mapping of property-right relationships onto space or from the influence of spatial relations on asset value. In essence, it is a specialized plan involving spatial use. Its purpose is consistent with the ultimate goal of the meta-rule of the territorial spatial planning system, namely preserving and increasing the value of state-owned natural resources [7]. Its implementation must follow the control conditions and value orientation of territorial spatial master plans and detailed plans. It should therefore be positioned as a specialized plan related to territorial space.

2.2.2 System of natural resource asset planning

The core of preserving and increasing the value of natural resource assets is to enable owners to balance costs and returns, or obtain profits, from the protection and use of natural resources. Since natural resource asset planning aims to promote asset value preservation and appreciation and create maximum asset value, for whom it creates value and over what spatial scope it measures value are key questions for supporting financial balance in protection and use. They are also questions that must be answered when determining the responsible actor, planning object, and hierarchical system of planning.

Under the current three-level ownership exercise model formed in entrusted-agency pilots, in which the Ministry of Natural Resources exercises owner responsibilities on behalf of the state and provincial and municipal governments act as agents [27], existing studies generally argue that natural resource asset planning should be prepared by entities that represent or act on behalf of owners for the resource assets within their scope of authority. Under this organizational model, different administrative levels may involve multiple subjects exercising ownership, and resources under the responsibility of the same subject may span several administrative areas. This may fragment the spatial scope within which resource assets can jointly generate value appreciation. Moreover, within the same region, subjects fulfilling owner responsibilities for different natural resource assets are diverse. Because the entrusted-agency mechanism involves civil rights, each actor tends to pursue maximum asset benefits in the exercise of rights, which will inevitably generate externalities for surrounding resource assets.

For the hierarchical system of natural resource asset planning, the division of responsibilities among owner representatives or agents and management bodies should be considered together with the planning granularity needed to calculate value preservation and appreciation. At the national and provincial levels, spatial scales are large, and governments focus more on national security, comprehensive development, and regional balance. Plans at these levels emphasize strategy and coordination, making it difficult to calculate a complete account for the value preservation and appreciation of state-owned natural resources. At the municipal and county levels, local governments are the main actors in resource asset preparation, financing, construction, and operation. Municipal and county master plans and detailed plans have already clarified the statutory spatial boundaries of

specific assets. It is therefore feasible to calculate a large account for overall resource asset allocation across the municipal or county jurisdiction according to the service, revenue, and financing attributes of different assets, and to calculate small accounts for refined allocation within specific units. The compilation hierarchy of natural resource asset planning should thus focus on the municipal and county levels and emphasize implementation. The natural resource asset planning system should include two types: overall allocation schemes and allocation unit plans (Fig. 3). First, the overall allocation scheme for natural resource assets should start from the overall interest of preserving and increasing the value of state-owned natural resources. Given the mutual influence and dependence among natural resources, the fact that assets cannot be simply separated and managed according to state or collective ownership [8], and the need for public power in territorial spatial planning to establish or guarantee order when value conflicts arise [28], municipal and county people's governments should organize the preparation of such schemes. They should coordinate the value-appreciation claims expressed by different owner-right exercise subjects, plan all state-owned assets within the administrative jurisdiction, and also coordinate collectively owned natural resource assets where necessary for combined resource-asset allocation. They should identify key areas for protection, use, and integrated preparation of natural resource assets and submit the scheme to the government at the same level for approval after review by the standing committee of the people's congress.

A municipal overall allocation scheme should emphasize coordination. Based on the pattern of territorial-space development and protection at the municipal scale, it should implement baseline control requirements, coordinate mineral, marine, forest, grassland, wetland, water, national park, and other resource plans and access requirements, identify key areas for natural resource asset preparation, and propose guidance on function, quality, and rights preparation. A county-level overall allocation scheme should emphasize planning. On the basis of the municipal scheme, it should designate allocation units in key preparation areas according to near-term implementation potential, specify the dominant allocation direction of each unit by resource-asset type, clarify the subject of resource asset preparation and the method of rights collection, propose guidance for combined resource-asset supply and rights allocation, and define implementation timing for each allocation unit. This provides the basis for preparing allocation unit plans.

Second, a specific-unit natural resource asset allocation plan should emphasize implementation. It serves both as a platform for rights holders and management bodies to negotiate value preservation and appreciation within a specific area and as the basic basis for cross-sectoral and cross-ownership preparation, rights collection, and combined supply of natural resource assets. People's governments at or above the county level should dynamically organize the preparation of allocation plans for specific natural resource asset units oriented to implementation and submit them for approval. At the same time, allocation unit plans should be refined through asset-package project implementation schemes in response to market demand. These schemes should be prepared by project implementation actors according to the allocation unit plan and should further clarify asset-package preparation, supply, revenue sharing, and other implementation pathways. For concentrated urban-rural construction areas, detailed plans and village plans already have an asset allocation function. Allocation unit planning should therefore focus on non-concentrated construction areas where there is a pressing need for combined resource-asset supply and ecological-product value realization, with dominant allocation directions such as urban-rural integration, ecological recreation, land-sea coordination, integration of agriculture, culture, and tourism, integration of primary, secondary, and tertiary industries, and mine-land integration (Fig. 4).

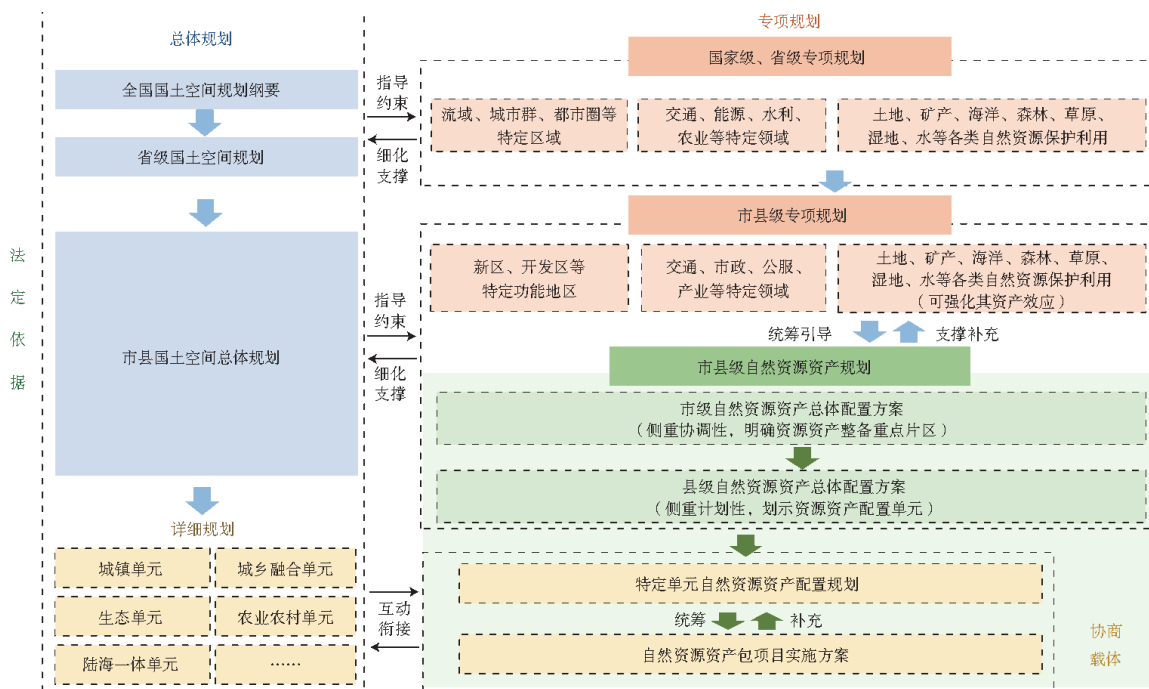


Fig. 3 Relationship between natural resource asset planning and the territorial spatial planning system.

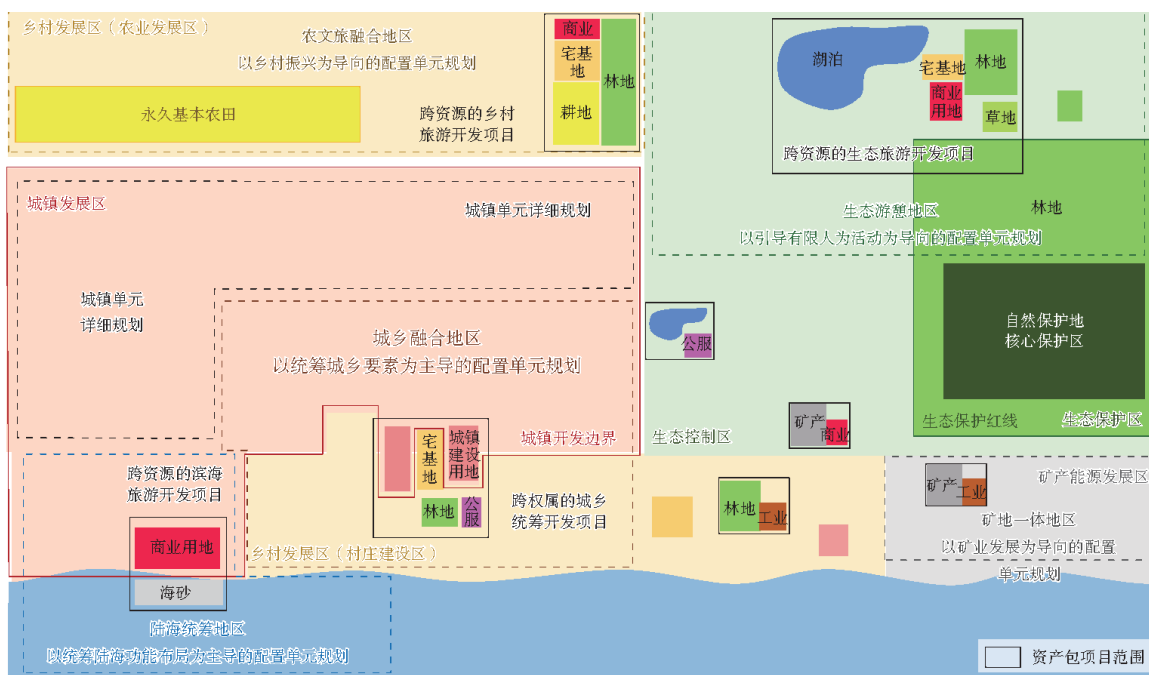


Fig. 4 Resource asset allocation unit planning in non-concentrated construction areas and indication of dominant directions.

3 Compilation model for implementation-oriented natural resource asset planning

Implementation-oriented natural resource asset planning is a concrete deployment scheme for allocation planning and implementation of natural resource assets within a specific unit. In combination with the concrete process of allocation implementation, it should include allocation unit planning plus asset-package project implementation schemes.

3.1 Allocation unit planning: clarifying the rights layout for the protection and use of natural resource assets

Allocation unit planning, that is, natural resource asset allocation planning for a specific unit, focuses on which natural resource assets, where, and in what quantity should be allocated within a specific territorial space, and whether such allocation can support financial balance between protection and use within the unit. Because detailed planning defines the spatial-use functions and capacities of natural resource assets, allocation unit planning must connect with and feed back into detailed planning. It should ensure that the rights layout, inputs, and outputs specified by unit allocation planning are coordinated with the land-use layout and control indicators determined by detailed planning. The key links are as follows.

3.1.1 Delineating allocation units: coordinating resource elements, asset ownership, and implementation boundaries

In response to market demand, allocation units should be delineated according to key resource-asset allocation areas identified in overall natural resource asset planning or value-potential areas identified through natural resource asset inventory. The delineation should consider the systemic nature of natural resource governance, the implementability of property-right adjustment, the feasibility of value appreciation through asset allocation, and the operability of integrated allocation management. Following the principles of functional coordination, clear ownership, rich combination, and appropriate scale, the unit boundary should be based on resource elements, asset ownership, administrative management, and detailed-planning units. It should emphasize the organic combination of public-interest resources and operational resources, service, financing, and revenue functions, and state-owned and collective assets as needed. The allocation unit provides a unified implementation scope for detailed investigation, current asset valuation, rights-layout adjustment and reconstruction, protection and use cost accounting, integrated resource asset preparation, and combined resource asset supply.

3.1.2 Analyzing the existing basis: forming six lists of resources, assets, funds, conditions, demands, and policies

Based on the results of natural resource asset inventory, land-change surveys, specialized natural resource surveys, real estate registration, and related work, the plan should clarify the physical quantity, value quantity, development and use status, property-right relationships, and use benefits of various resources within the allocation unit, and form lists of current resources and assets. It should sort available government fiscal funds, such as rural revitalization funds, mountain-water subsidy funds, and special bonds, social capital investment, financial institution financing, and proceeds from index transactions, and form a funding list. It should analyze use-control conditions, ecological-environmental capacity, infrastructure carrying capacity, and engineering construction conditions, and form a conditions list. It should investigate the protection, restoration, development, and use demands of owner representatives, management bodies, use-right holders, and market actors, and form a demand list. It should also integrate policies that can be applied within the planning scope, such as comprehensive land consolidation, redevelopment of inefficient land, and market entry of collectively owned operational construction land, and form a policy list.

3.1.3 Carrying out allocation planning: determining the rights layout and preparation mode for natural resource asset protection and use

First, development goals should be clarified and functional planning strengthened. The key to value preservation and appreciation lies in industrial and operational planning. Based on the location, resource advantages, and market demand of the allocation unit, the plan should define development goals, clarify the functional layout

and value orientation of resources and assets in terms of service, financing, and revenue functions, and propose strategies for protection and restoration, development and use, and industrial development.

Second, the plan should connect with land-use layout and clarify the rights layout. Under the baseline control conditions defined by territorial spatial master plans, urban control lines, and specialized plans, the plan should propose types, terms, and conditions of rights for natural resource development, protection, and use, such as construction land-use rights, land contract management rights, mining rights, state-owned agricultural land-use rights, and water withdrawal rights. It may also establish special operational rights, such as sightseeing and tourism operating rights or forestland management rights, according to asset operation needs. On this basis, the plan should form a rights allocation layout and, through rights layout and cost-benefit accounting, propose land-use layout and construction control indicator recommendations for detailed planning feedback (Fig. 5).

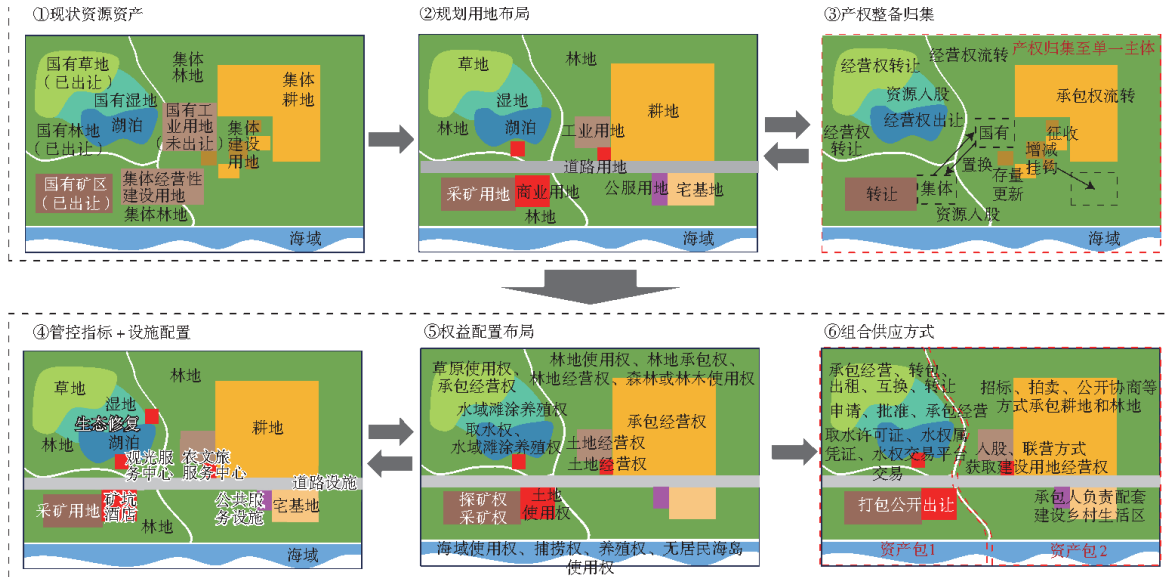


Fig. 5 Main technical contents of natural resource asset allocation unit planning.

Third, preparation strategies should be formed and allocation methods clarified. Based on land-use and rights-layout schemes, the plan should specify the preparation scheme for collecting fragmented resource assets through reservation, transfer, replacement, leasing, equity participation, trusteeship, and other means. It should delineate the scope of combined supply targets for natural resource assets, clarify allocation methods such as conveyance, leasing, equity contribution at appraised value, authorized operation, and ancillary rights, and set supply conditions and operating requirements for asset packages.

3.2 Project implementation schemes: clarifying pathways for resource asset preparation and asset-package supply

Asset-package project implementation schemes are the operational extension of allocation unit planning. They transform unit-level rights layout, land-use layout, preparation mode, and supply requirements into implementable project arrangements. Around the asset package, the scheme should clarify the implementation subject, project boundary, asset list, rights relationship, preparation costs, financing structure, approval procedures, supply timing, supply conditions, revenue measurement, and revenue-sharing rules. It should also coordinate with detailed planning, land supply contracts, ecological restoration requirements, and related industrial operation agreements, so that the rights, obligations, investment, returns, and risk allocation of government, owners, users, and market actors are explicit before implementation.

For non-concentrated construction areas, project implementation often involves multiple resources, multiple ownership subjects, and multiple sources of revenue. The implementation scheme should therefore organize asset preparation and supply around an integrated package instead of a single land parcel. It should combine ecological restoration, agricultural upgrading, cultural-tourism operation, mineral-land restoration, and infrastructure improvement with resource rights allocation, and establish a closed loop among preparation input, operational income, financing repayment, and public revenue. In this sense, the asset-package scheme is both a project implementation document and a mechanism for transforming planned value into transaction value and operating value.

4 Implementation guarantees for implementation-oriented natural resource asset planning

Implementation-oriented natural resource asset planning can take effect only when planning results are embedded in statutory spatial planning, resource supply, contract management, and market operation. It is therefore necessary to strengthen implementation guarantees through legal connection, administrative coordination, market participation, and dynamic feedback.

4.1 Strengthening legal implementation through detailed planning plus supply contracts

Detailed planning is the statutory basis for issuing planning permits and implementing land-use control. The rights layout, preparation requirements, and supply conditions proposed by asset planning should be fed back into detailed planning in a timely manner. Land-use functions, development capacity, public facilities, ecological restoration requirements, and control indicators in detailed planning should be coordinated with the rights layout, cost-benefit balance, and asset-package supply requirements of asset planning. In this way, the planned value generated by asset allocation can be fixed in statutory control conditions.

At the implementation stage, supply contracts should further translate planning requirements into rights and obligations. Through contracts for land supply, resource-right transfer, authorized operation, leasing, trusteeship, or other forms, the government and relevant actors should specify the scope of assets, term of rights, use restrictions, protection and restoration responsibilities, investment obligations, revenue distribution, performance assessment, and default liabilities. Detailed planning provides statutory support, while supply contracts provide enforceable arrangements for specific projects. Their combination can strengthen the legal and practical implementation of natural resource asset planning.

4.2 Strengthening planning implementation through effective government plus efficient market

The preservation and appreciation of natural resource assets require the joint functioning of an effective government and an efficient market. Government should undertake overall coordination, public-interest protection, baseline control, rights clarification, and policy integration. It should coordinate owners, management bodies, use-right holders, and market actors, and organize cross-sectoral and cross-ownership resource asset preparation where a single actor cannot complete implementation independently. At the same time, market mechanisms should be used to identify demand, organize operation, improve efficiency, and transform planned value into transaction and operating returns.

In practical implementation, government should avoid replacing market operation with administrative allocation. It should instead establish clear rules for asset preparation, combined supply, pricing, financing, revenue sharing, and performance evaluation. Market actors should participate in asset-package project planning and operation under clear rights, obligations, and control requirements. Through dynamic feedback between asset planning and territorial spatial planning, implementation results can be used to adjust unit boundaries, rights allocation, project packages, and supply timing, so that the planning system can respond to changes in resource conditions, market demand, and public objectives.

5 Conclusion

Planning is a key mechanism for promoting the value preservation and appreciation of natural resource assets. Territorial spatial planning plays a decisive role in the allocation of value appreciation for such assets, because it determines the scale, nature, type, distribution, and spatial value differentiation of assets through use control, functional layout, and detailed control indicators. However, existing territorial spatial planning has shortcomings in measuring asset value and calculating the financial balance of protection, preparation, supply, and operation. Natural resource asset planning is therefore needed to play a supplementary role.

From the perspective of coordination with territorial spatial planning, natural resource asset planning should be positioned as a specialized plan related to territorial space. Its system should focus on municipal and county levels, include overall allocation schemes and allocation unit plans, and be supplemented by asset-package project implementation schemes. Implementation-oriented natural resource asset planning should adopt the model of allocation unit planning plus asset-package project implementation schemes. Allocation unit planning clarifies what resources and assets should be allocated, where they are located, how much they amount to, and how rights, costs, benefits, and implementation responsibilities are arranged. Asset-package project implementation schemes refine resource asset preparation, supply, financing, approval, operation, and revenue-sharing pathways.

For implementation, asset planning should be connected with detailed planning through interactive feedback, so that rights layout, inputs and outputs, land-use layout, and control indicators are coordinated. It should also be implemented through supply contracts and market mechanisms, thereby clarifying legal responsibilities and operational arrangements. Through the combined mechanism of detailed planning plus supply contracts and effective government plus efficient market, natural resource asset planning can provide an operational pathway for translating planning-based value assignment into asset appreciation and for promoting the financial balance of natural resource protection and use.

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