Research on Spatial Resource Planning of Land and Sea Co-ordination

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Abstract. Land and sea coordination is an important principle of land and space development and utilization, but there is a lack of land and sea integrated spatial resource planning research. This paper analyses the connotation, characteristics and principles of land-sea spatial resource planning, and discusses the relationship between land-sea spatial resource planning and related zoning planning. On the basis of the regional system structure of man-land relationship, the adaptive management technology system of land-sea spatial resource planning is constructed. The theory of land and sea planning can provide a theoretical reference for the optimal allocation of sea space resources, and its technical system has certain reference significance for enriching the existing sea area management technology.

Keywords: Marine spatial planning; Marine zoning; Marine function zoning.

1. Introduction

Marine spatial planning - MSP is an important management method to cope with the continuous deterioration of the health status of the oceans and coastal zones and to coordinate the use of sea conflicts. UNESCO defines marine spatial planning as “a public process of analyzing and allocating the sea for human activities in space and time to achieve established ecological, economic and social goals”.[1, 2] Marine spatial planning has made positive progress in many countries.[3] As an important principle of land and space development and utilization in China, land and sea coordination is a concept put forward by Chinese scholars. However, the related research on coastal zone integrated management, which began in the early 1970s, also contains the idea of land and sea integrated management. The origin of land and sea coordination can be traced back to the 1990s "land and sea integration" research. Planning is the focus of the practice of land and sea planning concept. The experience of land and sea development is not much; especially the more perfect land and sea coordination mechanism has not been formed. 

Land and space planning land and sea separation, lack of land and sea overall perspective of the allocation of sea space resources research. The existing land and sea integrated research emphasizes that the rational development and utilization of marine space resources need the land and sea integrated planning, but the existing marine functional zoning and the main functional area planning in the domestic research process of the land and sea areas are studied separately. Lack of land and sea integrated spatial resource planning research. Foreign countries are trying to carry out marine spatial planning in the way of coastal land planning to realize the spatial planning of land and sea integration, but the existing research attaches importance to the connection of planning process and technical methods, and lacks the theory and method of spatial resource allocation in sea area.

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2. Connotation, Characteristics and Principles
Planning is the process of envisioning the future of the region and developing a plan to realize the vision. Planning first envisions the future and envisions the future state of development by setting development goals. Secondly, it is necessary to determine the actions and steps to achieve the goals. The road-map of development goals and actions is not the only one. It is necessary to select the appropriate program through the comparison of multiple programs.

Space resources are the carrier of regional economic development, and the planning work needs to rely on space resources to make overall deployment of regional social and economic activities. The spatial resource planning of the sea area is only aimed at the spatial scope of the sea area, and the planning object is only aimed at the social and economic activities carried by the spatial resources of the sea area. The existing marine functional zoning and the scope of marine main functional area planning only involve the sea area. Land and sea coordination is the unified planning of land and sea through systematic analysis. The spatial resource planning of land and sea is based on the systematic analysis of land and sea planning in coastal areas, and the overall deployment of social and economic activities carried by coastal zones and sea areas. Improve the comprehensive benefits of the development and utilization of marine space resources; promote regional social and economic sustainable development. The spatial scope of land and sea planning includes coastal zone and sea area. From the point of view of system division, coastal zone is analyzed and planned as an independent and complete system. The existing marine functional zoning and the scope of marine main functional area planning only involve the sea area. Land and sea coordination is the unified planning of land and sea through systematic analysis. The spatial resource planning of land and sea is based on the systematic analysis of land and sea planning in coastal areas, and the overall deployment of social and economic activities carried by coastal zones and sea areas. Improve the comprehensive benefits of the development and utilization of marine space resources; promote regional social and economic sustainable development. The spatial scope of land and sea planning includes coastal zone and sea area. From the point of view of system division, coastal zone is analyzed and planned as an independent and complete system.

On the basis of the overall analysis of land and sea, the main problems to be solved in the management of sea space resources during the planning period should be defined, the specific management objectives should be put forward, the implementation steps and related measures to achieve the management objectives should be formulated, and the implementation process of the objectives should be monitored and evaluated.

The principles of land and sea planning include ecosystem integrity principle, land and sea planning principle and dynamic principle. Based on the principle of ecosystem integrity, in order to maintain ecosystem services and maintain ecosystem structure and function, it is necessary to ensure that the natural functional boundary of ecosystem is the scope of management. The principle of land and sea coordination refers to the systematic relationship between land area and sea area, and the coastal area and sea area are regarded as a complete systematic analysis. Dynamic principle refers to the process of adaptive management. With the accumulation of knowledge and experience, dynamic planning is improved, and management is regarded as a process of continuous dynamic adjustment.

3. Relationship with Related Zoning Planning
The planning object of the sea area spatial resource planning is the sea area spatial resources, and the important zoning and planning of the sea area space are mainly the marine functional zoning and the marine main function area planning.

Marine functional zoning refers to the division of sea areas into different types of marine functional areas according to the location conditions, natural environment, natural resources, and taking into account the current situation of marine development and utilization and the needs of social and economic development. Different environmental quality requirements are implemented in different functional areas to control and guide the use of sea areas, protect and improve the marine ecological environment and promote the sustainable use of marine resources.

Marine functional zoning solves the problem of conflict of interest to a certain extent and forms the spatial regulation of sea area management. But it cannot guarantee the realization of function area management goal. In the process of rapid economic development in coastal areas, the current situation of sea area use, location conditions, sea area environmental conditions and social and economic development needs are in rapid change. The change of these factors directly affects the function orientation of sea area and the realization of function area management goal. The comparative study of the two stages of marine
functional zoning has shown the changes in the functional areas of coastal waters. A new round of marine functional zoning has not yet proposed a management mechanism to deal with changes. According to the carrying capacity of marine resources and environment, the existing development density and potential, and considering the population distribution, the structure and layout of marine industry and the degree of utilization of marine technology in the adjacent land areas as a whole, the development space of coastal areas and the sea area under jurisdiction is divided into four areas: optimized development, key development, restricted development and prohibited development, which provides the basis for the management of the development intensity of the sea area. However, the formulation of marine main functional planning lags behind the marine functional zoning, the development intensity positioning lags behind the functional positioning, and the functional positioning lags behind the change of zoning factors. Therefore, how to start with the change of zoning factors, determine the management objectives and construct the management mechanism to ensure the realization of the objectives is the problem that the marine spatial resource planning supports the marine functional zoning and the marine main function area planning to be solved.

Both marine functional zoning and main function area planning lack the specific process of achieving the goal. Functional area management puts forward restrictive regulations based on location, but it cannot be guaranteed to meet the regional development goals, such as water quality management and changes in the scope of protected areas. The main function area planning also lacks the concrete evaluation standard on the development intensity restriction.

Land-based human activities are the root of the change of regional factors, and the systematic analysis of land-sea planning is the key technology of sea space resource planning. The technical methods of marine main function area planning and marine functional regionalization are only based on the spatial scope and unit of sea area, which lack the spatial basis of systematic analysis of land and sea as a whole and the quantitative analysis of social and economic elements in land area. Based on the coastal zone regional system, the spatial unit connecting land and sea is constructed. On this basis, the comprehensive analysis and evaluation of the zoning elements of land and sea area can more accurately grasp the impact of human activities on the sea area.

The spatial resource planning of sea area should be connected with the spatial resource planning of land area. The development and utilization activities of ports, tourism, towns and industries are the extension of the demand of land-based human activities to the sea side, relying on the development and utilization of land-based space resources, and the realization of the goal of sea-area development and utilization is affected by the social and economic demand of land-based areas. Water pollution caused by land social and economic activities is the root of water quality deterioration in sea area, and the realization of water quality management goal in sea area cannot be separated from the corresponding land water pollution zoning management. The deterioration of marine ecological environment directly affects the realization of social and economic development goals in coastal areas. Therefore, marine spatial resource planning and land spatial resource planning should complement each other in management objectives and measures.

4. Technical System

The spatial resource planning of land and sea is an adaptive management system based on the regional system structure of man-land relationship.
4.1. Horizontal Target Management for the Region
Based on the analysis of land and sea system, a monitoring and evaluation system of land and sea utilization suitability is constructed to determine the objectives of exploitation, utilization and protection of sea space resources, including social, economic and ecological environmental objectives. Planning objectives are based on stakeholders, with subjective human development and utilization needs and objective ecological environmental protection needs (expert representatives). The planning objectives should be coordinated with the planning objectives at the next level. Planning objectives can be simulated; scenario analysis simulates different planning objectives. Planning objectives are based on a certain spatial range. Planning target zoning can be based on administrative unit zoning, or based on smaller scale estuaries, bays and other ecosystem zoning, can be consistent with the functional area, the scope can be arbitrary (but the spatial analysis basis of land and sea coordination must emphasize systematization). The scope of land-based pollution affecting the Marine environment should be included. Adopt consistent planning objectives within the target partition.

The planning target partition is decoupled from the functional area. In the process of functional zoning, the coordination of interests is highlighted, and the management objectives are lacking. Because the achievement of the goal does not affect the distribution of benefits (this is important). The negative externality of environmental impact in the implementation of adjacent functional areas is difficult to manage. Multiple functional zones within the same ecosystem area (e.g., the Gulf) should have the same management objectives (which can be analysed based on functional zoning in Liaoning), but the function-based management objectives break this consistency.

4.2. The Suitability Evaluation of Land and Sea Planning
The suitability arrangement is not limited to one kind of function orientation, does not affect the function of the sea area reuse, can meet the function of the sea area ecological environment quality management request, the open compatible function can all. The results of suitability evaluation of land and sea planning in planning target zoning can be one or more suitability type areas, and each suitability type area forms a suitability sequence, which realizes the decoupling of planning target zoning and suitability evaluation result zoning. The results of suitability evaluation guide the management of sea area use. The present situation of sea area use is not necessarily consistent with the result of suitability evaluation.

4.3. Vertical Target-oriented Process Management
According to the objectives of development, utilization and protection of marine space resources, the specific process management evaluation system of various types of sea use is determined, and the implementation process is monitored and evaluated. Evaluation is to determine the effectiveness of the
planning process, so that managers can determine the progress of planning implementation, the degree of achievement of expected goals. For example, whether the water quality environment has been improved and whether ecosystem service functions have been repaired. Specific management measures need to propose measurable targets for distance, water quality, scale and intensity of development and utilization (output per unit area, number of population per unit area), and to construct a monitoring, implementation evaluation system (what types of indicators are concerned by existing studies, and whether there is a lack of monitoring and evaluation of specific management measures). Ensure process safety and provide support for specific project sea assessment.

The process management evaluation system realizes the connection between regional planning and project management. The planning implementation process begins with the planning project. The project first needs to pass the sea area use demonstration and the environmental impact assessment, the project process management and the planning process management may combine. According to the current situation of sea area monitoring and evaluation, each project is committed to achieving the regional planning objectives, and the planning process management evaluation system judges whether the project has achieved the planning objectives. Develop early warning, stagnation repair and exit mechanism for regional sea use activities. For example, there is a sea for tourism and aquaculture in the same area, and the sea for aquaculture has caused environmental deterioration, which is difficult to meet the requirements of sea area management objectives. In the process of management, early warning, suspension of restoration or withdrawal of aquaculture activities should be realized.

Process management dynamically monitors and evaluates various suitability schemes and tracks the impact of regional social and economic development on the suitability of sea area utilization. The results of suitability monitoring and evaluation will change with the development of social economy, and the results of suitability sequence may change during the planning period. Process management finds out the suitability change caused by environmental change in the process of planning implementation, and takes necessary management countermeasures to guide the use and management of sea area during the planning period. For example, if there is a contradiction between the present situation of sea area use and suitability, the present situation of local sea area use affects the realization of the overall regional goal, and it is necessary to take necessary measures to ensure the realization of the goal.

Process management is transformed from traditional comprehensive planning management to suitability management. The traditional procedures include status investigation and data collection, determination of regional development objectives, systematic analysis and research, planning and design, scheme evaluation (selection, review, revision), approval and implementation. Integrated planning technology is a process of finding and solving problems. Process monitoring and evaluation realize the uncertainty of social and economic environment and natural environment change from the regional point of view, understand the change and cause the change, and solve the problem through the planning process. The first plan, also known as the draft, can start a new round of planning process on the basis of the draft until a satisfactory result program is formed, and in the process of planning implementation, new problems can be found through monitoring and evaluation, and a new round of planning process can be further started until a satisfactory result program is formed, and the planning management process of monitoring and evaluation can continue to be implemented. Monitoring and evaluation are not simple tasks, and their important role is to complete the planned management cycle. This does not mean the end of a planning and management cycle, but the beginning of a new cycle. The backtracking process of different stages in the planning procedure corresponds to the process of planning and solving problems under the conditions of partition change, target change, suitability change and project change respectively. Traditional planning and post-evaluation management of marine projects begin to consider evaluation after planning and project completion. Marine spatial planning practices continue to develop, from the final stage of the planning cycle to a more comprehensive assessment of all stages. According to the concept of suitability management, evaluation is regarded as a prerequisite for learning and continuous improvement. Through the acquisition of new knowledge, the management objectives, analysis process and evaluation methods are continuously optimized in the management process.
5. Conclusion
This paper analyses the connotation, characteristics and principles of land-sea spatial resource planning, and discusses the relationship between land-sea spatial resource planning and related zoning planning. On the basis of the regional system structure of man-land relationship, the adaptive management technology system of land-sea spatial resource planning is constructed. The system realizes 1) horizontal target management. 2) planning target partition and function area decoupling. 3) the suitability evaluation of land and sea planning. 4) vertical target-oriented process management. It can change from traditional comprehensive planning management to suitability management.

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