SPATIAL PLANNING

MARINE SPATIAL PLANNING: THEORETICAL ASPECTS

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In this article, I consider marine spatial planning (MSP) as a complex of analyses, calculations, and evaluations aimed to prove feasibility of economic activities and contribute to their development in a certain part of a sea or an ocean. A most likely comprehensive MSP object is an integrated segment of coastal/marine area. Consisting of a marine part and a coastal area, such segments are a product of zoning. In this article, I explore the key MSP stages — from identifying the panning object to evaluating the natural resource potential and performing calculations for relevant aqua-territorial structures. The basic principles of the geographical division of marine geosystems are the following ones: identifying relatively integrated marine sectors and relatively integrated coastal sectors and connecting them into a single whole. A hierarchical approach is key to transboundary marine basins. I propose the following techniques: geographical zoning, identification of an area and basin-specific combinations of natural resources, geoinformation modelling, and forecast analysis for different activities and relevant spatial elements of aqua-territorial structures.

Keywords: marine spatial planning, coastal-marine space segment, marine geosystems, trans-boundary marine basins, natural resource combinations, aqua-territorial structures, planning techniques, geographical zoning

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Introduction

Socio-economic planning, being a process of analyzing and planning scenarios of the future has always included spatial, regional and territorial dimensions. Ho-

wever, spatial and regional planning used to be carried out mainly for regions or other territories. Planning for offshore areas was either not done at all, or carried out in a simplified form. Only certain marine zones having prerequisites (or restrictions) for economic activity were included into socio-economic plans, for instance, mariculture, recreation, or shipping zones.

Marine spatial planning (MSP) has been developing worldwide since the 1980s as part of Integrated Coastal Zone Management (ICZM) and Integrated Coastal Area and River Basin Management (ICARM), or large ecosystems management [1—6]. Similar management methods were developed and applied in Western Europe, East Asia — Japan, China, South Korea, Vietnam, Thailand — and other countries. However, these approaches differed very little from territorial ones.

Statement of the problem

Since the end of the 20th century, countries all over the world have been exploiting marine natural resources, including biological, oil-and-gas, mineral, recreational and others more extensively. The 'maritime constituent' of spatial socio-economic development of Russia and its regions has also become more visible: the country has been extensively using its diverse marine resources, developing different types of marine activities, and deepening knowledge about seas and oceans [7—11]. Marine spatial planning has started developing on a new basis — that of objective-setting and information technology[1].

In Russia, the first steps in the development of marine spatial planning were made by scientists and specialists in economy and geography [12—19]. Nevertheless, the following aspects of marine spatial planning (MSP) require further research:

— identification of MSP objects and their hierarchy;
— identification, spatial division and zoning of marine areas;
— nature management of marine areas;
— assessment of possible combinations of spatial economic activities within marine areas.

Key findings

Marine spatial planning (MSP) is a complex of analytical, computing and evaluative activities aimed at the identification and justification of certain types of economic activities and their combinations feasible in a particular marine area.

[1] E. g.: Proceedings of the International Conference on Marine Spatial Planning — November 24—25, 2017, St. Petersburg, and the works of S. D. Mityagin, V. M. Razumovsky, M. I. Amosova, G. M. Fedorova, P. P. Spirina, V. A. Mayboroda, O. Yu. Korneev, the author of the article and others.

From the point of view of its integrity and complexity, an object of MSP in its integrated form should consist of the following segments (Figure 1):

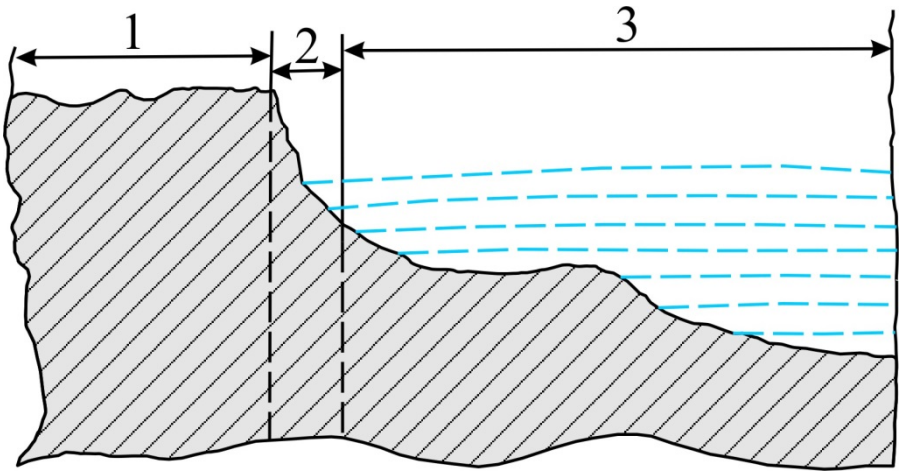

Fig. 1. Segmentation of a coastal-marine area
1 — coastal land segment; *2* — coastal structures;
3 — marine space, including water space and some of the seabed

As historical experience shows, the organization of almost any type of activity in the marine area is impossible without coastal bases (land-based structures) and other segments of coastal territory. In this regard, the inclusion of coastal structures in the MSP object should be considered as the most important methodological principle of MSP.

The following main stages of marine spatial planning can be distinguished:

1) Identification of a MSP object (marine geosystems, ecosystems of different types) in the form of segments of coastal-marine space;

2) Assessment of spatial differentiation of the MSP object and identification of its structural parts;

3) Identification of natural resources and the assessment of their potential in marine geosystems (here and after marine geosystems are considered as forms of coastal-marine spatial segmentation);

4) Assessment of coastal territories and their functions in the economic development of marine geosystems;

5) Identification of coastal structures as primary centres for the development of marine geosystems on coastal territories;

6) Calculation and assessment of economic and natural-resource potential of marine geosystems;

7) Selection and justification of the most effective options and stages of a comprehensive development of coastal-marine spatial segments.

As our studies and experience of economic development of coastal regions show, they usually include complex spatial elements — port complexes, shore-based processing enterprises and settlements; some of them also function in coastal water areas, including the seabed — mariculture farms, fishing vessels, oil and gas platforms, transport vessels and communications, and others. We refer to these spatial structures as *aqua-territorial ones* [17—18]. Functionally, they can be considered as economic or as socio-economic ones since they have social (population) and economic components. If complex integrated spatial structures have natural resources both in their coastal and water areas they can be called geographic aquaterritorial ones [20]. Being highly integrated, such structures can form an aqua-territorial system. Therefore, the MSP object is a segment of the coastal and marine space that may comprise various combinations of geographic aquaterritorial structures and systems within its boundaries.

We can identify the following principles of geographical segmentation (zoning) of marine ecosystems:

1. Identification of relatively integrated geographic structures in a coastal zone, in most cases based on the type of landscape. The coastal territory should be large enough to accommodate a settlement (about 50 km wide). (1, 2, 3, 4 — Fig. 2);

2. Identification of relatively integrated marine ecosystems having a natural resource potential (a, b, c, d — Fig. 2);

3. Establishing interconnection between marine ecosystems and geographic structures of coastal zones; identification of coastal-marine geosystems in the form of spatial segments (1a, 2b, 3c, 4d), in which it is possible to achieve sustainable coastal-marine and marine wildlife management; formation of certain types of economic activity and their aquaterritorial combinations.

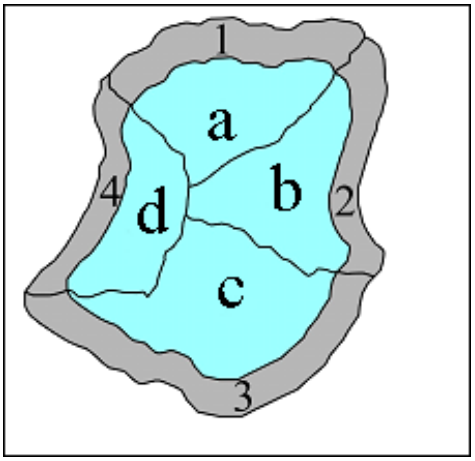

Fig. 2. Identification of coastal marine segments as MSP objects (See the article)

The most important task and stage of MSP is the identification and assessment of natural resources of marine areas. It should be noted that natural resources, being spatial themselves, are located throughout the space of coastal-marine segments. Taking the inter-resource links into consideration, these natural resource systems appear to be complex ones [21].

Basic principles for the identification of spatial marine natural-resource systems are as follows:

1. Assessment of spatial differentiation of near-surface layers of the water area in terms of:

— hydrophysical characteristics;

— availability of natural resources, their properties and interconnections.

2. Assessment of spatial differentiation of benthic layers in terms of:

— underwater landscapes;

— benthic natural resources, their characteristics and interconnections;

3. Assessment of spatial differentiation of seabed layers in terms of:

— types of seabed relief;

— availability of seabed natural resources, their characteristics and potential.

4. Assessment of spatial differentiation of the entire marine space according to a combination of resources and other characteristics; identification of marine natural-resource systems;

5. Matching the identified marine natural resource systems and areas of the coastal territory.

It should be noted that many of the seas and their basins in Russia are transboundary ones: the Baltic and the Barents seas in the west, the Black, the Caspian and the Azov seas in the south, and the Chukchi, the Bering, the Okhotsk and the Japan seas in the east.

Being relatively integrated geographic systems due to their natural resources and ecological characteristics, these transboundary basins are intersected by state borders — land and marine — as well as territorial water boundaries and 200-mile economic zones. These boundaries can form (and they often do) certain "gaps" in the information space which contain different characteristics of these integrated transboundary basins, different approaches and methods of assessing natural resources in some countries, the formation of national environmental management structures and the regulatory environmental base etc. As some research works show [11; 22—26], the assessment of natural resource potential, sustainable nature management and the development of transboundary regions in general require active international cooperation and the development of international cooperation programme.

Therefore, marine spatial planning requires a multilevel hierarchical approach, comprising at least four levels:

1) International level for a general assessment of the entire transboundary marine basin;

2) National level, covering coastal and marine segments of several countries; marine area is included within a 200- nautical mile economic zone;

3) Regional level for the identification of a coastal territory within an administrative entity (region, territory, etc.) and a marine area both as part of an economic zone and territorial waters;

4) Local level for the identification of coastal settlements and adjacent waters (not more than a few kilometers in width).

Some transboundary basins require a combination of hierarchical planning levels. For instance, it is impossible to single out only national Russian coastal-marine segment for the Baltic Sea basin. In this case the regional level takes on enormous importance, and in the Kaliningrad region, for example, it overlaps with the national one [9; 25; 27].

Marine spatial planning should use a combination of different tools:

1. Geographical division, zoning and coastal-marine space zoning which have been described in many research works in Russia [2; 3; 13; 20, 23];

2. The identification of spatial natural-resource systems in coastal territorial zones and in the sea; their quantitative assessment including mapping;

3. Geoinformation modeling of layers and components of natural and natural-resource space;

4. Complex forecasting and calculations of the formation and development of different spatial aqua-territorial economic structures.

Based on the above-mentioned approaches, the generalized zoning of Pacific Russia has been carried out (Fig. 3).

These segments, which include coastal areas with a width of 25—50 km and sea areas within a 200-nautical mile economic zone, can be be considered integrated objects of MSP with a subsequent assessment of long-term prospects for their development.

A number of practical tasks of MSP can be outlined:

— The assessment of the natural resource potential in coastal-marine segments.

— Different-scale functional zoning of coastal marine areas and water areas and the identification of priority and presumptive types of nature management within the identified segments.

— Functional zoning of a 200-nautical mile economic zone.

— The assessment of options for the formation and development of aqua-territorial economic structures in certain coastal-marine segments.

— Geoinformation modeling of the formation and restructuring of spatial structures of nature use as well as spatial aqua-territorial economic structures in general.

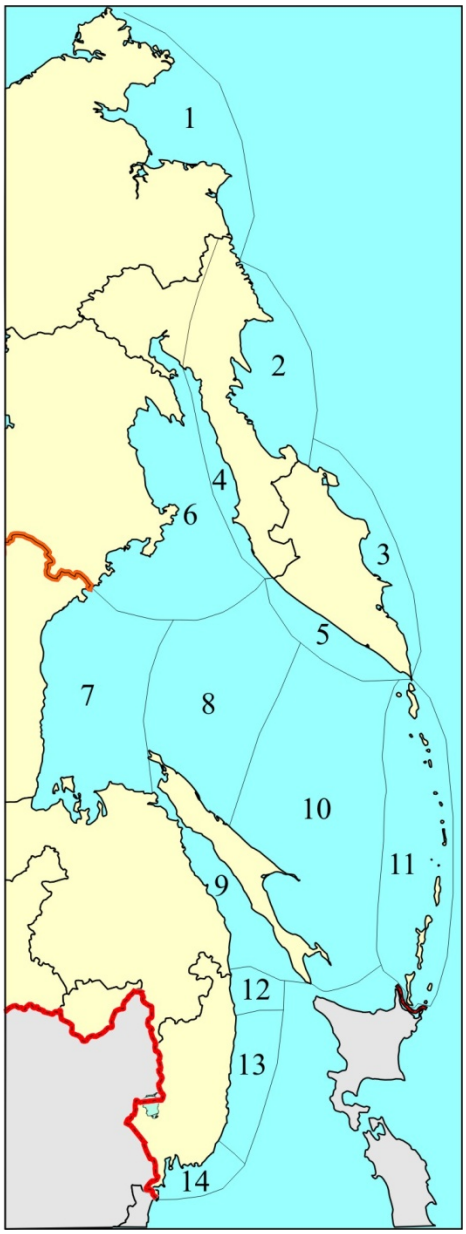

Fig. 3. Pacific Russia coastal area zoning (See the article):
Major segments of the coastal and maritime space are identified as follows:
1 — Outer Chukchi Sea Shelf zone (*Prichukotskaya Zone*); *2— 5* — Kamchatka Shelf (*Prikamchatka Zone*); *6* —Northwest Outer Shelf of the Sea of Okhotsk (*Northwest Priokhotsk Zone*); *7* — Southeast Outer Shelf of the Sea of Okhotsk (*Southeast Priokhotsk Zone*); *8* — Northeast Sakhalin Shelf (*Northeast Prisakhalin Zone*);
9 — Western Sakhalin Shelf (*Western Prisakhalin Zone*);
10 —Southern Sakhalin Shelf (*Southern Prisakhalin Zone*);
11 — Kuril Islands Outer Shelf Zone (*Prikuril Zone*);
12—14 — Primorye Zone

Conclusions

Segments of the coastal and maritime space should be identified as the main objects of MSP. The basic type of human activity within the coastal sea area is a multitier source of nature management, based on the extraction and use of coastal territorial and marine natural resources. Therefore, MSP can be defined as a coastal-marine spatial planning at large. In the course of MSP, a close interconnection of the formation and development of spatial coastal-territorial and aquatorial socio-economic structures is necessary, which in its turn should be based on variants calculations and modeling.

Therefore, MSP should become the most important gear of spatial socio-economic development of coastal regions.

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