ISSN 1875-3728, Geography and Natural Resources, 2017, Vol. 38, No. 4, pp. 333-340. © Pleiades Publishing, Ltd., 2017.
Original Russian Text © P.Ya. Baklanov, V.V. Ermoshin, V.P. Karakin, V.V. Zharikov, Nguyen Van Cu, Dao Dinh Cham, 2017, published in Geografiya i Prirodnye Resursy, 2017, Vol. 38, No. 4, pp. 46-55.

Coastal-Marine Nature Management in Pacific Russia and Northern Vietnam: Notions, Structural Features, and Types

P. Ya. Baklanov [a, *], V. V. Ermoshin [a, **], V. P. Karakin [a, *], V. V. Zharikov [a, ****], Nguyen Van Cu [b, *****], and Dao Dinh Cham [b, ******]**

[a] *Pacific Institute of Geography, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia*

[b] *Institute of Geography, Vietnam Academy of Science and Technology, Hanoi, Vietnam*

**e-mail: pbaklanov@tig.dvo.ru*

***e-mail: yermoshin@tig.dvo.ru*

****e-mail: vpk45@rambler.ru*

*****e-mail: zhar@tig.dvo.ru*

******e-mail: vancu.huonhbien@gmail.com*

*******e-mail: chamvdl@gmail.com*

Received August 4, 2017

Abstract—Coastal-marine nature management is treated as a spatiotemporal structure consisting of two interrelated components: the coastal territorial component occurring in the coastal territory, and the coastal aquatic component occurring within the coastal aquatic area as well as the sea shores connecting them. The study revealed the components of the main and concomitant uses of natural resources which have evolved directly across the land and sea areas of mining of separate kinds of natural resources and having technogenic impacts on them. From a combination of natural resources as well as of spatial scales of the main and concomitant uses of natural resources on the coastal territory and in coastal waters, we identified the main types of coastal-marine nature management in the southern areas of Pacific Russia and in Northern Vietnam: different kinds of nature management including the utilization of the territory for industrial-residential and transportation purposes as well as for cultivation of rice and vegetable crops, extraction of building materials, other mineral resources, forest use, extraction of marine salt from the sea water, coastal fisheries, various forms of mariculture, marine recreation, etc. A fragment of the cartographic assessment of the current types of coastal-marine nature management is presented for the southern coastal areas of Pacific Russia.

DOI: 10.1134/S1875372817040047

Keywords: components of the main and concomitant uses of natural resources, coastal structures, coastal-marine geosystem, natural-resource combinations, types of coastal-marine nature management.

FORMULATION OF THE PROBLEM

The Far Eastern territory of Russia adjacent to the seas of the Pacific Ocean and the ocean itself (Kamchatka, and Kuril Islands), together with the 200-nautical mile Exclusive Economic Zone, can be regarded as a major aquatic-territorial macroregion, Pacific Russia [1]. Although the macroregion is located in northern latitudes (from 42° to 70° N), and in the natural zones from the arctic ice deserts and tundra in the north to coniferous/broad-leaved forests with subtropical species in the south, and Vietnam is located in the tropical zone (from 23° to 8° N), their geographical location has much in common. Both Pacific Russia and Vietnam are significantly extended along he meridian and, with their broad front adjoin the seas of the Pacific Ocean.

The shoreline of Pacific Russia and Vietnam, respectively, is about 26 thou km (as estimated by Pacific Institute of Geography FEB RAS) and more than 3.2 thou km [2]. Therefore, both Pacific Russia and Vietnam have huge land–ocean contact zones [3, 4], within which highly dynamical geographical contact structures are generated [5, 6]. Such structures in the form of combinations of interacting components and processes of land and sea are produced in the natural, natural-resource and even in the socioeconomic spheres. Thus, in the natural sphere in estuarine zones there is taking place the interaction of the liquid and solid discharges with the sea waters and bottom sediments, the impact of the wave activity of the sea, including tsunamis, on the coastal structures, as well as complicated interactions of the sea and overland air masses in atmospheric processes in contact zones.

It is possible to identify a number of significant linkages between separate natural resources of land and marine resources. For instance, separate marine fish species (Salmonidae) migrate for spawning to many coastal rivers of Pacific Russia, as far as one

thousand kilometers from the shores. After that, young fishes return to the seas (Bering Sea, Sea of Okhotsk, and Sea of Japan). The quality of river discharge (both liquid and solid) can have a substantial influence on bioproductivity of coastal marine ecosystems [7]. In Vietnam, marine salt is extracted on the basis of specific complexing of the marine natural resources, sea water and land – areas of coastal territories, and sea water is then let into them; marine salt is left upon its evaporation.

A close linkage is observed between recreation resources of coastal land and sea. Finally, development of marine natural resources gives rise to the formation of aquatic-territorial structures consisting of interacting economic (including infrastructural) facilities situated on land and on the sea: base enterprises, facilities (including port facilities) on coastal territories, and marine transshipmen terminals, extracting installations, enterprises of mariculture, etc. in the coastal marine zones. The role of such aquatic-territorial economic structures will increase in the future. Furthermore, their formation and subsequent development is based on human uses of combinations of natural resources of land as well as marine resources, i. e. different forms and types of regional nature management.

In the modern scientific literature, regional nature management is treated in two meanings. In the narrow sense, it implies extraction and direct use of separate kinds of natural resources. Hence we have an array of notions, such as land use, water use, use of mineral resources, forest use, etc. In the broad sense, regional nature management encompasses the entire gamut of interactions of man with the natural-resource environment arising in the process of extraction and utilization of particular natural resources and their combinations in the region [8–11].

When considered in the broad sense, regional nature management is realized in complicated spatiotemporal structures that form on the basis of combinations of natural resources. In contact zones, they are combinations of natural resources of land and sea. Their extraction and development gives rise to different kinds and structures of marine and coastal nature management [12-16]. Furthermore, coastal-marine nature management is formed in zones adjacent to sea coasts, i. e. within narrower geographical spaces. They show the more pronounced contact processes, properties and characteristics. In the components of coastal-marine nature management, the contact phenomena and processes are frequently enhanced [4, 17]. The questions as to what natural resources can be involved in such nature management structures and within what coastal spaces of land and sea still remain poorly explored. It can be suggested that the basis for regional nature management forming in the contact zones is based on geographical contact structures. However, their composition and significance depend greatly only on the geographical location of a particular area and on the types of coastal geosystems, combinations of natural resources, their properties, and on the consumer demand. These questions are also insufficiently studied and are discussed in this paper.

RESULTS

This study is based on methods and approaches of system analysis. Extensive use was made of the comparative-geographical approach as well as of cartographic and geoinformation investigative techniques, including when using cartographic material. It is suggested that matrix presentations should be used in assessing the linkages between separate components of nature management.

Based on a general understanding of the formation of contact geographical structures in the land–sea interface zone, it can be suggested that the components of the nature management structures on land will interact with the structural components of nature management arising on the sea. Moreover, no formation of nature management structures on the sea, including in the offshore zone, is possible without the emergence of their components on coastal land. These are represented by specific types of coastal land use during the construction and operation of access transport roads, pipelines as well as coastal port and berthing facilities. This process is also accompanied by the utilization (for these purposes) of corresponding building materials which can be extracted both on land, and on the sea, in the coastal zone. Such an interaction is ensured by the existence of linkages of the individual components and processes between land and sea in the natural, natural-resource and socioeconomic spheres. Nature management in contact zones will, at all times, consist of two components: coastal and marine, and the geographical system itself, where such nature management is realized, may be represented as a three-component geographical space (Fig. 1).

The methodological basis for determining the outer boundaries of the coastal territory and the coastal waters is the existence of substantial linkages between the components and processes of natural-resource space of coastal land and of the sea prior to development of their natural resources as well as the emergence of closer linkages after the beginning of extraction and development of the natural resources of land and sea.

As the analysis shows, the process of extraction and development of natural resources both on land and in the sea gives rise to structural components of the main and concomitant types of nature management. For instance, when sand-gravel mixtures are extracted

on land for building materials, this process produces a quarry. It is the component of main nature management. The allocation of a territory for the quarry, and also the transport access road to such a quarry should be regarded as the component of concomitant nature management.

The same process is also observed in the case of extraction of marine sand: a component of main nature management is produced in the form of the zone of the sea waters and seabed where extraction itself occurs, and concomitant nature management in the form of the influence area on the bottom components and water space when sand is extracted from bottom deposits. Concomitant nature management in such cases can also include a significant reduction in bioproductivity in the areas of extraction of building materials, both on land and from the seabed (Fig. 2).

Impacts of territorial nature management on the coastal marine ecosystem are possible to occur, for instance, in the form of dust through atmospheric transport or in the form of polluted rainwater flow into the coastal waters. If marine sand is delivered with the sa water to coastal land (via dredgers), then the components of land are influenced by the sea water separated from sand. In this case, use of the coastal territory for sand, and also of the sea water withdrawn from the bottom layers together with sand corresponds to concomitant nature management.

The coastal structures in this case have a dual function: on the one hand, they separate the natural-resource space of land and sea and, on the other, they connect them thus ensuring extraction and use of marine natural resources on the basis of the resources of land in the event of the formation of base infrastructure facilities and complexes on the coastal territory.

Hence, coastal-marine nature management is a spatiotemporal structure that includes the components of main and concomitant nature management resulting from the extraction and utilization of natural resources of land on the coastal territory, and natural resources of the marine waters and seabed within the coastal waters in their particular linkage through coastal structures with infrastructure facilities. Also, an important role

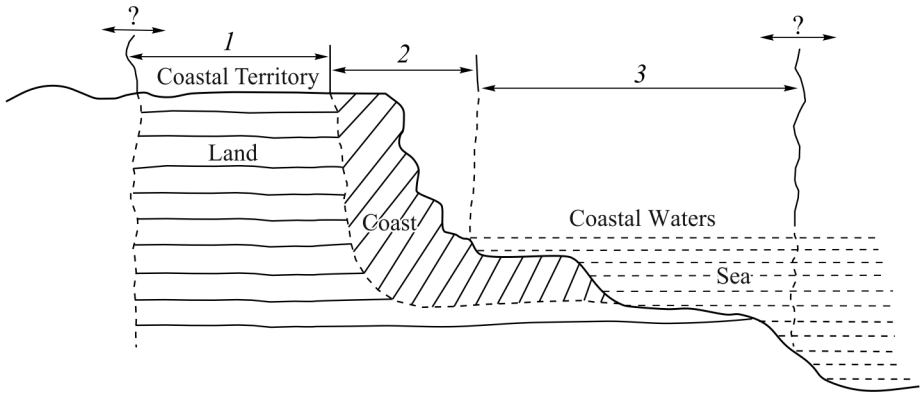

Fig. 1. Coastal-marine geographical system.
1 – space of the coastal territory; *2* – coastal spatial structure proper; *3* – space of the coastal waters.

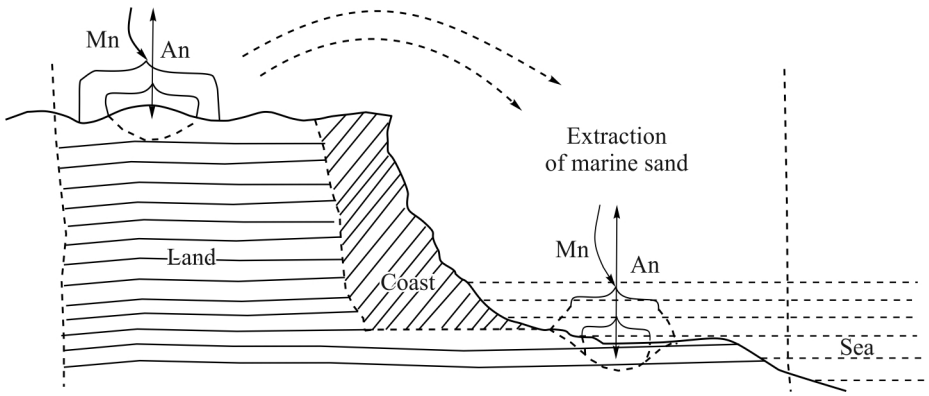

Fig. 2. Formation of the components of the main and concomitant types of nature management on coastal land and sea.
Mn – component of main nature management; An – component of concomitant nature management. The arrows show the directions of extraction and utilization of separate natural resources; the dashed arrows indicate the impacts of land-based nature management on the marine coastal ecosystem, and marine nature management on the land ecosystem. The small brackets arbitrarily denote the space of main nature management, and the large brackets correspond to concomitant nature management.

in coastal-marine nature management is played by coastal nature management itself, in the form of using coastal surfaces and earth materials for the construction and operation of the port and berthing facilities and access transport roads and pipelines. A substantial role on this case is played by such characteristics as the composition of rocks, the height and existence of favorable access roads from land to them, the size of a relatively flat territory adjacent to the shoreline, its roughness, etc. Concomitant nature management on coastal land is largely determined by a combination of coastal landscapes and the natural-resource potential contained in them. For instance, if forest (timber) resources are present, they will almost always be used in the construction of port and berthing facilities.

On the whole, within the most developed southern regions of Pacific Russia, it is possible to identify different combinations of structural components of the main and concomitant types of coastal-marine nature management which are based (formed) on the basis of combinations of natural resources (Table 1).

Table 2 provides generalized assessments of the main components of land use and of the concomitant components in the coastal zone of the Peter the Great gulf (Primorskii krai, Russia). Table 3 shows combinations of the main and concomitant components of coastal-marine nature management in Northern Vietnam.

In spite of the great diversity of the components of main and concomitant nature management in the southern regions of Pacific Russia and in the northern regions of Vietnam, their outlines have much in common. Such common features can be reflected in the typology.

For identifying the types of coastal-marine nature management it is appropriate to use the following criteria. The first (spatial) criterion is representative of the scales and types of spaces within which there occur the coastal-marine territorial and aquatic components of nature management. It is possible to identify the point-local types of nature management where the main component of nature management on the coastal territory is realized within a small space

Table 1. Structural components of coastal-marine nature management in the southern areas of Pacific Russia

Components of main nature management	Combinations of natural resources	Components of concomitant nature management	Combinations of natural resources
Territorial components			
Land use for agriculture	Coastal territory, lands, water	Use of the territory for wastes, etc.	Territory including the one that is disturbed by technogenic impacts
Specific land use in the coastal zone during the construction of port and berthing facilities, coastal components of mariculture	Surfaces of shores, earth materials, territory in the coastal zone	Allocation of the territory for transport access; use (liquidation) of bioresources of such territory; impact on the coastal marine waters during the construction	Coastal territory, bioresources, sea water
Extraction of raw materials for building materials	Sand-gravel rocks	Use of the territory; movement of overburden, outcrops of groundwater	Territory, rocks, groundwater
Logging (forest management)	Combination of forest resources	Use of the territory; use (reduction) of collateral forest and young growth resources	Territory, forest resources
Utilization of the territory for coastal settlements	Territory, space of earth materials, surface and subsurface waters	Impact on the natural-resource environment of the surroundings, including the marine environment	Territory, rocks, waters, bioresources, sea waters
Aquatic components			
Extraction of marine sand	Bottom sandy deposits, sand-gravel mixtures	Impact on the sea water, seabed and bio-organisms	Sea water, bottom space, bio-organisms, bottom landscapes
Cultivation of mariculture, coastal marine facilities, devices	Marine aquatic environment, bottom landscapes, mollusks, algae	Impact on resources and components of the marine ecosystem in the zone of mariculture	Apace and components of the marine ecosystem
Development of recreation: coastal-shore components of nature management and aquatic components	Coastal zone, part of the marine ecosystem: beaches, sea water, seabed	Impact on coastal structures, the marine ecosystem in the zone of beaches	Space and components of coastal structures and marine ecosystems in the zone of beaches

Table 2. Size of the main and concomitant components of land use in the coastal zone of the Peter the Great Gulf (thou ha)

Municipal formations	Total area	Main components of land use (arable lands)	Main components of land use (territories for settlements and roads)	Accompany-ing components of land use (disturbed lands)
Khasanskii district	413.0	2.4	11.5	0.2
Nadezhninskii district	159.6	10.9	8.1	0.3
Vladivostok	56.2	1.2	13.2	0.1
Artem	50.6	6.7	10.1	0.3
Bol'shoi Kamen'	12.0	1.4	1.4	0
Shkotovskii district	266.5	8.8	5.8	0.2
Fokino	29.1	0.3	1.9	0.1
Nakhodka	36.0	0.8	8.6	0
Partizanskii district	409.7	10.4	4.8	0.1
Partizansk	128.9	2.7	3.5	0

Note. Compiled by the authors from Rosreestr data as of 1.1.2015.

Table 3. Structural components of coastal-marine nature management in Northern Vietnam

Components of main nature management	Combinations of natural resources	Components of concomitant nature management	Combinations of natural resources
Territorial components			
Land utilization for cultivation of rice and other crops	Lands, water, coastal territory	Water delivery via canals (including water losses), territory for canals, roads, etc.	Territory, water
Extraction of sand and other building materials	Sand-gravel and other deposits	Movement of overburden	Territory, ground surfaces
Extraction of sea salt from sea water	Sea water, territory for evaporation basins	Allocations of the territory for servicing facilities of evaporation basins, and for roads	Territory, ground surfaces during the construction of basins
Breeding of fish and waterfowl in coastal ponds	Territory, water, bioresources	Allocations of the territory for servicing facilities and roads, impact on water (including losses)	Territory, water, discharges of wastes into the water, including the sea water
Aquatic components			
Extraction of sea sand	Sandy deposits on the seabed	Impact on the aquatic environment and benthic communities	Sea water, bottom organisms
Coastal fisheries	Coastal reserves of fish and seafood, coastal waters	Impact on the marine environment	Sea waters, plankton
Recreation structures of nature management	Territory of beaches, zones of coastal waters	Impact on beaches and on the marine environment	Territory of beaches and their surroundings, marine ecosystems
Cultivation of mariculture	Marine aquatic environment, bottom landscapes	Impact on sea water, seabed, bio-organisms and marine landscapes	Space and components of coastal marine ecosystems

(area), or, collectively, in the form of "points", such as the coastal portion of a device (a dredger) for extraction of marine sand. The aquatic component in this case is also localized within a small space. If the aquatic component occupies a relatively large space, such as the one of mariculture, such a type can be categorized as point-areal.

The type of coastal-marine nature management can be identified as areal if both the territorial and the aquatic components are considerably clearly

pronounced spatially, such as a small coastal settlement with coastal structures for mariculture, and the water area itself used for mariculture. Finally, it is possible to identify the spatial-scale type where both the territorial and the aquatic components occupy significant spaces, or a large settlement and coastal fisheries, or a large zone of marine recreation.

The next criterion for the typology of coastal-marine nature management involves territorial and aquatic combinations of natural resources used, primarily in the main components of nature management. On the coastal territory this can include using the territory for settlements and various structures, land use for cultivation of various crops and raising of animals, forest use in exploiting forest resources, subsurface resources if mineral resources (including energy resources) are extracted in the coastal zone. In the coastal water area there is a possibility for extraction of different kinds of chemical raw materials from the sea water, and extraction and use of bioresources and minerals resources of the seabed. Furthermore, the space of the water area can be used for the operation of the sea transport facilities, including submarine pipelines, and the surface water and submarine transport.

A more complicated typology of coastal-marine nature management can be constructed on the basis of combining the spatial criteria and types of combinations of natural resources in the territorial and aquatic components (Table 4).

Fig. 3 shows the cartographic assessment which we made for the territorial components of current coastal-marine nature management in the southern regions of Pacific Russia. Five types were identified from a combination of the main natural resources used in the coastal territorial component. The coastal-marine component of nature management within the Peter the Great Gulf is represented by coastal fisheries, mariculture, recreation and the sea transport, and along the eastern coast by small areas of mariculture, coastal fisheries, and by the sea transport.

CONCLUSIONS

Coastal-marine nature management always has a two-component character, with coastal territorial and aquatic components which connect the coastal structures. The territorial as well as aquatic components of nature management always develop the main structures of nature management which must be identified and assessed.

The formation of spatiotemporal structures of coastal-marine nature management is based on territorial an aquatic combinations of natural resources. Unsustainable exploitation of some of them can often lead to negative quantitative-qualitative changes in others. Therefore, there is a need for a comprehensive coherent assessment of coastal natural resources of land and waters as well as coastal structures.

For a further development of coastal-marine nature management it is important to have relatively flat territories in the coastal zone which would be favorable as regards their geomorphological conditions and the composition of rocks in the coastal structures. Of significant importance in the coastal waters are some characteristics, such as the depths and their difference, the existence of gulfs and bays protected, to some extent, from winds, the tidal processes, the character of the seabed, bottom landscapes, etc. It is appropriate to make such assessments within special regional programs of development of coastal-marine zones.

The magnitude of spatial pronouncedness of the territorial and aquatic components of nature management, and also the combinations of natural resources of coastal land and sea can be used as the basis for the typology of coastal-marine nature management. Such a typology appropriately reflects the existing differentiation of coastal-marine nature management in the southern regions of Pacific Russia and in Northern Vietnam.

This work was done under a project of the Ministry of Education and Science of RF (RFMEF 161316X0060).

Table 4. Main types of marine-coastal nature management

Main types as identified by spatial criteria	Combinations of the main natural resources, extracted and utilized	
	in the territorial coastal component	in the aquatic coastal component
Point-local	Areas of the territory, including on the coast; deposits of mineral resources	Mineral resources of the seabed, sea water withdrawals
Point-areal	Areas of the territory, including on the coast; mineral resources (separate deposits)	Zones and combinations of bioresources, influence zones on the sea water (discharges of polluted flows)
Areal	Territory, land resources (including for urban settlements)	Marine bioresources, recreation zones, ecosystem services (for mariculture)
Spatial-scale	Territorial, land resources (including for large urban settlements), forest resources	Bioresources, large recreation zones, beaches

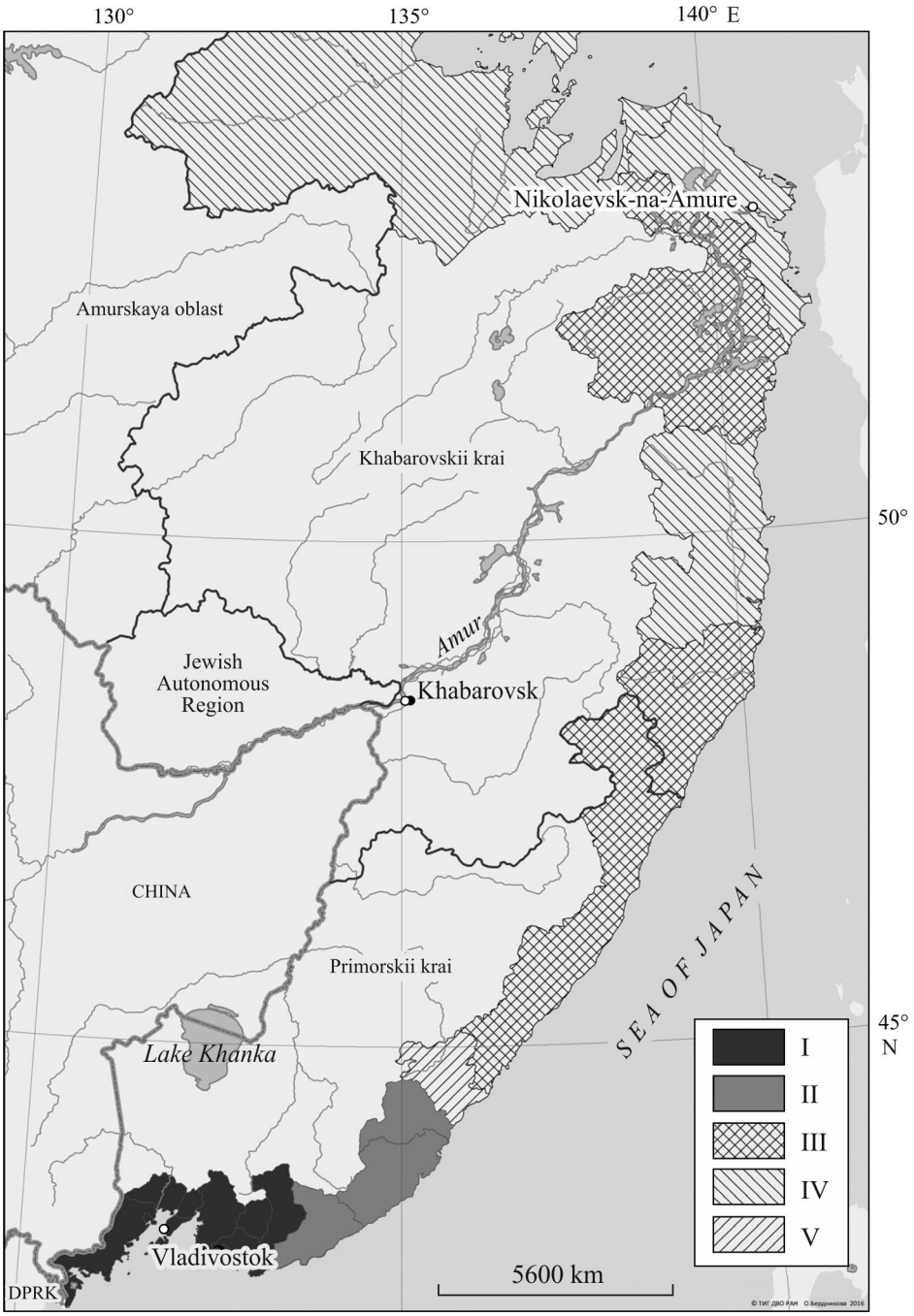

Fig. 3. Types of nature management in the territorial components of the coastal zone in the south of Pacific Russia.
Types with dominant types of nature management: I – urbanized and sub-urbanized areas, transport transit, recreation; mariculture, agriculture, coastal fisheries; II – forest management, recreation, coastal fisheries; III – forest management, coastal fisheries; IV – coastal fisheries, minerals management; V – minerals management.

REFERENCES

1. *Pacific Russia: Pages of Past, Present and Future*, P.Ya. Baklanov, Ed., Vladivostok: Dal'nauka, 2012 [in Russian].
2. *The Sea and Islands of Viet Nam – The Great Potential*, D. Tran, Ed., Hanoi: Thế Giới Publishers, 2014 [in English].
3. Dergachev, V.A., *The Natural-Economic "Land–Ocean" Contact Zone*, Izv. VGO, 1980, vol. 112, pp. 40–45 [in Russian].
4. *Coastal and Marine Nature Management: Theory, Indicators, Regional Peculiarities*, P.Ya. Baklanov and I.S. Arzamastsev, Eds., Vladivostok: Dal'nauka, 2010 [in Russian].

5. Baklanov, P.Ya., Contact Geographical Structures and Their Functions in Northeast Asia, *Izv. Akad. Nauka, Ser. Geogr*., 2000, no. 1, pp. 31–39 [in Russian].
6. Baklanov, P.Ya., Coastal and Marine Nature Management as the Formation and Functioning of Contact Geographical Structure, *Proc. Int. Conf. "Sustainable Nature Management in the Coastal and Marine Zones" (October 5–6, 2013, Vladivostok)*, P.Ya. Baklanov, V.P. Karakin and V.V. Zharikov, Eds., Vladivostok, 2013, pp. 14–16 [in Russian].
7. Baklanov, P.Y. and Moshkov, A.V., Amur Region of Russia – Natural Resources, Population and Economy, in *Environmental Change and the Social Response in the Amur River Basin*, Sh. Jaruyama and T. Shiraiwa, Eds., Tokyo; Heidelberg; New York: Springer, 2015, pp. 1–35.
8. *Geosystems of the Russian Far East at the Turn of the 21st Century*, Vol. 2: Natural resources and Regional Nature Management, P.Ya. Baklanov and V.P. Karakin, Eds., Vladivostok: Dal'nauka, 2010 [in Russian].
9. *Nature Management of the Russian Far East in Northeast Asia: Potential of Integration and Sustainable Development*, A.S. Sheingauz and V.P. Karakin, Eds., Khabarovsk: DVO RAN, 2005 [in Russian].
10. Mikhailov, Yu.P., *Territorial Organization of Nature and Society. Selected Works*, Novosibirsk: Nauka, 2012 [in Russian].
11. *Geography and Siberia in the Early 21st Century*, in 6 Vols., Vol. 4: Nature Management, L.A. Bezrukov and L.M. Korytny, Eds., Novosibirsk: Geo, 2014 [in Russian].
12. Dolotov, Yu.S., *Problems of Rational Use and Protection of the Coastal Regions of the World Ocean*, Moscow: Nauchnyi Mir, 1996 [in Russian].
13. Lymarev, V.I., *Coastal Nature Management: Questions of the Methodology, Theory and Practice*, St. Petersburg: Ros. Gos. Gidrometeorolog. Univ., 2000 in Russian].
14. Denisov, V.V., *The Ecological-Geographical Foundations of Sustainable Nature Management in the Shelf Seas (Ecological Geography of the Sea)*, Apatity: Karel. Bauch. Tsentr TAN, 2002 [in Russian].
15. Aibulatov, N.A., *The Activity of Russia in the Coastal Zone of the Sea, and Problems of Ecology*, Moscow: Nauka, 2005 [in Russian].
16. Mikhaylichenko, Yu.G., *Adaptation and Mastering of Integrated Zone Management of the Seas of Russia*, Izv. Akad. Nauk, Ser. Geogr., 2004, no. 6, pp. 33–42 [in Russian].
17. *Proc. Int. Conf. "Sustainable Nature Management in the Coastal and Marine Zones" (October 5–6, 2013, Vladivostok)*, P.Ya. Baklanov, V.P. Karakin and V.V. Zharikov, Eds., Vladivostok, 2013 [in Russian].