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ECOLOGICAL FRAME OF THE REPUBLIC OF
BASHKORTOSTAN

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Abstract

The article is devoted to the ecological frame of the Republic of Bashkortostan (RB). For the republic, which has an area of 143.6 thousand sq. km with a large variety of landscapes, where natural and unique natural complexes are still preserved, which are constantly increasing anthropogenic impact and undergo significant negative changes due to the expansion of their accessibility due to the development of transport infrastructure, the growth of cities and industrial facilities, as well as places of mining, the problem of creating an ecological frame is very relevant. On the territory of the RB 119 relict and 98 endemic plant species have been established, of which 47 relicts and 36 endemics are already listed in the Red Book of the Republic of Bashkortostan. To preserve biodiversity and restore the landscape structure, specially protected natural areas (PNA) are created. The article discusses the role and place of PNA in the structure of the ecological frame as its core, also highlighted the ecological corridors, buffer zones and local elements. The analysis of the term "ecological frame", its formation, meaning, understanding of it by different authors was carried out. The various principles, concepts and approaches used in the development of the ecological frame for the territory (EFT) are considered, in particular, general geographical and biogeographical principles that are the methodological basis for ensuring environmental stability are highlighted, and the most frequently used methodological approaches are highlighted.

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Keywords: Anthropogenic factors, ecological frame, natural complex.



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1. Introduction

At present, not only the individual components of nature, but also the natural complexes themselves, and, in general, the human habitat changes significantly, with increasing speed. The task of mankind is to maintain nature in the necessary condition for life and health. And it is especially important to preserve, as far as possible, the most unique natural complexes of scientific value or components of the ranges of valuable and endangered plant and animal species. To solve these problems, “specially protected natural territories” (PNA) are created, which are part of, or part of, the ecological frame of the territory (Gridnev, 2016, p. 96).

2. Problem Statement

The World Wide Fund for Nature (WWF) Southern Urals was included in the list of 200 unique objects. But in the conditions of intensive development of human economic activity, natural complexes are strongly influenced, as a result of which they undergo significant, as a rule, negative changes. This is also characteristic of the territory of the Republic of Bashkortostan.

The current approaches to solving problems of reducing anthropogenic pressures and protecting the natural environment are often characterized by a highly specialized approach and inter-agency inconsistency. As a result, environmental protection measures are fragmented and relate mainly to the individual components of the natural territory complex (NTC).

The most effective measure for the conservation of species composition, natural ecosystems, unique and reference areas is the creation of a network of specially protected natural territories. PNA are “plots of land, water surface and airspace above them, where natural complexes and objects are located that have special environmental, scientific, cultural, aesthetic, recreational and recreational value” (Federal Law No. 33-FZ “On Specially Protected Natural Territories”..., 1995).

3. Research Questions

The degree of transformation of the territory of the RB is very high. With the increase of anthropogenic pressure and inefficient use of resources, the condition of not only the land fund, but also all components of nature is deteriorating. Unfortunately, the existing network of protected areas is not able to maintain its ecological balance.

With an increase in the anthropogenic impact on the natural environment, the need for reserving relatively poorly developed territories and creating a kind of fund of natural ecosystems at the global, regional and local levels becomes urgent.

This task is not entirely consistent with the narrow framework of the traditional approach to the organization of protected areas. Especially protected natural territories according to N.F. Reimers and F.R. Shtilmark is “volumetric areas of the biosphere, including land or water area with their surface and thickness, which are completely or partially, permanently or temporarily excluded from the traditional intensive economic turnover and are intended to preserve and improve the properties of the natural environment of man, protection of natural and artificial objects and phenomena of scientific, historical, economic or aesthetic value ” (as cited in Reymers, 2015, p. 43).

The existing network of protected areas also does not provide the proper level of material and energy relations, as the complete organization of the territory and the implementation of its functions of the natural territory requires connecting elements. In other words, a new system is needed to solve the problem of organizing and optimizing the territory. And the concept of “natural frame of the territory” quite successfully fits such a role. In geographical science, the term “ecological frame of the territory” (EFT) has been widely used, consisting of sites with different environmental management regimes (Treyvish, 1987, p. 51).

4. Purpose of the Study

The concept of "ecological framework" appeared in the second half of the 20th century. In modern geographic literature, different authors use different terms: natural framework, biosphere framework, environmental and green framework, sustainability framework, natural reserve and landscape-ecological framework, natural-ecological framework, etc. But the most commonly used term is “ecological frame”. It was first used by V.V. Vladimirov, according to which the ecological framework is a system of interacting nodes and axes of concentration of the greatest ecological activity for the implementation and support of a rational ecologically territorial settlement structure. The author believes that specially protected natural territories represent the central, “nuclear” part of the ecological framework (as cited in Latypova & Omarov, 2017, p. 53).

The concept of “ecological framework” in its formation has passed through a lot of discussions. Some researchers consider the ecological framework as a system ensuring the ecological stability of the territory, preserving the stability of the natural balance of matter and energy, the landscape and species diversity of the territory, contributing to the solution of environmental and resource-saving tasks; others - as a set of ecosystems.

Stoyascheva (2007) calls the territorial compensation system an ecological framework, consisting of a continuous network of sites with different environmental management regimes. When considering the concepts of “ecological frame” and “natural frame”, the author suggests to perceive them as synonyms and gives three directions for the development of this concept: 1) the natural (ecological) frame as a system of natural complexes of special ecological responsibility; 2) natural and ecological frameworks as a network of low-altered, including existing, protected natural territories; 3) the ecological framework as a system of natural complexes with various types of regulation of environmental management (p. 45).

A great contribution to the development of the concept of “ecological framework” was made by Rodoman (2002). He formulated the idea of a "polarized landscape" as a kind of mechanism for segregation of protected natural areas and urbanized zones. Moreover, the centers of cities are contrasted to natural reserves and should be as far from each other as possible.

At the same time, a variant of territory differentiation into a number of functional zones is proposed, where the need to introduce “green corridors” for connecting nature reserves into a single array is considered (Rodoman, 2002, p. 62).

All of these versions involve the creation of a scientifically based system of interrelated areas of nature to maintain the ecological balance of the territory and optimize environmental management.

In foreign scientific literature, the ecological framework often corresponds to the concept of ecological nets or the ecological network, and therefore in modern geographic literature the term ecological network is used as its synonym (Shwarts, 1998). Some researchers associate it with a system of specially protected areas. The ecological network unites individual specially protected natural territories of all categories with various forms of nature protection outside PNA into a single system of measures for the preservation of a functionally integrated set of natural communities (natural skeleton) and wildlife in the face of increasing anthropogenic pressures. This provides an opportunity to maintain ecological balance as a necessary condition for sustainable development.

Analyzing the considered versions in the interpretation of the concept of “ecological framework”, one can single out a variety of approaches explaining the nature of this term. Relying on their arguments about the role of the ecological framework in stabilizing the anthropogenic impact on the environment, as well as in creating stabilizing territories, they all, although they are called differently, understand its importance in optimizing environmental management.

The term “ecological framework”, having passed the way of various debates, was established in the everyday life of modern researchers, and it meets the requirements that are put before the territory, which helps to maintain the balance between the extensively and intensively exploited territories (Yelizarov, 2008).

The essence of the concept of “ecological framework” is most fully reflected in Reymers (2015) as “the natural frame is a system of moving nature plots, ranked by the degree of ecological significance, the inseparable interrelation of which creates prerequisites for the formation of a natural ecological balance capable of withstanding anthropogenic consequences” (p. 65).

5. Research Methods

The territorial organization of environmental management requires a scientifically based location of areas with different functional modes of use. Formation of spatial infrastructure for maintaining environmental stability in the territory implies consideration of a variety of principles, concepts and approaches.

The framework approach is used in various branches of territorial planning in regional planning, urban planning and environmental design. Moreover, it is necessary to perform various functions: environmental, recreational, recreational, landscape-forming.

Kolbovskiy (2008) highlighted the geographical and biogeographical principles of ecological framework planning. The geographical includes the following: the principle of geoecological representativeness, territorial integrity, selection of the optimal organizational and legal form of the eco-frame object, relative simplicity of the device, manufacturability, coordination and coordination of the relative positions and interrelationships of the objects of the framework, various organizational and legal forms and modes, functional development, hierarchical conformity, openness, transboundary. Biogeographical: principle of landscape diversity, maintenance of natural (ecological and evolutionary) processes, sustainability, viability. As practice shows, both geographical and biogeographical components of the territory components are important.

When organizing a territory. Ivanishcheva (2013) proposes to base on the landscape-geographical approach and for the optimal functioning of the entire system, take into account the morphology and specificity of each landscape, while depending on their internal structure and resistance to external influences, plan economic loads and analyze anthropogenic consequences.

According to the researchers, the use of the territory with the help of an ecological approach presupposes an ecological optimization of the natural complex, since it gives the maximum use of the useful properties of the landscape, preserves these properties for a long time, reduces the possibility of their loss and reduces the cost of their use and preservation.

Yelizarov (2008) notes that the design of the functional structure of the ecological framework includes determining the role of each site in the framework, the appropriate mode of its use and its legal form. It should be created on the basis of all the knowledge, achievements and various fields of activity involved in this matter. He singled out some general principles that must be adhered to: 1) the principle "nature knows best"; 2) the principle of ecological corridors (switching); 3) the principle of polarization of the landscape (the principle of Rodoman); 4) the principle of buffer zones; 5) the principle of hierarchical cells (the Ponomarenko principle); 6) the principle of the general hierarchy of the device; 7) the principle of the interpenetration of natural and economic infrastructure; 8) the principle of mosaicity of territories of different scales and functions; 9) the principle of relative environmental autonomy and discreteness of individual sections; 10) the principle of representativeness of ecosystems; 11) the principle of taking into account historical trends in the development of the territory; 12) the principle of individuality of the natural conditions of each area of the territory. (p. 291)

These principles serve as a methodological basis for ensuring the ecological stability of the entire territory and its parts with maximum efficiency.

Almost all researchers agree that the ecological framework is a hierarchical concept, and it should be identified consistently at the global, regional, basin and local levels. Although there are differences in research approaches and in the uniqueness of regional and national networks of nature, it is generally recognized that the ecological framework of any country includes areal (large-area), linear and point elements. And like any system, the ecological framework has a rather complex structure and consists of three types of elements. The main system-forming element - the cores (nodes, natural-geographical windows, key territories) - is represented by geo-ecosystems that perform such functions as environmental reproduction, environmental protection, information, and storage of the gene pool.

Each element of the natural frame should correspond to one or another protected natural area that is included in the ecological frame; each site should have its own specific mode of use, based on its role in maintaining environmental stability in both the surrounding area and the entire territory of the region.

The ecological framework should include, along with the territories with the most stringent use regulations, which include protected lands, territories with less stringent restrictions on their use: reserves, water protection and green zones, protective forest belts and other artificial elements specially designed to reduce the impact of man-made objects on the natural environment, as well as the territories where the use

of natural resources is conducted in a gentle manner, in which natural complexes are preserved in a state close to the natural one. These are lands of the forest fund, including household forests, provided that forestry is rationally maintained in them, undisturbed pastures and hayfields, areas of development of beekeeping, hunting, etc.

Since the existing network of protected areas is taken as the basis of the ecological framework, it is very convenient to begin the formation of the framework with the selection of this network. The basis of the framework thus obtained should be supplemented and expanded taking into account the natural features and the anthropogenic development of the territory.

For the formation of the natural-ecological framework, some methodological approaches are often used:

- design of the framework on the basis of existing, legally enshrined forms of protected areas, functionally related and ensuring ecological balance;
- a systematic approach in which ecologically stable zones (cores) and subordinate sites are released; between them there are material-energy bonds. The units of the territorial organization of the eco-skeleton are geosystems or ecosystems;
- territorial approach: only the territories falling under the protection of the International and European conventions are distinguished;
- landscape approach, which is the methodological basis for the implementation of geographical representativeness;
- basin approach: drainage basins are selected as a unit for preserving the ecological integrity of ecosystems (Zakirov, 2017, p. 76).

In most cases, on the basis of these approaches, plans are made for constructing an ecological framework, while, according to Ivanischeva (2013), the formation of the eco-frame should be carried out using GIS-technologies, the method of analyzing the state of natural complexes, optimizing, supplementing and developing the existing network of protected areas.

For the sustainable development of the region Pavlova (2016) frame design proposes to implement in several stages. At the first stage, the definition of the main conflict areas between nature and nature management is considered; on the second, it is planned to develop the structure of the project and create a database of the natural, demoeconomic and ecological framework; on the third, the effectiveness of the created project and the adequacy of the conserved areas are checked, on the basis of which a diagnosis is made about the possible functioning of the entire eco-frame model. The fourth stage is called "Reflection and analysis of the result", and this process occurs during the project implementation (p. 87).

N.V. Stoyasheva believes that the formation of eco-skeleton is appropriate to begin with the selection of the existing network of protected areas, which allows the use of already recognized information. It can serve as a basis for identifying the ecological framework of the territory, since the functional characteristics and their purpose are similar. The algorithm for the formation of eco-skeleton thus looks as follows: 1) the selection of the natural frame of the territory; 2) identification of the most important elements of the demo-economic framework; 3) identification of areas of negative environmental impact of elements of the demo-economic framework; 4) construction of an ecological framework for a territory (as cited in Treyvish, 1987, p. 61).

When identifying a system of specially protected natural territories, it is advisable to adhere to certain geo-ecological principles: 1) ubiquity, 2) territorial differentiation, 3) functional development 4) organizational completeness (Nigmatullin, 2004, p. 45):

1) with ubiquity, all typological groups of landscape landscapes should be included in the PNA system. At the same time, it is necessary to take into account the typicality, value, stability, preservation of natural natural-territorial complexes;

2) when choosing a place for future protected areas, it is necessary to differentiate the territories according to natural parameters and the degree of economic development. It also takes into account the power and direction of the main flows of the substance, their ability to transfer various elements, especially polluting, from industrial and agricultural centers, and also considers the availability of protected areas for recreational purposes to the population and the inaccessibility of strict protection reserves;

3) the functional development of the territory is especially necessary for the formation of a nomenclature of protected areas;

4) the organizational completeness of the territory allows the most effective implementation of the program, which, as a rule, ends with the drawing up of a general scheme with an indication of the timing of their organization.

When organizing these principles, it is easier to substantiate and create PNA, while at the same time other sites that can ensure the passage of dynamic processes and unite protected areas. Subsequently, they become structural elements of the ecological framework of the territory.

Of interest is the proposed by Gridnev (2016) algorithm for the development of natural-ecological framework, which is the methodological basis for the organization of a balanced ecological-economic territorial system of the municipality. The algorithm developed by him includes:

- analysis of the landscape structure of the territory;
- analysis and assessment of the impact of the modern use of the territory and the ecological condition of natural complexes not dependent on them;
- allocation of zones with special regulatory conditions of use of the territory;
- paired analysis of all existing functional structures of the territory;
- construction of a functional-planning model of the natural-ecological framework of a municipality and the establishment of modes of its use (p. 100).

6. Findings

Most researchers believe that it is especially important to determine the structural elements of the future ecological framework. The basis of EFT is usually made up of existing in the PNA. As a rule, the following elements are included in the structure of eco-skeleton: key natural areas (core), ecological corridors, buffer zones, areas of ecological restoration (Latypova & Omarov, 2017).

The core of the framework is carried out by large areas of protected areas: reserves, game reserves, national and natural parks, and natural monuments. The core performs the functions of maintaining the ecological balance of the territory and regulating all its parameters, preserving the natural state and integrity of natural complexes, the diversity of habitats and species, and creating recreation.

Ecological corridors are transit territories, connecting key and other elements of the eco-frame into a single system. They provide the metabolism and energy of neighboring highways and remote cores of the framework, the spatial connections between the protected areas and other elements of the ecological network. Transit territories consist of channels and floodplains of large rivers, valleys and small rivers, watersheds, protective forest plantations, etc.

Buffer zones perform protective and protective functions around key areas and ecological corridors of the POS, while providing additional stability and preventing, or minimizing, external influences on the ecological network. These include: protected areas of protected areas, water protection zones, green areas around settlements, resort and sanitary protection zones, protection zones of mine workings, water intakes, balneological objects, etc.

Restoration areas - areas that require the restoration of the natural functions of natural complexes. These include various types of disturbed land: fire, logging, landfill sites, degraded agricultural land. In the structure of the ecological framework, an important role is played by point, or local, elements of environmental activity that perform the function of protecting individual objects of nature. On the ground, they often constitute a kind of microkernel.

7. Conclusion

The Republic of Bashkortostan is located at the junction of two large physiographic countries: the East European (Russian) Plain and the Ural Mountains. Due to this geographical position of the territory of the Republic, a complex combination of natural complexes is characteristic.

On the territory of the Bashkir Pre-Urals and beyond the Urals natural complexes are experiencing a strong anthropogenic load, respectively, they are characterized by high economic development. The Pre-Ural region is distinguished by the most favorable climatic conditions, which contributes to the greatest economic development and lesser preservation of natural landscapes. The territory is characterized by a high concentration of industrial enterprises that have a negative impact on natural complexes. Within beyond the Urals, the main types of economic activity are the mining of ore minerals, intensive farming and recreation. As a result, unique lakes, reference areas of forest-steppe and steppe complexes are subject to anthropogenic influence.

The territory of the mountainous Bashkortostan due to the strong dissection of the area is characterized by relatively weak economic development. Industrial production is underdeveloped here. The anthropogenic load on the territory is associated with the influence of forestry, recreation and animal husbandry. Due to this, in general, mountain natural complexes are distinguished by relatively good preservation.

The flat part of the republic, corresponding to the southeastern edge of the Russian Plain, is characterized by latitudinal zones, within its borders forest, forest-steppe and steppe natural-territorial complexes are distinguished. In the mountainous part, characterized by high-altitude zoning, mainly mountain-forest and mountain-forest-steppe landscapes are represented.

The north of the flat part of the territory was previously almost completely occupied by spruce-fir forests with a mixture of linden, which are now preserved mainly only within the Ufa Plateau. At the present stage of development of the territory of the Republic of Belarus, the largest area is occupied by forest-

steppe. They are usually divided into three subzones: north, typically, and south-wooded. Trans-Ural forest-steppe differ from the Pre-Ural forest by the absence of broad-leaved species and the development of mountain-forest-steppe natural complexes. The smallest area is inherent in the steppes with feather-grass vegetation on black soils. The southern Urals is characterized by the development of mountain-forest landscapes, only in the southern part mountain-forest-steppe complexes are widespread. When justifying specially protected natural areas one of the main natural factors is the nature of the NTC. Taking into account the properties of landscapes contributes to the implementation of the principles of the formation of protected areas, such as ubiquity and differentiation (Nigmatullin, 2004).

The basis of the EFT of Bashkortostan currently constitute the existing PNA. Within the RB there are 218 PNA of various categories, 5 of them are of federal significance: 3 state reserves (“Bashkirsky”, “Shulgan-Tash”, “Yuzhno-Uralsky”), national park “Bashkiria”, Botanical Garden-Institute. 213 PNA have the status of republican significance: 4 natural parks (Aslykul, Iremel, Kandry-Kul, Muradymovskoe Uscheli), 27 state nature reserves, 182 nature monuments, including: zoological - 5, botanical - 55, dendrological - 34, hydrological - 22, geological - 21, complex - 45.

Five protected areas (state nature reserve “Shulgan-Tash”, national park “Bashkiria”, nature park “Muradymovskoe Uscheli”, state nature zoological reserve “Altyn Solok”, state nature reserve “Iksky”) are part of the UNESCO Biosphere Reserve with the general name "Bashkir Ural", which is included in the World Network of Biosphere Reserves.

At the same time, the buffer area is performed by the Kugarchinsky forest area, the expansion zone of the Shulgan-Tash reserve, and the buffer zone of the Bashkiria national park. The protection zones created around the protected areas also belong to this element of the eco-frame. For example, in the coastal zone of the Aslykul Lake of the Aslykul Natural Park, work was carried out to enclose the water protection zone and the coastal protective strip of the lake with a length of more than 11 km (Zakirov, 2017).

In the republic there are 7 health resorts and resorts, which also represent the EFT buffer zones. Within the ecocarcasal area, significant areas are occupied by transit territories or ecological corridors, which are more than 12 thousand rivers with a total length of over 57 thousand kilometers, about 2 thousand lakes.

Ecocorridors also include reservoirs created for the spatial and temporal redistribution of river flow, accumulation of water resources and recreational use. The largest of them: Pavlovskoe, Nugush, Yumaguzinskoe.

As a point or local, elements of the ecological framework are natural parks of local significance, for example, Zilim, more than 60 mineral springs, on the basis of which sanatoriums, burial mounds and archeological monuments operate, as well as many caves and natural objects that do not have PNA status.

There is still a lot of work to further develop the ecological framework of the RB. Geoparks will take a special place in it: “Yangan-Tau” is a complex of objects of geological, biological, historical and cultural heritage, which consists of 9 PAs, and Toratau, as well as promising natural parks, nature monuments (“Inzer”, “Agidel”, “Irendyk”, “Krykty”, “Yuryuzan”, “Pavlovka”), etc.

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