The development of protected natural areas and adjacent territories

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Abstract. In Russia, the most common form of preservation of specially protected natural areas is formation of nature reserves. Due to nature protection regulations, which limit activities within the boundaries of the reserve, and due to the difference between the natural boundaries and those of the protected natural areas, the authors propose the strategy for urban development of the territories adjacent to the protected natural areas. The study identifies the main types of the areas adjacent to the reserves and provides their classification. It is proposed to form three zones: strictly preserved, buffer and protected natural zones. Strategies for urban planning development of the territories adjacent to the protected natural areas and measures have been developed for three sites of the Belogorye reserve: Forest on Vorskla, Yamskaya Steppe, Stenki Izgorya. This will ensure preservation of unique natural complexes; strengthen the natural framework of the region and stabilize the ecological situation; intensify research and educational activities in the reserves; enhance the socio-economic development of the territories adjacent to the reserve and the development of the region’s tourist and recreational infrastructure.

1. Introduction
Various natural complexes and/or objects with their unique ecosystems make the basis of the protected natural areas. Their formation at the level of administrative-territorial division depends on numerous factors: on the historically established natural and landscape-geographical features, the specifics of public administration, on current spatial boundaries and characteristics of the territories of the administrative units. Social and economic development of the adjacent territories, which develop to meet the needs and requirements of the population, is of great importance for the status of the protected natural areas. As a result, most of the territories adjacent to the protected natural areas are to some extent anthropogenic. The processes in anthropogenic territories that are key to the regions can refer to agricultural, agro-industrial, mining complexes, etc. Their direct and indirect impact on the environment can be extremely negative for the natural framework and lead to the loss of the unique natural and biological originality of the protected natural areas. Landscape design will ensure competent and safe nature managemen to eliminate current problems of the protected natural areas and their sustainable development. The tourist and recreational potential of the territory is interrelated with the natural, historical, cultural and transport framework of the territory [4]. Landscape design of the territories adjacent to the protected natural areas involves:
- identification of typological features of these territories, and development of (proposals for) their classification.
- identification of the most favorable territories for development and establishment of regulations for their use with subsequent elaboration of development projects.
- functional zoning of the territory to identify the optimal ratio of the type of nature management and the environmental regulations.

2. Materials and methods
The theoretical and methodological basis of the study is a conflictological approach used to study the resource potential of the territory, identify interests and needs of the participants of urban planning activities in the territories adjacent to the reserve, and to find a compromise in solving issues of land use optimization in order to preserve and strengthen the natural framework. The study also employs a comprehensive analysis of the process of urban development of territories with regard to the socio-economic function of various types of landscape.

3. Classification of the territories adjacent to the protected natural areas
It is proposed to classify the lands adjacent to the protected natural areas in accordance with the interstate standard [1], in accordance with the basis for the development of principles of landscape classification by A.G. Isachenko [3], with the classification of modifications of primary and conditionally primary facies developed by V.I. Prokaev [9]. These classifications are based on the degree of impact of human economic activity on the territory, the depth and degree of anthropogenic transformation. This allows most full application of these classifications to the territories adjacent to the protected natural areas, which are largely anthropogenic. When studying the territories adjacent to the protected natural areas, it is proposed to correlate their classification with urban planning conflicts developed by M.V. Perkova [6, 7]. Thus, the lands adjacent to the protected areas can be classified as follows (Table 1).

1. With regard to the main types of landscape, depending on the socio-economic function:
- agricultural;
- forestry;
- water management;
- industrial;
- landscapes of settlements;
- recreational;
- reserved;
- not currently used [1].
2. Depending on the location in relation to the protected natural areas.
- Land use.
- Material.
- Linear.
3. Depending on the types of urban planning conflicts.
- Land use;
- Property;
- Social and functional;
- Transport.
4. Depending on the degree of transformation.
- Indigenous (unchanged and conditionally unchanged);
- Derivatives (modified to varying degrees);
- Anthropogenic (completely modified).

Indigenous landscapes include modern territorial units that did not undergo or were indirectly subjected to economic activity [2]. Specially protected natural areas are indigenous landscapes.

Derived landscapes refer to territories with changes within their boundaries related to the features
of their use. The features characteristic of these landscapes have retained their priority, and changes occurring can be temporary and reversible unless the interference of human activity.

*Anthropogenic landscapes* are among the most deeply changed territories. These include man-made parks, naturally formed residential and historical industrial territories, landscapes with strong religious, and artistic and cultural associations [5].

5. **By economic value.**
- Reasonable;
- Excessive;
- Depressive.

*Reasonable* territories include areas of agricultural, industrial and other anthropogenic activities with the results needed to maintain a high level of economic, social, economic, cultural and other functions.

*Surplus* territories include areas with irrational economic activities within their boundaries with outcomes that have an adverse affect on the state and development of the protected areas.

*Depressive* territories include areas where no or insufficient activities performed, which deteriorated their functional and aesthetic qualities. For example, natural waterlogging of floodplain areas; degradation of landscapes in need of restoration; soil erosion due to no measures to protect them undertaken, etc.

4. **Potential for development of the territories adjacent to protected natural areas**
The study of different types of territories adjacent to the sites of the Belogorye reserve revealed different levels of their resource potential (high, medium or low). Thus, the lands with rural settlements, their transport links and areas needed for sustainable socio-economic development of the territorial unit were recognized as unsuitable for the formation of buffer territories of the protected natural areas within their boundaries. At the same time, water and/or floodplain and agricultural territories are of the highest potential for development, which makes them a priority basis for formation of a buffer zone of the protected natural areas.

For a number of natural reasons (a decrease in livestock, abnormal weather conditions, etc.), 30–40 percent of these lands are not used. At the same time, the land of the protected natural areas make up 49.4 million hectares, as a result of which many territories adjacent to the protected natural areas are agricultural land. The presence of floodplain landscapes is characteristic of these territories. The river network with adjacent territories has a great potential for development as buffer zones. A coastal strip, a coastal protective strip and a water protection zone restrict the formation of any infrastructure, which takes place with regard to the established mode of economic activity.

Thus, agricultural lands and floodplain territories adjacent to the protected natural areas need measures to prevent environmental degradation. Partial withdrawal of degraded territories from agricultural lands and renaturalisation of their landscapes can expand the boundaries of the protected natural areas to natural boundaries.

5. **Transformation of the territories adjacent to protected natural areas**
Based on the functional zoning model of the territories adjacent to the protected natural areas proposed by M.V. Perkova [8], strategies for the development of three sites in the Belogorye reserve have been developed. The urban development strategies need allocation of three main zones: strictly preserved, protected, and buffer zones. A *strictly preserved natural zone* is the natural core, which implies limited human presence due to the specifics of nature conservation activities. Protection and buffer zones are formed along the perimeter of the protected natural areas. A *protected natural zone* includes recreational activities within its boundaries, which will meet the requirements of special conditions for land use. At the same time, the territories adjacent to the protected natural areas belong to the protected natural zone. It is proposed to form a *buffer zone* as territories of the protected landscape and territories with objects of tourist and recreational infrastructure – territories for scientific research, treatment-and-prophylactic and recreational territories.
M.V. Perkova and O.E. Roshchupkina have developed a strategy for transforming the territories adjacent to the protected natural areas in three areas of the Belogorye reserve in Belgorod region. At the same time, the fundamental goal is to form a single interconnected network of territories of the Belogorye reserve through a continuous system of connecting elements (ecological corridors, protected natural areas, buffer zones, riverine territories, etc.) and to ensure its development as a large federal museum-reserve, corresponding to the status of a particularly valuable heritage site of the peoples of the Russian Federation.

The urban development strategy for the territories adjacent to the reserve includes:
1. Expansion of the boundaries of the reserve areas to natural boundaries by changing the status of currently unused state territories.
2. Formation of conservation and buffer zones to maintain a more stable ecological status (including the renaturation of landscapes and reclamation of technogenic landscapes).
3. Formation of ecological corridors to provide relationship between the cores of the natural framework and to increase biodiversity.
4. Organization of visit centers for implementation of educational, cognitive, teaching and research functions of the reserve, as well as the development of tourist and recreational infrastructure in the territories not currently used by the reserve (Figs 1–3).

The urban development measures for the Les na Vorskla area (Fig. 1) include:
1. Organization of tourist, recreational and educational space on the basis of an arboretum adjacent to the reserve.
2. Construction of a wooden nature trail in the forest and a structure covered with perforated metal over the ravine.
3. Design and construction of a new building for a nature museum with a greenhouse in place of the old building that is to be demolished.
4. Reconstruction and adaptation of the cultural heritage site of regional significance The house where the geobotanist, academician V.N. Sukachev worked. 1934–1941.

The urban development of the Yamskaya Steppe site (Fig. 2) includes:
1. Organization of ecotrails for walking and horseback riding in the reserve with unpaved surface.
2. Construction of a facility over the paleosol layer in the territory of the reserve.
3. Breeding of ungulates for preservation of identical steppe landscapes in Belgorod region (saiga, etc.)

**Figure 1.** The strategy for transformation of the territories adjacent to the protected natural areas (Forest on Vorskla, Belogorye reserve). Developed by M.V. Perkova and O.E. Roshchupkina
kulan, Przewalski’s horse) in the territories adjacent to the reserve.

4. Creation of the tourist and recreational infrastructure in the territories adjacent to the reserve (an asphalt road and public transport stops).

5. Strengthening of the dust protection in the Lebedinsky mining complex; treatment of the tailing dumps with chalk suspension in order to fix the surface and form stable relief — artificially created chalk mountains with identical vegetation.

Figure 2. The strategy of transformation of the territories adjacent to the protected natural areas (Yamskaya steppe, Belogorye reserve). Developed by M.V. Perkova and O.E. Roshchupkina.

The urban development of the Stenki Izgorya site (Fig. 3) includes:

1. Construction of a nature trail in the territory of the reserve.
2. Design and construction of a hippotherapy center in the territories adjacent to the reserve.
3. Organization of a bee park in the agricultural lands adjacent to the reserve.
4. Design and construction of a phytocenter in the territories adjacent to the reserve.

Figure 3. The strategy for transformation of the territories adjacent to the protected natural areas (Stenki Izgorya, Belogorye reserve). Developed by M.V. Perkova and O.E. Roshchupkina.
6. Conclusion

1. The classification of the territories adjacent to the protected natural areas by groups has been proposed: by the types of landscape, depending on the socio-economic function; by the type of location; by the type of urban planning conflicts; by the degree of transformation, by the economic value. This classification will take into account various interests of those involved in urban planning activities in relation to the considered area and contribute to realization of its resource potential through optimization of land use.

2. The strategy has been developed for transformation of the territories adjacent to the protected natural areas, which can be the basis for optimization of land use. It will preserve unique natural complexes; strengthen the natural framework of the region; contribute to research and educational activities in the reserve; develop the tourist and recreational infrastructure in the territories adjacent to the reserve.

3. Development of the tourist and recreational infrastructure will make it possible to create an investment-attractive environment for formation of tourist and recreational clusters of educational tourism in the territories adjacent to the protected natural areas. It will develop unique recreation and tourism forms (hippotherapy center, phyto-center, bee park) to identify the region’s environment and help attract internal and external tourist flows.

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