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# Structure and evolution of landscapes in connection with strategic planning of development of rural areas (on the example of the Slavsk area in the Kaliningrad district)

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**Abstract:** *The article describes the landscape planning possibilities for changing of rural zone functions on an example from a problem area in the district of Kaliningrad. During the field season of 2003 the group of landscape-ecological planning of Faculty of Geography and Geoecology, Kalinigrad State University, accomplished the first stage of research – the geomorphological and landscape mapping of the Slavsk area (scale 1:50,000), and the tourist map of the area was prepared (scale 1:100,000). On the basis of field research the functional-ecological map of the Slavsk area was drawn.*

*On this basis four spatial zones were determined in the Slavsk area:*

- *the protected natural territories and their buffer zones,*
- *delta lowland of the river Neman limited by the waterway of the river Matrosovka,*
- *lowland plain in the central part of the area with wooded aeolian sands,*
- *upland moraine plain in the southern part of the area.*

**Keywords:** *spatial planning, functional zoning, strategy of development, ecological frame, landscape analyze.*

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## Introduction

Most of rural areas suffer from numerous problems both in the post-socialist countries, and in several countries of the EU. The countries of the Baltic region are no exception. Many of them are in a depression resulting from the insufficient development of infrastructure and some other social-economic circumstances. These areas tend to intensify agricultural production with the related process of labor resource liberation. That is why these territories attract attention of planners, researchers and managers. In fact, sustainable development is generally connected with changes of functions of various zones. Changing of functions has to be well based, because the consequences of mistakes can be hardly reversible. It is necessary to take into account both the economic and social effects of development, and also the aspects of natural environment of the areas

in question and their ecological frame. The system of landscape planning can supply a comprehensive approach to this process.

## **Spatial and landscape planning in Russia**

Landscape planning is developing nowadays in many countries of the EU and is gradually entering the nature protection activity and the strategic development processes in many regions of Russia.

At the same time landscape planning is a necessary component of spatial planning. When seen against the background of landscape planning, which basically is concentrated on the analysis of natural and anthropogenous conditions of a territory and the development recommendations for sustainable development of a region, spatial planning includes the analysis of socio-economic conditions, external and internal tendencies of development, and also the land use regulation process.

Thus, it is possible to consider the system of spatial planning as a part of both the strategic and the operative management of space. In fact, spatial planning includes the domain of urban design, especially at the municipal and local levels. In our country, until the 1990s the tasks of spatial planning were carried out by the system of general plans, and main functions of strategic planning were carried out by the Gosplan. Now this system is still partly kept. Various boards such as administrations of the respective entities within the Russian Federation and municipalities (centers of strategic planning), and also design organizations deal with different levels of activity, which enters the framework of the concept of spatial planning.

An important factor limiting the functioning of this system is the absence of precise legislative basis for its activity. In fact, the only normative document regulating construction and land use until now is the Town-planning and Ground code of the Russian Federation.

Besides, a weak element of the system is also constituted by a fragmentary resource analysis, which does not allow for making comprehensive assessments of spatial opportunities and problems.

In the actual practice evaluation of space is mostly based on the analysis of existing statistical materials, disregarding many natural components of environment and their interrelations, which would require comprehensive field studies.

This shortcoming must be overcome in order to obtain a system of landscape planning accounting for the various factors of natural and anthropogenous environment and for prediction of the adverse ecological consequences resulting from the human economic activity.

Landscape planning is of special importance for the Kaliningrad area, considering its geopolitical situation and the necessity of maintenance of sustainable development and improvement of ecological conditions.

Besides, many municipalities face the necessity of changing the present structure of management, as in their majority they remain subsidized. First of all, this concerns the remote and traditionally agricultural municipalities, whose attractiveness for investment making is small. Currently, work on landscape planning is underway in urban districts and around the resort zone, as the most attractive and best mastered areas of the territory. Nevertheless, the majority of municipalities remain backward in this respect.

One of such mainly rural municipalities is the area of Slavsk, which has been chosen as the pilot territory for developing the system of landscape planning.

## The pilot area

The area of Slavsk is situated in the northwestern part of the Kaliningrad district, bordering upon the Lithuanian republic, washed by waters of the Curonian gulf, and including the vast delta of the Neman river. This is one of largest (1,302.5 km<sup>2</sup>) and at the same times most thinly populated (16 persons per km<sup>2</sup>) municipalities of our region. In the socio-economic terms this municipality is one of the most pronounced problem area in the Kaliningrad district. Its population is at about 22,000, rural population accounting for 80.4% (in the whole district – 22.4%). Natural increase of population is negative. The basic economic sector of the area is agriculture (stock breeding), which employs 28% of the working population. The unemployment rate is 4.2% of the able-bodied population, but the rate of hidden unemployment is very high. Along with the traditional agricultural orientation of area, it lacks industrial enterprises. There are only food processing plants in the Slavsk area. Petroleum is extracted here, but it has not influence on economic development. Thus, there are the following negative tendencies in the Slavsk area:

- crisis in agriculture,
- high level of unemployment,
- low standard of living of the population,
- low attractiveness for investors.

They call for a change in the development strategy of the area.

More than half of the territory of the area is constituted by agricultural land, a significant share of which are polders – unique anthropogenous landscapes with controlled flow and substance-power regime. There are several protected natural territories in the area, their surface accounting for 23.7% of the total area. This indicator value comes near to the average for the developed countries of EU (the average for the Kaliningrad district being 14.9%). Forest share on this territory also exceeds the district average with 28.3% (17% for the district). There is also the largest peat-bog area, nowadays under protection, of great importance in balancing the ecological conditions of the entire territory in question and the Baltic sea basin.

## The study work accomplished

Thus, in order to form the strategy of development for a given municipality it is necessary to take into account not only the objective need of increasing the economic potential, but also the role of this territory in the maintenance of the broader ecological system, in this case – of the Baltic region. Otherwise, the consequences of unreasonable location of industrial objects in vulnerable natural and anthropogenous landscapes can be irreversible. Besides, ecological condition is an important component of the concept of „quality of life“, and improvement of quality of life of the population is the mission of any authority, of regional or municipal level.

Landscape planning, as a process of analysis of natural and anthropogenous conditions of an area is carried out in two stages. In the first stage the comprehensive inventory of landscapes and resources of the area is drawn up, requiring both field studies, and the search for archival and other materials. The second stage consists in evaluation, based on investigation of importance, vulnerability and potential opportunities of use of landscapes as a resource for diverse purposes.

During the field season of 2003 the group of landscape-ecological planning of the Faculty of Geography and Geoecology of the KSU (Kaliningrad State University) accomplished the first stage of research – the geomorphological and landscape mapping of the Slavsk area (on the scale of 1:50,000). The tourist map of the area was prepared (scale 1:100,000). A significant collection of literary, archival and other material was gathered as well. At the present, second stage of landscape planning, investigations are in course on the assessment.

Landscape mapping is used as a basis for further work in landscape planning of an area. It provides the opportunity for determining the features of a given environment and the principal problems of nature use in this area.

Landscape mapping was carried out according to the standard procedure, complex landscape structures of basic forms of relief were put together with the method of routing landscape shooting (Isachenko 1998; Preobrazhenskij et al. 1988).

The following genetic types of natural landscapes were outlined:

1. Landscapes of the developed low valleys with alluvial turf and alluvial-marsh soils under meadows and agricultural lands on the delta alluvium.
2. Flat delta plains with light alluvial sod, partially podzolic soils under agricultural lands and meadows on the delta alluvium.
3. Low coastal peat bogs under grassy, moss-sedge and meadows, periodically flooded.
4. High moor.
5. Seaside reed marsh.
6. Polder landscapes with light sod-gley under agricultural lands on delta alluvium.

7. Wavy dune and dune-like landscapes with meadow-podzolised soils under pine and pine-oak woods on aeolian sands.
8. Aeolic sand, fixed in places by a grassy cover.
9. Wavy and sloping-wavy plains with sod-podzolic loam gley soils under agricultural lands and mixed woods on heavy red moraine.
10. Sloping-wavy plains with sod-podzolic loam gley soils under agricultural lands and mixed woods on light moraine.
11. Valleys of small rivers (undeveloped).
12. Aquatic landscapes, including anthropogenous (channels, land improvement ditches).

Landscapes of the ancient delta of the Neman river occupy more than two thirds of territory of the Slavsk area. The principal features of the natural complexes are low relative heights (from 0.7 up to 3.5–4.2 m), dense hydrological network of the surface waters, and the flat or weakly wavy relief, sometimes uneven (Timofeev, Bogolyubova 1998).

Resulting from the century of intensive agriculture the soils on flat and weakly wavy delta plains were transformed into the cultural ones, and natural landscapes turned into agrolandscapes.

A special category of cultural landscapes is constituted by polders. Their initial landscapes were boggy meadows of the ancient delta of the Neman, frequently situated below the sea level and flooded repeatedly. The unique system of hydraulic engineering structures has been built over centuries, providing for adequate fertility and favorable water regime. The man-made agricultural landscapes occupy more than half of the ancient Neman delta. The polder landscapes are extremely vulnerable. Polder landscapes occur in Lithuania, Sweden, Denmark, Germany, Poland and the Netherlands. The Slavsk area features the largest polder in Russia.

The landscapes of the developed flood plain can be associated with the very narrow strips along the Neman, Matrosovka, Lugovaya and Rzhevka rivers. The territory occupied by these landscapes is limited by the dams, whose construction began hundreds years ago. Despite their marginal share, the soils of these areas make up for the most valuable agricultural land.

The modern flood plain landscape features rather high stability, as it is supported by the natural processes.

Low peat bogs are located at the coast of the Curonian gulf. Low bogs are covered mainly by grassy and moss-sedge alder patches with an admixture of willow and ash and also by the hygrophilous reed meadows. The age of peat adjournment can reach 4.5 thousand years, the capacity of peat horizons varies from 30 cm up to 3.5–4 m.

The central parts of low bogs are covered by various kinds of sedges, and in the especially humidified sites by *Phragmites communis*, *Genceria aquatica* and some others. For the edges of low bogs *Filipendula ulmaria* is common, consid-

ered to be more often in contact with dry meadows. Especially remarkable for low bogs of the Neman delta are black alder woods, mainly dominated by *Alnus glutinosa* and some other varieties of alder, with the single trees of *Fraxinus excelsior*, *Salix reptans*, *Rhaennus frangula*, etc. growing there as well.

Basic peat-formers of the low types of vegetation the representatives wood are the grassy and mossy of groups of plants. Prevailing among the peat-formers of the grassy group are various kinds of sedges. An appreciable peat-former among this group of plants is the ordinary reed. Quite often its contents in peat grows up to 85%.

Among the peat-forming plants in the forest the basic one is black alder. As an admixture there also grow spruce, willow, birch, although sometimes birch may be the basic peat-former, giving rise to birch peat. Basic peat-formers in the moss group of plants around the low bogs are glues.

Black alder, on low bogs, goes back to primary the woods. The core boggy black alder woods support water balance of the territory considerably exceeding the Slavsk area. Besides, these woods are ornithological shelters.

Landscapes of low bogs are only marginally changed by man. Due to the preservation of the core woods they can be considered as the most stable landscapes. On the most part of low peat bogs of the Slavsk area the reserve of „Zapovednensky“ sanctuary was established.

The areas of high sedge peat, sedge-sphagnum bogs of birch-pine dwarfshrubland are located on periphery, mainly in the cultivated part of the area. The largest bogs are Chistoe and Gromovskoe.

The Chistoe bog has the status of a reserve, while the status of Gromovskoe bog is being determined by the decisions of the regional administration. The age of high peat bogs exceeds 3 thousand years. *Betula pubescens* and *Picea excelsa* are common among the ancient vegetation of the high bogs.

Various kinds of *Sphagnum*, *Pinus sylvestris*, *Eriophorum vaginatum*, *Scheuchzeria palustris*, *Vaccinia vitis*, *Vaccinia myrtillus*, various kinds of *Droseraceae* in case of an extensive development of *Trichophorum caespitosus*, and *Rhuncospora alba* in the case of larger bogs are the forming species of the high bogs.

Grasses, woods and a high variety of moss species are characteristic for the vegetation of the high bog. The grass group is represented only by two characteristic peat-formers: *Eriophorum vaginatum* and *Scheuchzeria palustris*. Pine, whose rests turn into peat virtually in their entirety, belongs to the group of the wood-based high peat-formers. *Sphagnum fuscum* and other kinds of *Sphagnum* moss make the basic moss group of the peat-formers of high bogs.

High bogs are vulnerable natural complexes. Production of peat will result in disappearance of these unique landscapes. Seaside reed marshes are located along the coast of the Curonian gulf. They are a place of spawning and nesting.



These landscapes have practically not been subject to anthropogenous changes and have a high level of stability.

The areas of deflated aeolian sands occupy small plots in the southern part of the area near to the settlement of D'unnoe, in the southern part of the Slavsky woods. The deflated sands are partially fixed with rare plants.

The sandy areas and dune ridges represent unique natural landscapes, also extremely vulnerable. Excessive recreational traffic on these areas will result in disruption of the unstable vegetation and soil cover and will lead to landscape transformation.

The taiga-proper species dominate on the surfaces of dune sands, planted with spruce-forest, pine and pine-oak woods. However, there also exist associations, which are rather characteristic for the broad-leaved forests, lime-tree forests, or oak forests. Some patches of woods have features of mature park woods: mature pine-forests with herbal layer.

The landscapes of the moraine plain are located in the southern part of the area, under farmland and mixed woods. Small rivers form the narrow eroding valleys. High bogs, which are now used for peat extraction were formed on the concave hilltops.

Soils of the moraine plain have excess moisture because of the impermeable layer at the depth of not more than 0.5 m. Moraines have higher natural fertility than the delta lowland soils. Practically all of them can be drained and require chemical improvement. Natural vegetation was replaced by the cultural one, all of the wood areas are the secondary pine and spruce forests. The landscapes of the moraine plain are unstable.

Anthropogenous landscapes began to form in the area since the 13<sup>th</sup> century. The human habitat landscapes occupy a small area and are basically the settlements of agricultural type. In these settlements the technogenic landscapes are represented only by small enterprises of manufacturing industry and municipal services. Peat extraction and individual deposits of building materials, agricultural works, as well as pumping stations form the sparse system of technogenic landscapes. The unique anthropogenous landscapes of linear type, whose construction began in the 16<sup>th</sup> century are the dams protecting against flooding.

Thus, the area of Slavsk represents a complex mosaic of natural, natural-anthropogenous and anthropogenous landscapes.

The authors used the methodology of K.N. Dakonov and A.V. Doncheva (2002) when drawing up the functional-ecological map of the Slavsk area. The Slavsk area belongs to well developed territories, the area of farmland makes up 58% of the total. The agricultural system of this area can be classified as chemical-technological (Milkov 1973), with the leading role being played by energy- and material capacity, deep land improvement intervention and chemical intensity of production. The necessary transition towards the landscape-adapted type of agri-



culture for this area should be based upon the concepts of crop programming and ecological priority in spatial planning.

The maintenance of ecological balance in such areas is meant to protect natural territories (Solntsev 1981). There are three reserves in the Slavsk area – „D’unii“, „Gromovskiy“ and „Zapovednoe“. These reserves aim to preserve the natural complexes and to maintain biodiversity. The protective or buffer zones with an adjustable mode of economic activity can be formed on the respective territories.

The forest management in the area should be related to the first group and carry out protective, sanitary-hygienic and improving function (*Designing, building...* 2001). From the ecological-economic point of view the optimum forest cover would make 40–60 % (Stepanitskiy 2001), in the Slavsk area it makes currently 28.3%. A part of this cover is included in the reserves and water-protection zones.

The water-protection zones along the Curonian gulf, reservoirs and rivers of the area are established to prevent pollution and to maintain the appropriate environment of water organisms.

Monuments of nature have exclusive importance for preservation of natural and anthropogenous objects and phenomena at different levels and for protection of special elements of a landscape, and are especially important in this area for maintaining the ecologically balanced structure of landscapes (Stepanitskiy 2001). However, the unique dune complexes, deflated sands, dams and hydraulic engineering structures should also be placed in this category.

The zones of undisturbed natural landscapes – seaside meadows, boggy valleys of the rivers, low and high bogs qualify, as well, as ecological reserves.

The important function of the natural filter, a protective and aesthetic barrier between the natural environment and the technogenic landscapes of enterprises and transport lines belong to the sanitary-protective zones.

Urban landscapes have combined properties of natural landscape and the functional features of urban technogeoms and represent hierarchical systems consisting of mutually associated natural and technical subsystems, developing by natural and social laws (Milkov 1973). The degree of stress in the ecological situation depends on the rank of a settlement and its socio-economic functions.

There is a single small city in the area – the center of municipality (Slavsk). Bolshakovo, Yasnoe, Zapovednoe are centers of local administration with various functions. Gorodkovo, Okhotnoe, Sovetskoe are the settlements with agricultural and cultural-household functions. Bolshiye Berezki, Pobedino etc. are the settlements with only dwelling functions.

Functional zoning allows for compiling the chart of the ecological skeleton for an area and for development of a justified strategy of municipal planning in terms of land use.

The investigations conducted have shown that it is necessary to approach in a differentiated manner spatial planning in several parts of the Slavsk area, in view of diverse landscape structures, vulnerability of natural complexes and the system of management. On this basis we have recognized four spatial zones in the Slavsk area:

- protected natural territories and their buffer zones,
- delta lowland of the river Neman limited by the waterway of the river Matrosovka,
- lowland plain in the central part of area with wooded aeolian sands,
- upland moraine plain in the southern part of area.

For each of these zones a special system of measures directed towards change or improvement of their functions should be developed and implemented, proceeding from the changes in economic and political realities of the municipality.

### Protected natural territories and their buffer zones

These areas include low and high bogs (reserves) and a rather wide, smoother coastal strip. Besides, the buffer zones of protected territories 1 to 5 km wide should form these areas as well, depending on local conditions. The actual function of this zone – maintenance of ecological balance of eastern part of the Baltic sea – should be completely kept. A limited recreational use of territory, in particular, development of ecological tourism is assumed. Besides, the economic activity of the existing households should be under control of the nature protection organizations. In the buffer zone of the protected areas, where economic activity is carried out, it is expedient to develop an extensive agriculture of a limited scale, handicrafts and traditional trades (Stepanitskiy 2001). A degree of concentration of the necessary objects of recreation and tourism can be tolerated.

### Delta of the river Neman limited by the waterway of the river Matrosovka

This territory, except for a narrow strip adjacent to the Neman, represents almost continuous agricultural lands, mainly polders. Taking into account the specificity and the value of polders, their exploitation should be continued (intensive plant growing). At the same time the monotony of the landscape can be broken by planting protection strips along the roads and numerous channels that will serve also to preserve the biodiversity of landscape. There are also some continental dunes and deflated sands, which are potential objects for tourism in this territory. Taking into account the socio-economic necessity of adding new industrial branches, it is expedient to develop active tourism in this zone and to provide construction of horse lines, golf grounds, bicycle-paths, camping grounds and parking places. The center of tourist activity could be established in the settlement of Yasnoye, which suffers from a long economic and demographic crisis. The recreation and tourism orientation of this zone can be successfully combined with the concept of cross-border cooperation.

### Lowland plain of the central part of area with woody aeolian sands

The landscape of this zone is quite similar to the previous one, except for the widespread forest cover. The essential feature of this zone is the presence of the only city of the area – Slavsk, an administrative center, which has also transport function and where the majority of objects of industrial manufacture and infrastructure of the area are concentrated. In the future the functions of an administrative center will be kept. At the same time it is necessary to return to the city its lost traditional function of a health resort. Performance of this function is promoted both by the ecological-climatic parameters and the presence of mineral waters. Besides, woods can become the grounds for controlled recreation.

### Upland moraine plain of the southern part of Slavsk area

The landscapes of this zone differ greatly from landscapes of all the other parts of the area. The entire southern part of the area is constituted by the elevated plain of low hills with valleys of the small rivers. Superficial sediments of this zone are of fine and medium loam. Almost whole territory of this zone is under agricultural use. The settlement of the secondary importance is Bolshakovo, being simultaneously a transport junction. Agricultural functions of this zone should be supplemented. It is expedient to develop gardening and bee keeping here, and to start plantations of hop. In the combination with barley it can serve as the raw material base for the local brewing development.

Thus, the spatial planning of the Slavsk area allows for looking with a degree of optimism at this now depressed territory. The analysis of spatial structure of the area demonstrates the necessity of combining the elements of economic feasibility with those of preservation of natural environment when developing the strategy, an important condition for the stable development of this territory.

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