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Spatial variability of multifunctional landscape as the basis for potential differences of regional „smart growth“ of rural areas – the examples from Poland

Abstract: *Management of multifunctional landscape in conformity with the prerequisites of the sustainable and harmonious development constitutes currently one of the priorities of spatial policy in the countries of European Union. This policy assigns a special significance to rural areas, subject to a very strong human pressure and the associated functional and spatial transformations of landscape. The purpose of the present report is to identify the conditions of regional development of the rural areas, linked with the concept of „smart growth“, and to illustrate them with the results of analysis of the factors determining this process, conducted for two territorial units of Poland, corresponding to the provinces of Greater Poland – situated in western Poland, and Podlasie – in the north-eastern part of the country. The choice of these provinces was by no means incidental, since they are representative, in terms of numerous socio-economic features, for the larger areas of western and eastern Poland. The results obtained indicate that smart growth can be considered a very important tool in development of the regional growth policies. It allows, on the one hand, for making use of the natural resources of the environment and of the socio-economic potential of the region, while on the other hand – to optimise regional growth in accordance with the principles of sustainable development.*

Keywords: *multifunctional landscape, sustainable development, smart growth, rural areas.*

Introduction

One of the priorities of spatial policy in the countries of European Union is constituted currently by the correct, that is – conform to the prerequisites of sustainable and harmonious development – management of the natural and cultural landscape (European Strategy of Sustainable Development 2001). The general principles of managing space, understood as the multifunctional landscape, are

included, in particular, in several of the basic documents of the European Communities, such as the Pan-European Strategy of Biological and Landscape Diversity (1995), European Perspective on Spatial Development (1999), European Landscape Convention (2000), and European Strategy of Sustainable Development (2001). A high number of precepts forwarded in these documents concern the subject of the rural areas. Currently, it is just the rural areas that are undergoing the most intensive civilisation-related transformations, it is within them that the very strong processes of environmental destruction are taking place, involving the change of their natural character and of the quality of their sanitary status. These areas are, as well, subject to the most intensive functional-spatial changes. The changes of the landscape function give rise to appearance of a new human space, endowed with the environmental, economic and social dimensions, whose attribute is constituted by development (Benfield et al. 2001; Degórski 2003a).

One of the tools allowing for the optimisation of this development is smart growth. This concept associates the ideas of sustainable land use, sprawl control and spatial order. Smart growth means smart management of resources in both growing and declining communities. Smart growth, like sustainable development, is at the same time productive and environmentally, economically and socially sound, while enhancing the choices that people have regarding housing, jobs, recreation and transportation. The long-term needs of people, businesses and environment ultimately define what is smart and sustainable growth and what is not (Smart Growth Network 2002).

One of the most important items in the procedures of elaboration of strategies related to the smart growth concept is determination of the local and regional conditions for the sustainable development, and then indication of its directions conform to the environmental, social and economic potential of a given area. In construction of such strategies an essential role is played by the generation of optimum solutions linking land use and multifunctionality of landscape, and establishment of the foundations for the sustainable development in each of the sectors of economy (including agriculture), across the entire natural-economic-social system. The primary goal in this process is to enhance the existential safety and the quality of life of the inhabitants.

The purpose of the work here reported is to identify the conditions for regional development, referring to the concept of smart growth in the domain of rural areas, and to provide an illustration based on the examples of results from the analysis of factors determining this process. The latter analysis was carried out for two territorial units in Poland, corresponding to the provinces of Greater Poland (Wielkopolska), situated in western Poland, and Podlasie, situated in the north-eastern part of the country. The choice of these two provinces was by no means incidental, since they are representative, in terms of numerous socio-economic characteristics, for the larger areas of the western and eastern parts of Poland.

Changes in land use and landscape functions in rural space

One of the consequences of the civilisation-related development of the population is constituted by the structural transformation, reflected through land use changes, generating, in turn, the functional and spatial changes in landscape (Figure 1). Along with these changes there are also transformations in the domains of resources, structure, diversity, stability of the matter and energy fluxes in landscape (the geo-dynamic and bio-geo-chemical processes), spatial cohesion of the areas valuable for their natural assets, or the social utility of landscape quality (Degórski 2003b).

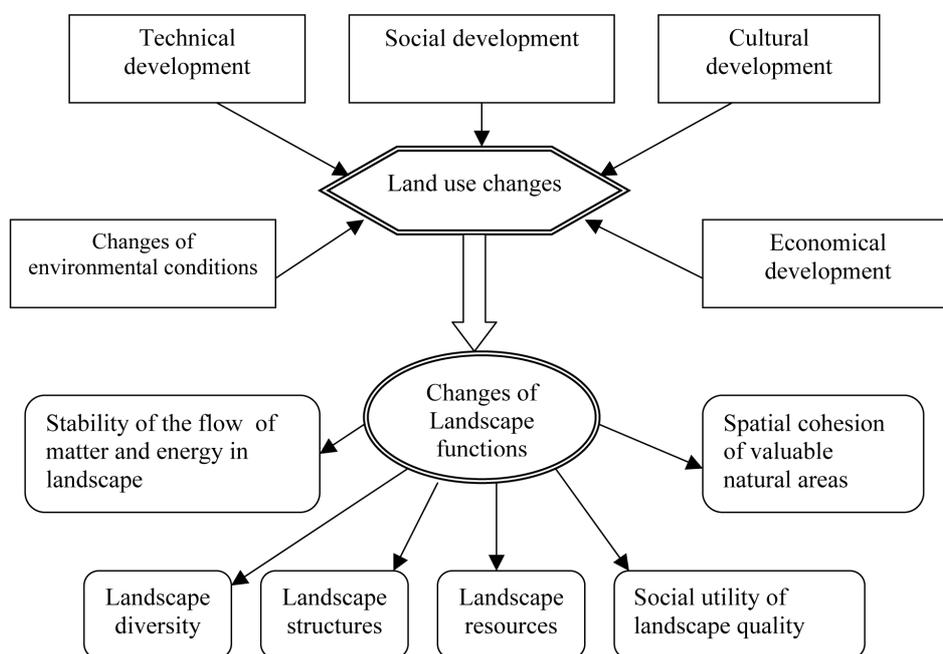


Figure 1. Structural transformation of landscape

An exceptional place is taken in all these changes by the rural areas. These areas, as indicated already, are the most active element of space in the civilisation-related transformations. They are, in particular, the locus of the change from the traditional agricultural functions into the residential, transport, industrial, service or tourist-recreational functions (Figure 2). These areas are therefore subject to the strongest processes of anthropisation of landscape.

A special role is played in the dynamics of the functional and spatial changes over rural areas by the mutual relations between the areas used for both plant and animal farming production and the forest areas. Until the turn of the 20th century the deforestation processes, proceeding with a variable intensity, dominated in Europe, and therefore also in Poland. At the beginning of the second

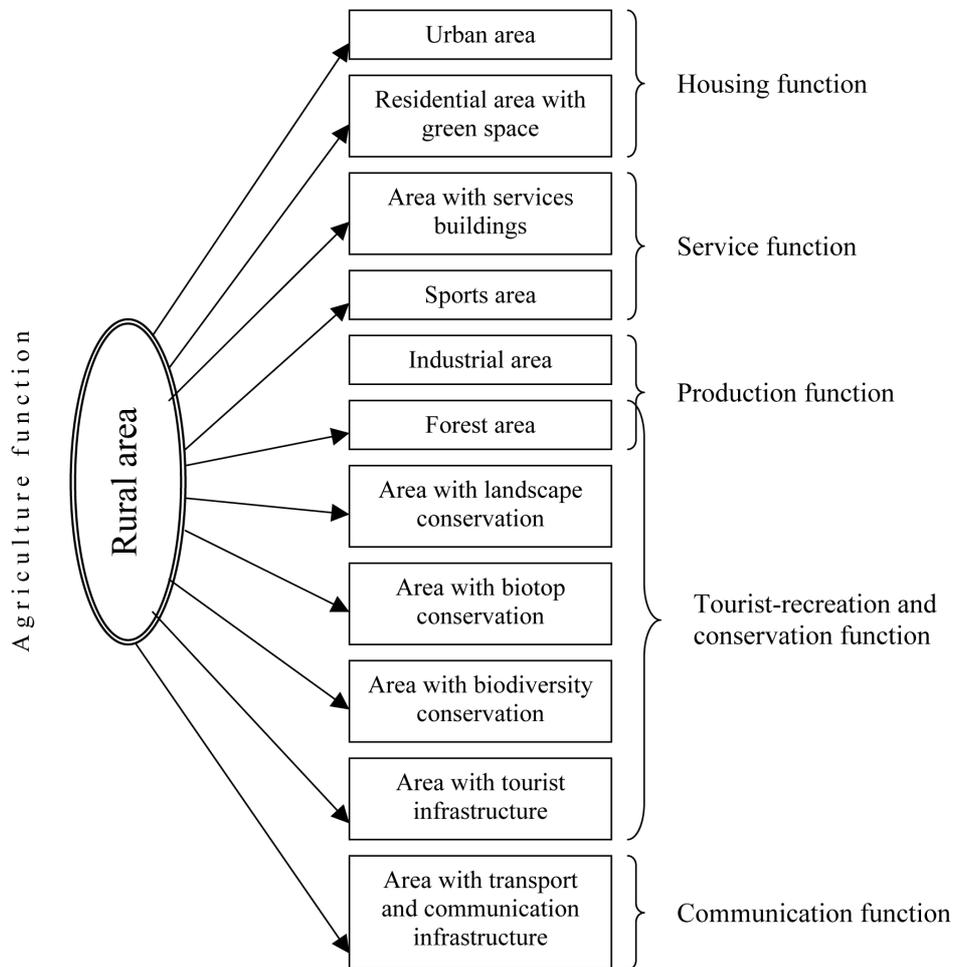


Figure 2. Functional and spatial changes of rural landscape

millennium the share of forest areas in Poland was at about 70% (Maruszczak 1988; Degórska 1996). It decreased by the turn of the 20th century to approximately 40%, and then by the 1930s and 1940s – to roughly 22% (Degórska 1996). The decrements of the forest share were mainly brought about by the transformation of forest areas into agricultural land, mainly arable land. This land was used for food production, directly or indirectly, or for other crops. In some cases land was cleared where forests grew on soils poor in nutrients, like podzolic earths, classified as the poorest quality soils. In the second half of the 20th century these soils were the first to be excluded from the agricultural use and assigned for other forms of use. They were either forested again, or used for housing, commercial or industrial investment projects. This process caused that during the last 50-60 years the forest share in Poland has been increasing, while the share of arable land has been decreasing. The contemporary forest shares of the two provinces in question are 25.2% for the Greater Polish province, and

29.6% for the Podlasie province. Agricultural land accounts for, respectively, 63.4% and 59.5% (*Statistical yearbook...* 2003).

In the category of agricultural land an important role is played, side by side with arable land, also by meadows and pastures (Figure 3 and 4). Meadows, especially in eastern Poland, are characterised by an extensive or semi-extensive exploitation form, which enhances certainly the landscape value of the area with respect to its biodiversity, and also allows for the preservation of the ecosystems in the semi-natural or alike form. A high share of meadows and pastures in the land use structure means also a potential capacity of developing cattle raising based on grazing. Total area of meadows and pastures in the Greater Polish province equals 289,900 hectares, and in Podlasie province – 402,400 hectares.

Both sustainable development and smart growth depend largely upon the preservation of the natural and landscape assets of the environment and therefore also upon the most valuable objects in these terms. This applies to the areas containing highly valued natural elements, both biotic and abiotic, as well as the ones

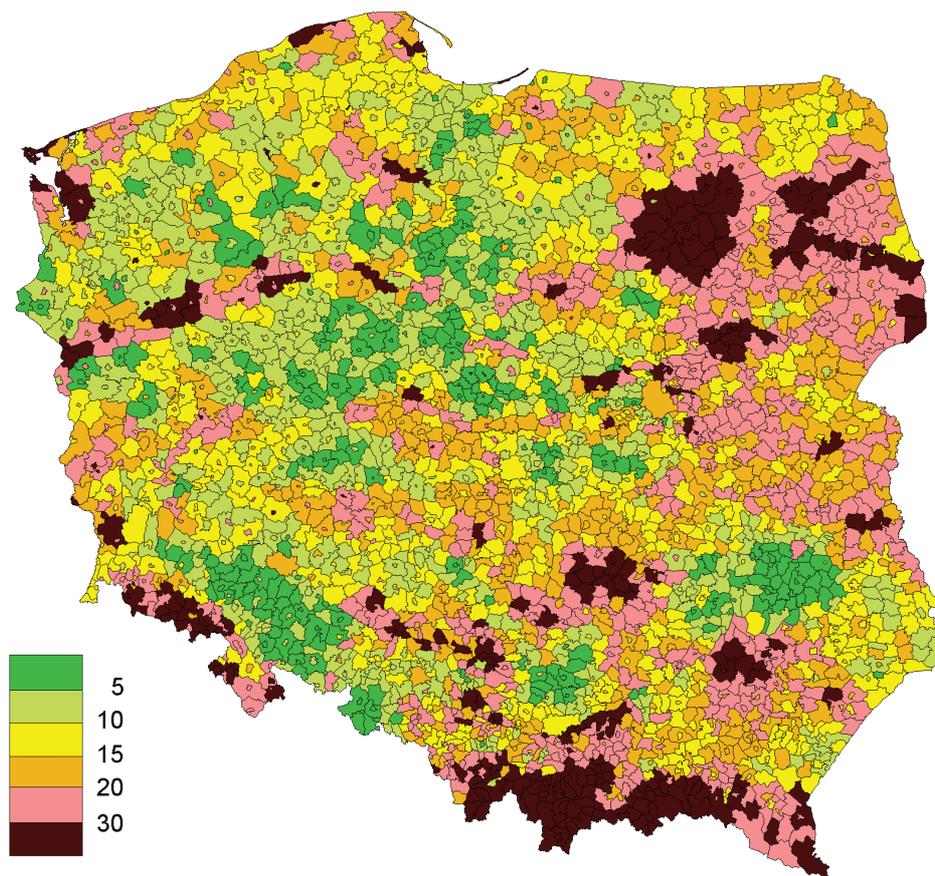


Figure 3. Meadows as a percentage of total agriculture area. Total agriculture 2001 (according Kulikowski 2003)

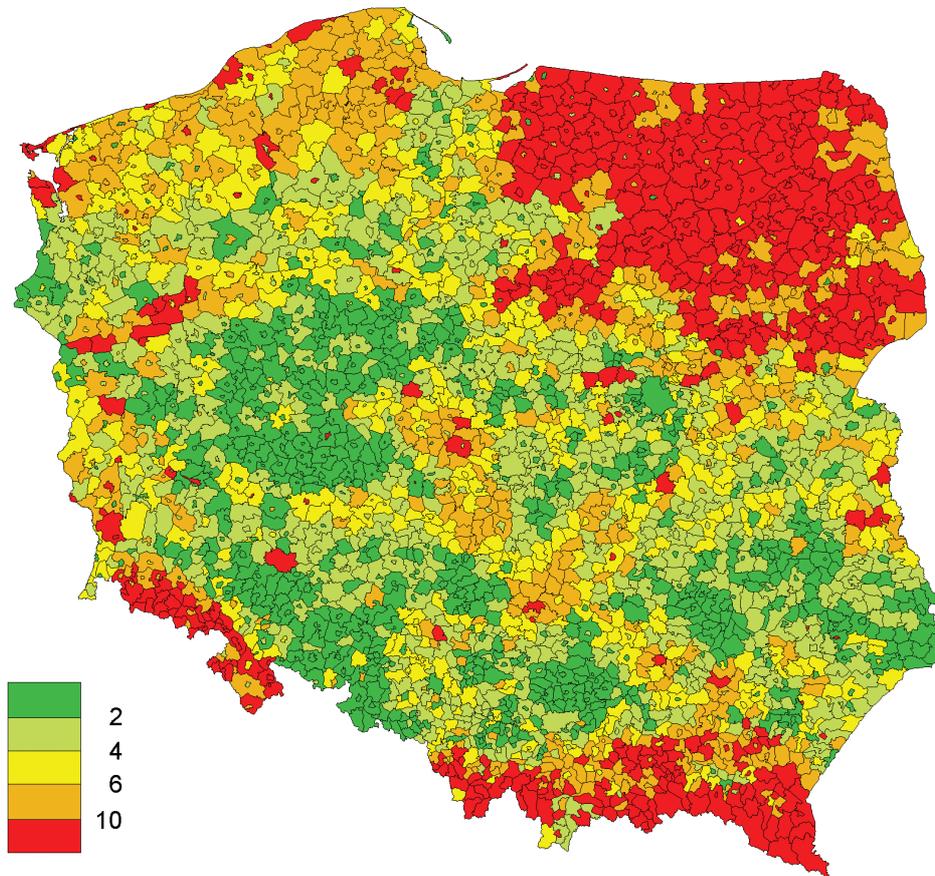


Figure 4. Pastures as a percentage of total agriculture area. Total agriculture 2001 (according Kulikowski 2003)

characterised by the unique features or naturalness of landscape, which have been subject to legal protection. The two regions analysed feature high shares of legally protected areas, which decidedly increases their tourist and recreational value. The shares of the legally protected areas in the total surfaces of the two provinces are 31.3% in Greater Poland and 31.9% in Podlasie province. These areas include the most important protection forms, that is – national parks (one in Greater Poland and four in Podlasie voivodship), and nature reserves (96 and 88, respectively). Both provinces include also the areas incorporated in the NATURA 2000 system.

The natural-economic-social factors and smart growth

Besides the land use data concerning analyse of smart growth procedures, we have to collect data connected with many aspects of nature and socio-economic development. The factors determining the regional development conform to the

concept of smart growth can be classified in four basic groups. These groups of factors correspond to:

- properties of the environment,
- social development,
- economic development,
- cultural and historical development.

Factor analysis, carried out in the elaborates meant to determine the strategies conform to the smart growth idea for the rural areas, for which agricultural function remains the basis of the functional-spatial structure, should include the prerequisites for sustainable agriculture. It integrates three main goals: environmental health, economic profitability, as well as social and economic equity. In this concept it is most important to work out the compromise between the natural and human resources. Stewardship of natural resources involves maintaining and enhancing the vital resources base for a long time. Stewardship of human resources includes consideration of social responsibilities, such as working and living conditions of farmers, the needs of rural communities, and consumer health and safety both in the present and in the future. Hence, the fundamental questions, which are accounted for in the work on sustainable agriculture constitute the complement to the smart growth factor analysis in the domains of farming and natural resources, plant production practices, animal production practices, as well as their economic, social and political context.

The most important natural resources accounted for in evaluation of agricultural space include soils, climatic and water conditions. In terms of conditions for agricultural production both areas here considered are characterised by medium quality soils (domination of the classes III and IV of the Polish soil classification), featuring very good sanitary characteristics (*Atlas...* 1997). These soils are in close to 100% free of contamination with heavy metals (Table 1). On the other hand, the regions in question differ as to the potential risk of water and wind erosion, to which agricultural land is exposed. The areas exposed to such risk constitute, respectively, 16.8% and 27.6% of the total areas in case of water erosion, and 26.9% and 42.6% for wind erosion (*Statistical Yearbook...* 2003).

Table 1. Percentage share of contamination free soils in total area of soil cover

Elements	Wielkopolska	Podlasie
Pb	99.82	100.00
Zn	99.33	99.87
Cu	99.89	100.00
Ni	99.96	99.97
Cd	99.96	100.00

In view of the postulate of preserving the nutritional potential of the soils and of their edaphic functions for the satisfaction of food supply needs of the population, it is important, when elaborating the smart growth strategies, to define the

optimum conditions of managing the agricultural land, the degree of chemical treatment, the use of mechanical equipment, and application of genetic modifications in agricultural production. Thus, finding of the compromise between the extensive forms of economy and intensification of activities in farming belongs among the most important procedures in the establishment of the development directions. The regions in questions differ decisively as to the levels of intensification of agricultural production. These differences can be seen, in particular, through the level of use of mineral fertilisers, NPK (the Greater Polish province: 107 kg per hectare, Podlasie province: 79.8 kg per hectare), or of the calcium fertilisers (74.9 kg per hectare and 59.2 kilograms per hectare, respectively). The consequence of the higher intensity of agricultural production is the higher yield in both plant production (Table 2) and animal production.

Table 2. Yield per hectares of same arable plants

Arable	Yield per hectares dt.ha ⁻¹	
	Wielkopolska	Podlasie
wheat	41.9	28.7
potatoes	196	177
sugar	390	326

A very significant factor influencing the landscape of rural areas is constituted by the agrarian structure. The acreage of farms is closely associated with the organisation of rural space, its patchwork and spatial order. It is of high importance for the concept of smart growth not only from the point of view of aesthetics of landscape, perceived by the local community, but also from the point of view of economic evaluation of landscape as the medium of development of the tourist and recreational function, as well as optimisation of production. Conform to the results of the agricultural census of 2002 both of the areas considered feature relatively low share of small farms (i.e. between 1 and 5 hectares) in the total surface area of agricultural land, below 5%, while the average for Poland equals 19.9% (Kulikowski 2003). The acreage structure is dominated by the average farms, with few large farms. Yet, the share of the latter in total area of farms is significant. Thus, in particular, in numerous communes of Greater Poland the share of the very large farms (i.e. of more than 50 hectares of area) exceeds 30% of the total area of private farms (see Figure 5).

Agrarian structure, together with the socio-economic level and the historical-cultural factor, is the generating factor for the character and spatial setting of structures, amounting to the spatial order associated with the morphogenetic types of rural settlements in landscape. Thus, irregular villages dominate in the Greater Polish voivodship, while in Podlasie province it is the lineal street or row villages that dominate. The shapes of habitat areas are accompanied by definite patterns of fields in space. Small, irregular villages, occur in conjunction with the block or block-and-belt field patterns, while large villages coexist with the stripe and forest-and-stripe patterns (Szulc 2002).

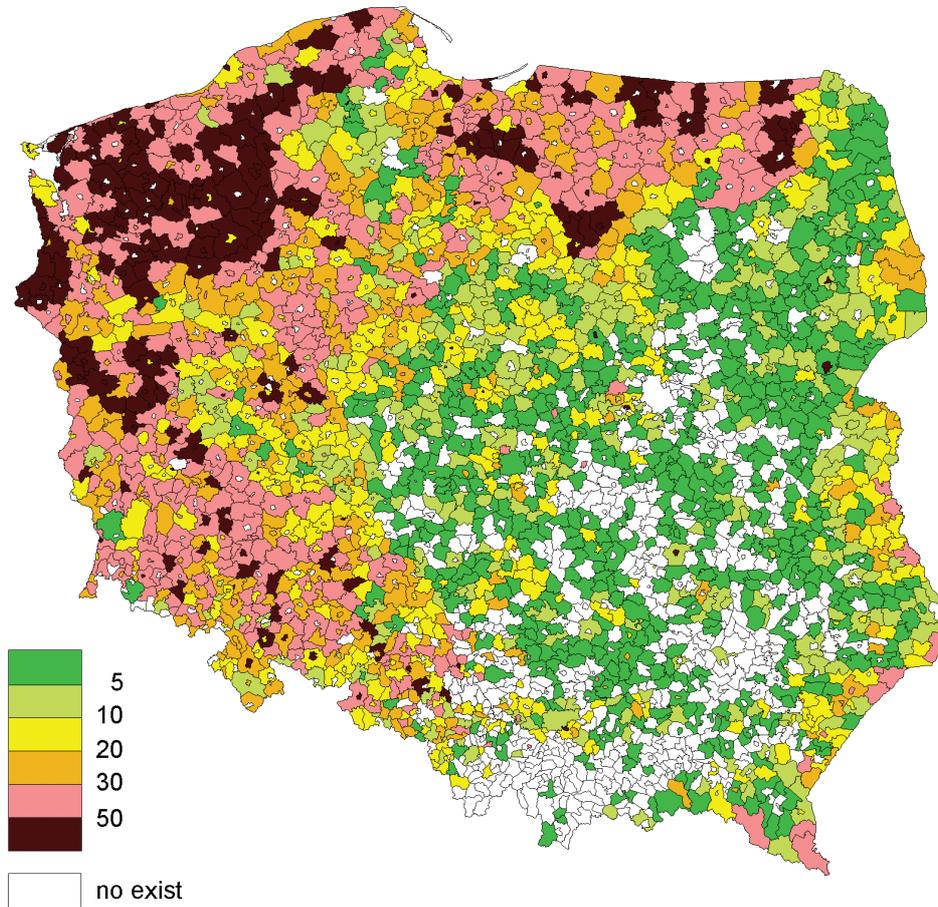


Figure 5. Agriculture farms above 50 hectares as a percentage of total agriculture area of individual farming 2002 (according Kulikowski 2003)

One of the most important elements conditioning smart growth is constituted, from the sociological point of view, by the society, understood as the subject, for whom the entire development concept is being elaborated. The regions in question differ considerably also with respect to the social development. The Greater Polish province, with the surface area of 29,800 sq. km, is inhabited by close to 3.4 million people, while the province of Podlasie, of 20,200 sq. km of area, is inhabited by a much smaller number of people: 1.2 million. This difference is reflected, as well, through the spatial distribution of population. The population densities are equal, respectively, 113 and 60 persons per sq. km. Despite the fact that the percentage share of people inhabiting the rural areas in both provinces is similar (amounting to 42.5% in Greater Poland and to 44% in Podlasie), the average densities of population within the rural areas are, correspondingly, different, namely 53 and 29 persons per sq. km (*Statistical Yearbook... 2003*).

The economic circumstances within a given area exert a direct influence on the level and structure of employment. In the case of the two regions analysed we can see quite distinct differences, which exist between the western and eastern parts of the country. Employment in agriculture in relation to total employment amounts to 25.9% in Greater Polish province, while it attains 46.4% in the Podlasie province. The bigger dismemberment of farms and the lower possibilities of finding employment in the non-agricultural sectors of economy in the East of the country entail lower commercial value of agricultural production (2,615 PLN per 1 hectare in Greater Poland and 1,436 PLN per 1 hectare in Podlasie). This is paralleled by the lower level of socio-economic development in Podlasie: the GNP per capita in the Greater Polish voivodship is equal 18,900 PLN, while in the Podlasie voivodship – 13,174 PLN. Therefrom an increased rate of migration, in particular – of the younger people. The consequences of this fact can be seen in the increasing average age of the population inhabiting the rural areas of Podlasie, and the decreasing magnitude of the birth rate (which is equal in Greater Poland approximately 1‰ and in Podlasie – only 0.2‰) as well as the real population increase. This phenomenon is highly disadvantageous from the point of view of the smart growth, since it weakens the possibilities of the region's socio-economic development and, through the decrease of the population numbers, may lead to the disappearance of regional identity, so important in the cultural and social development of Europe.

The higher level of technical development of the region, expressed, in particular, through high industrialisation, development of infrastructure and intensification of agricultural production, means higher consumption, including consumption of natural resources, but also – potentially – higher emission of pollutants, bigger production of waste, both solid and liquid, etc. For the prerequisites of sustainable development and smart growth this increased pressure on the environment does not necessarily have to amount to an increased degradation of the environment and the worsening of living conditions of the local communities. Yet, limitation of the consequences resulting from the influence exerted by the industrial and technical development is a very difficult task, requiring definite financial outlays, especially in the domains of water management, waste disposal and storage, as well as pollution emission control. The purpose of the respective undertakings must be constituted by the improvement of life quality and health safety of the society through, for instance, production of healthy food or development of infrastructure promoting healthy lifestyles. In case of the areas under analysis one should emphasise the significant differences in the levels of extraction of natural resources and in the effects of their use, existing between the two voivodships. Water extraction is almost 20 times higher in the Greater Polish province than in Podlasie (1905 hm³ and 89 hm³, respectively), of which industry uses only 84.3 hm³ and 16 hm³, respectively. Hence, the difference results primarily from the levels of water extraction and use for agricultural and municipal purposes. Higher water consumption means higher production of wastewater. Industrial and municipal liquid waste amounted in 2002 to 195 hm³ in the Greater Polish province and to 38.1 hm³ in Podlasie. Likewise, emission

of dusts was five times higher in Greater Poland than in Podlasie (10.9 thousand tonnes and 2.0 thousand tonnes, respectively), according to the *Statistical Yearbook...* (2003).

The level of economic development of a given region, the socio-cultural conditions and the natural dispositions of the environment, expressed, in particular, through the land cover, determine spatial organisation on rural areas, as well as directions of spatial development and directions of agricultural production. Production profile may undergo changes with the change of one of factors, which becomes, in definite conditions, the determinant of development. Such a phenomenon is being observed during the recent years over the areas in question. Traditionally, and until quite recently, the region of Greater Poland has been the primary milk producer. Of late, due to a high potential of meadows in the region encompassing northern Masovia and Podlasie, as well as significant investments into the dairy industry in the region, Greater Poland lost its leading position in milk production. There has been a significant increase of cattle raising in north-

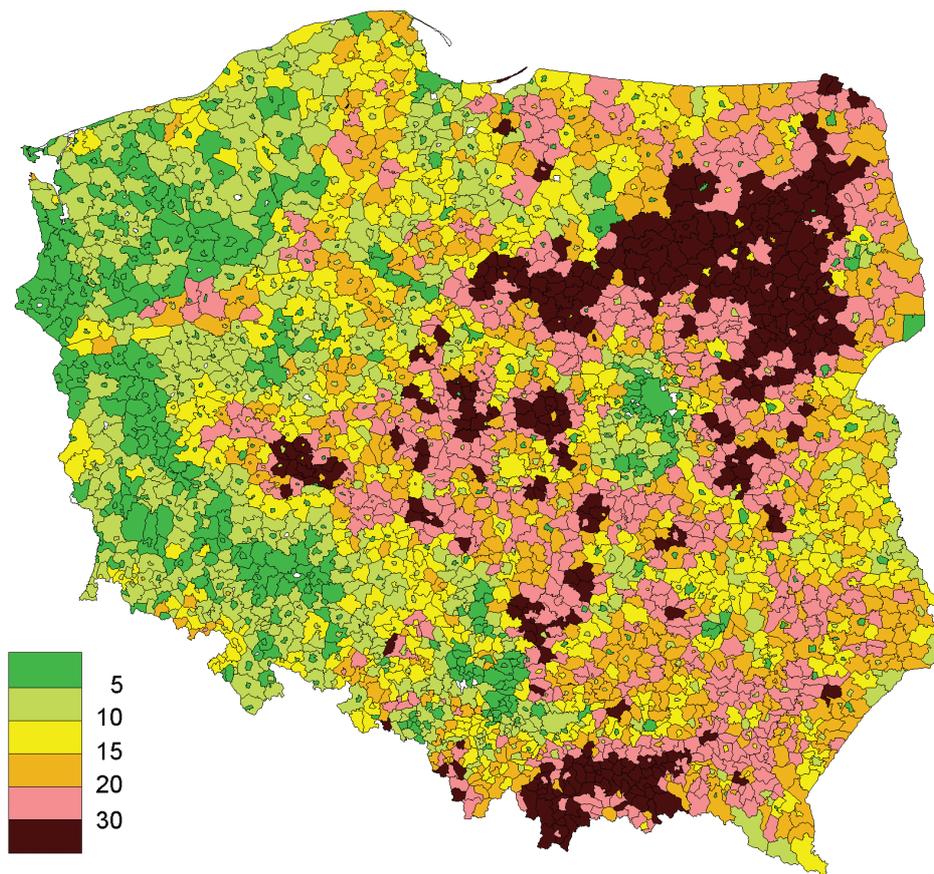


Figure 6. Number of dairy cows per 100 hectares of agriculture land. Individual agriculture (according Kulikowski 2003)

ern Masovia and Podlasie (53.5 units per 100 hectares, compared to 38.6 units per 100 hectares in Greater Poland), including milk cows (Figure 6). The consequence of this change is the increased milk production, so that Podlasie produces now $1.28 \cdot 10^9$ tonnes of milk per annum, while Greater Poland – $0.86 \cdot 10^9$ tonnes.

Model ordinances for sustainable land development

The next step in smart growth procedures after data collecting and their spatial analyse is modelling and preparing some scenarios for regional development which are determining a multifunctionality of the landscape concerning to the socio-economic development and environmental protection policy. Also, solution of those procedures have to take into consideration assumptions of CAP (Common Agricultural Policy of EU). The comprehension thereof and the correct management and determination of the development directions, that is – conform to the natural-social-economic potential of a region, requires generation of very precise solutions being in accordance with the smart growth concept. That is also why it is essential in the search for the tools meant for the local or regional smart growth to develop model ordinances for sustainable development. The structure of this model is strongly connected with four items: driving forces, state, responses and tasks (Figure 7). The ordinances cover a broad range of topics, from neighbourhood design and energy efficiency to watershed management and pollution prevention. The goal is to cover the aspects of sustainable development that may be reasonably achieved through the ordinances and to provide for the voluntary fulfilment of their prescriptions.

The analysis of interdependence between the factors determining spatial organisation, carried out for the two regions of Poland, indicated mutual connections and interrelations of these factors. On the basis of evaluation of the prerequisites for sustainable development and smart growth of the provinces considered we can clearly see the differences in directions of development of rural areas, associated with the natural-social-economic potential of the regions as the conditioning related to regional policy. In the Greater Polish province this would be the strengthening of the agricultural function through the growth of the medium sized and large farms, increasing production intensity and at the same time caring for the ecological and sanitary standards of production, and thus also for food quality. In the province of Podlasie, side by side with agricultural function, the tourist and recreational function as well as the protective function of the environment will be very strongly developed. In view of the highly clean environment, not destroyed by human impact, the areas subject to legal protection must constitute the instrument for the economic development of the voivodship in this particular region. Agricultural production, on the other hand, should be based mainly upon ecological farming, turning out very high quality „healthy food“. Cattle raising will be further strengthened as the direction in agricultural production, with main orientation at milk production.

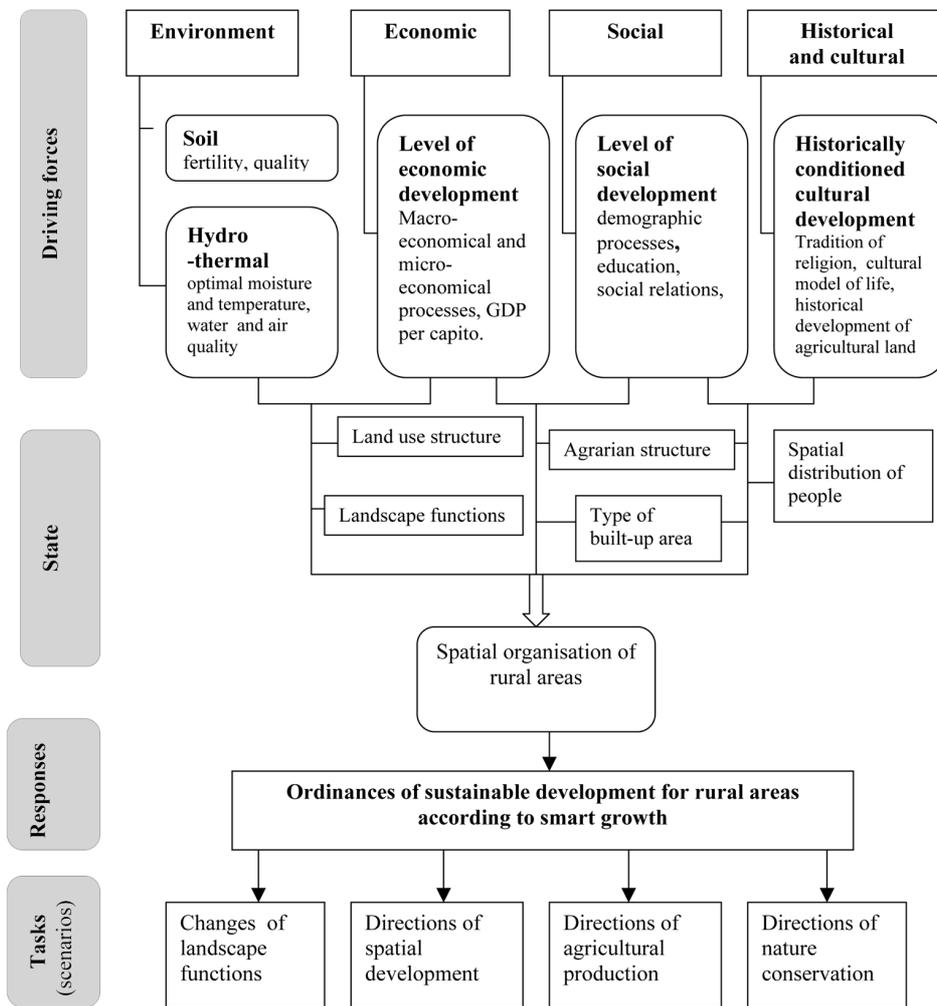


Figure 7. Proposal of the model ordinance for sustainable development for areas according to smart growth ideas

Summary

In the light of factor analysis, carried out for the two territorial units of Poland (the Greater Polish and the Podlasie provinces) from the standpoint of their development according to the precepts of smart growth, we can state that this concept allows for the optimisation of the spatial and economic development of rural areas, in which the fundamental assumptions of sustainable development are accounted for, and the elaborated procedures and instruments, applied in landscape management, make it possible, in particular, to:

- take advantage of the natural potential of the environment,
- account for the socio-economic level of the society,

- enhance life quality of the society,
- solidify the cultural and historical identity of the local society,
- produce healthy food,
- monitor sprawl,
- establish spatial order.

Thus, smart growth can be considered as a very important instrument in the elaboration of the regional development policy, allowing, on the one hand, for making of appropriate use of the natural resources of the environment and of the socio-economic potential of the region, while optimising, on the other hand, the regional development in accordance with the principles of sustainable development.

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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)

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.*

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 km²) and at the same times most thinly populated (16 persons per km²) 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 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 13th 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 16th 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’uniy“, „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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