

CHANGES IN THE LANDSCAPE DUE TO LAND CONSOLIDATIONS

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Abstract

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The aim of this paper is the analysis of changes in the secondary landscape structure caused by comprehensive land consolidation processes. For a more detailed survey, three cadastral areas have been selected. In those areas, the land consolidation projects are undergone and are currently in draft stage for the general principles of functional organization of the landscape and form different geomorphologic types of georelief. In the territory of Hájske, the georelief prevalent type is lowland, in the cadastral area of Veľké Vozokany upland and Kaniaňka represents typical hills. We evaluated the landscape structure of the territory under consideration in three levels: historical landscape structure (2. Austro-Hungarian military mapping), current landscape structure (analytical part – the results of a dedicated planimetric mapping in land consolidation projects), and the new structure of the country (evaluation and design part – results of the draft of the general principles of functional organization of the territory). As indicators of changes in the landscape the elements characterizing the land use have been selected: arable land, forest land, vineyards, gardens, orchards, permanent grassland, water areas, urbanized areas and other areas. In the paper, we focus on an aggregated balance of types of plots in all three areas and three selected horizons. We present the evolution of landscape structure and we have also tried to propose clear landscape structure changes (size and location), in line with the trend of sustainable land use. In the areas of interest, there are proposed new landscape elements to enhance the landscape diversity and also positively influence the species diversity of flora and fauna, enhance the landscape ecological stability and prevent the destructive processes in the landscape.

Key words: comprehensive land adaptations, landscape changes, the general principles of functional organization of the territory, ecological landscape stability

Introduction

Implementation of land consolidations is anchored in the Act 330/1991 Coll. on landscape consolidations, land ownership organization, land offices, Land Fund and Land Associa-

tions as amended (the Land Act amendments). According to the Land Consolidation Act is a rational layout of land ownership in a given territory, and other agricultural and forest real property associated therewith, made in public interest in accordance with the requirements of environmental protection and creation of spatial system of ecological stability, functions of agricultural land and operational and economic aspects of modern agriculture and forestry and rural development support.

Land consolidations (LC) include:

- identification and rearrangement of ownership and usage status and other related rights in the area of land consolidation and land reallocation (blending, separation, or other land arrangements),
- technical, biological, ecological, economic and legal measures relating to the new configuration of relationships.

Land consolidation projects are designed to take the utmost account of consistency between production and landscape values. This compliance ensures that the aesthetic landscape value will be included in the design work. This way the landscape consolidation projects, inter alia, contribute to the landscape nature enhancement in the solved area. The landscape consolidation result is a new spatial and functional organization of the territory, which is represented by changing types of lots, thus changing the landscape structure. And particularly landscape structure belongs to the key components of the landscape image as well as the landscape nature. Evolution of landscape structure means its rearrangement. In the contribution, changes in the structure of the country, which were caused by different forms of land consolidations in the range of about last 150 years, are assessed (Muchová, Vanek, et al. 2009).

Material and methods

For the analysis of landscape changes induced by different forms of land consolidation, three cadastral territories have been selected: Hájske, Veľké Vozokany, and Kanianka. Their localization in the Slovak Republic is shown in Fig. 1. A precondition for their selection was that the land consolidation projects are underway and are currently at least in the draft stage for the general principles of functional organization of the landscape (GPFO/VZFU). Another selection criterion was the inclusion of different geomorphologic types of georelief. In the territory of Hájske, the georelief prevalent type is lowland, in the cadastral area of Veľké Vozokany upland and Kanianka represents typical hills.

Hájske

The cadastral area of Hájske belongs by the administrative-territorial division in the Nitra region, district Šala. Hájske cadastral area size is 1406 ha; it has a population of 1380. Hájske village is located 26 km southwest of the region capital Nitra. Geographically, the territory belongs primarily to the Danube plain.

The mapped area has warm and dry climate with mild winters. There are two terrain types in the area of interest. The southern part (Nitrianska tabuľa table and Novozámocká planina plains) is slightly wavy lowland. The northern part belonging to the Trnava upland is erosion-denudation type of lowland hilly landscape with dales. According to the engineering-geological classification (Hrašna, Klukanová, 2002), dealt-with-territory belongs to the region of tectonic depression, the sub-region with the underlying Neogene-substrate. In the solution area, there are three types of engineering-geological rayon: loess sediments rayon, rayon of valley river sediments and rayon of organic sediments on valley river sediments. The area belongs to the Váh river basin, the sub-basin of the water flow Jarčie. Flow regime

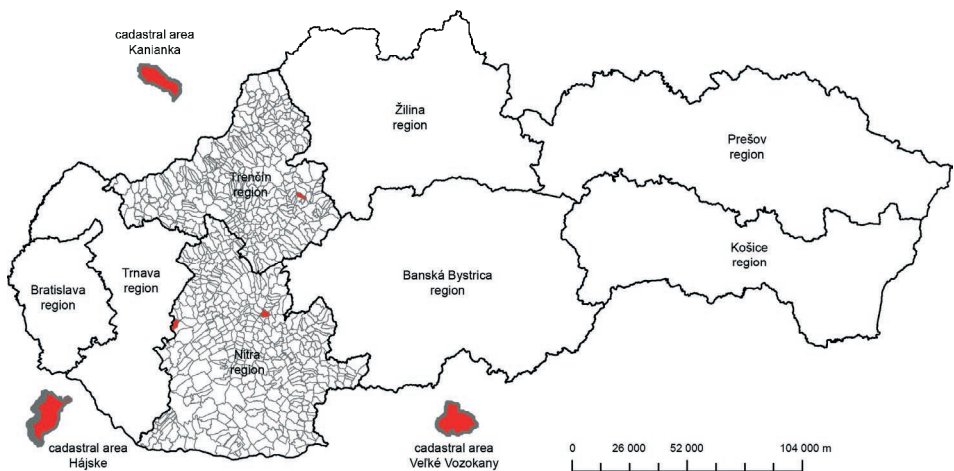


Fig. 1. Location of the cadastral areas.

is influenced mainly by atmospheric precipitation. The maximum flow rates occur at snow-melting and summer storms. Minimum flows are typical for winter. The main hydrology axis of the area is the Hájsky potok stream. Most common soil types are different sub-types of chernozems. Locally at Bačová marshes are encountered high-salinity soils with vegetation of high-salinity marshes. In the valley between Hájске and Mladý Háj, there are also Fluvisols. According to the granularity, the largest representation have the loamy soil (moderate soil) – 73%, sandy-loamy soil (moderate soil) occupies 21%, very heavy soils (clayey) occupy 1% and light soils occupy 6%. The entire area of the territory consists of soils without skeleton and very deep. In the priority soil groups for protection against the non-agricultural use (quality group 1 to 4), there are 1035 ha, representing 84% of agricultural land. According to the phytogeographical division of the territory of Slovakia (Plesník, 2002), the area of interest falls within the Pannonian flora (Pannonicum) area, Eupannonian xerotherm flora (Eupannonicum) zone, the Danubian lowland district. This phytogeographical district is characterized by almost exclusive representation of the elements of thermophilic flora. Reconstructed natural vegetation of Hájске cadastral area consists of three basic units: Pannonian oak-hornbeam forests, oak/mossy oak forests and lowland floodplain forests.



Fig. 2. View of the landscape of the cadastral area Hájске.

Velké Vozokany

The cadastral area of Velké Vozokany belongs by the administrative-territorial division in the Nitra region, district Zlaté Moravce. The village is of road type, lies 8 km south of the district town Zlaté Moravce and about 38 km from the region capital Nitra. The cadastral area has 987 ha, 536 people live here. Geographically, the territory belongs to the Danubian downs.

The mapped area has warm and dry climate with mild winters. There are two types of terrain. The northeast section falls into the plain and the northwest is a part of the Hron downs. The area has the character of alluvial flood plains surrounded by hilly relief. According to the engineering-geological classification the dealt-with-territory belongs into the Neogene tectonic depressions region, inside-mountains lowland areas. There are three types of engineering-geological rayon: rayon of loess sediments, deluvial sediments rayon and rayon of fine-grained sediments. Area of the interest lies in the catchment area of Žitava. River network is underdeveloped. The most important watercourse is Širočina, the second major permanent watercourse is the left tributary of the Širočina potok stream – Bočovka potok stream. Water flows have snow-rain type outflow regime with the accumulation of water in December and January, high water amount in February and March, with the lowest flow in September, with ancillary water amount increase in the second half of November to early December, and low positions from mid July to the end of September. Most common soil types are different subtypes of brown soils. According to the granularity, the most frequent are loamy soils (moderate soil) – 84%, clayey-loamy soil (hard soil) occupies 14% and sandy-loamy soils (medium-heavy soils, lighter) occupy 1%. The whole area consists of soils without skeleton and very deep. Based on a comparison of the productive potential value of soils in the cadastral area with particular regions of Slovakia as well as production ability classes, we can conclude that the farmland of the territory is very productive (5th grade production capacity) on average. In the priority soil groups for protection against the non-agricultural use (quality group 3 to 4), there are 417.78 ha, which represents 51% of agricultural land. The cadastral territory belongs to the phytogeographical oak zone, its lowland sub-zone and hilly area. It consists of a Hron downs district. According to the phytogeographical division of Slovakia, the broader area of interest falls within the Pannonian flora (Pannonicum) area, Pramatran xerotherm flora zone, the phytogeographical Danubian Lowland district. Potential natural vegetation consists of three basic units: lowland floodplain forests, Carpathian oak-hornbeam forests and oak/mossy-oak forests.



Fig. 3. View of the landscape of the cadastral area Velké Vozokany.

Kanianka

The cadastral area of Kanianka belongs by the administrative-territorial division in the Trenčín region; district Prievidza, lies about 5 km northwest of the district town Prievidza. Kanianka cadastral area size is 793 ha, 536 people live here. Geographically, the territory belongs to the Strážovské vrchy hills a Hornonitrianska kotlina basin.

The mapped area has moderately warm and moist climate with highland altitude mostly over 500 m a. s. l. There are two terrain types: basin in the eastern part of the cadastral territory and highlands in the western part. According to the engineering-geological classification the dealt-with-territory belongs into the Neogene tectonic



Fig. 4. View of the landscape of the cadastral area Kanianka.

depressions region, inside-mountains lowland areas. There are the following types of engineering-geological rayon: river valley sediments rayon, rayon of deluvial sediments, effusive rocks rayon, rayon of sandstone rocks, and rayon of pyroclass rocks. The area of the interest lies in the Váh catchment area. River system in the forests in the spring areas can be classified as elementary, bears all the signs of underdevelopment, only the middle section of the flow Kanianka shows greater complexity and dendroid system of some tributaries, but even there is the river network only in the development. The main flow of the reference area is Kanianka stream. Throughout the cadastral territory the clearly predominant soil type is pseudogle. These are typical pseudoglees on loess and polygene clays. According to granularity, the most frequent are loamy soils (moderate soil) – 72% and sandy-loamy soil (moderate soil – lighter) – 28%. Most area of the territory has soils without skeleton and very deep. Agricultural land consists on average of less productive areas (6th grade of production ability). The best (high quality) soils in the territory are in the 3rd group (14%). The area belongs to the phytogeographical beech zone – its crystalline Mesozoic subregion. It includes two districts: Strážovské vrchy hills (with sub-district Suchý, Magura) in the northwestern part of the land and the upper Nitra basin in the southern part of the land. According to the phytogeographical division of Slovakia the territory is situated in the West-Carpathian flora area on the contact of pre-Carpathian flora zones of phytogeographical district Strážovské and Súľovské vrchy Mts with flora zone of high (central) Carpathians of phytogeographical district Fatra (Malá Fatra – Lučanská Fatra). Potential vegetation of cadastral municipality Kanianka consists of lowland floodplain forests, Carpathian oak-hornbeam forests, mountainous floodplain forests, flowery beech and fir forests, mountainous flowery beech forests, and mountainous acidophilous beech forests.

Methodological aspects of land consolidations in Slovakia

At present (Slovak Ministry of Agriculture records as of June 30 2009), the land consolidations are made in 422 cadastral areas of Slovakia, projects are completed in 56 cadastral areas and the project is under development in 366 cadastral areas. In 21 cadastral areas of Slovakia, simple land consolidation projects are under way, of which 13 projects are completed and 8 projects are in progress. Up to the mentioned date, the implementation of projects is under way on the total area of 393 635 ha; completed projects are recorded on the area of 44 891 ha. In 19 cadastral areas, the implementation of common facilities and measures and in 2 cadastral areas, the construction has already been completed.

The land consolidation (LC) project is made up of:

Initial documentation of the project consists of:

- project area operate,
- actualization of the soil-ecological units (SEU) in the project area,
- creation of land value maps,
- registry of the initial state,
- local territorial system of ecological stability for land consolidations,

- general principles of functional organization of the territory in the area of land consolidations following the local territorial system of ecological stability for land consolidation.

Proposal for a new arrangement of plots within the perimeter of the project includes:

- principles of the placement of new land plots
- plan of shared facilities and measures and plan of public facilities and measures
- partitioning plan in the form of placement and marking plan (special rules).

Implementation of the project consists of:

- alignment and marking the border fracture points of the new plots in the district project
- actualization of the project perimeter operate, registry of initial state, placement plan
- design of the partition plan as a geometric plan or in the form of reconstruction of the cadastral operate by a new mapping.

Methodological steps

Methodologies applied in the paper were used as follows:

1) Determination of the indicators of landscape change

As indicators of changes in the landscape the elements characterizing the land use have been used: arable land, forest land, vineyards, gardens, orchards, permanent grassland, water areas, urbanized areas and other areas.

2) Determination of time horizons and their characteristics

Secondary structure of the landscape of the territory was evaluated in three levels:

- historical landscape structure (2nd military mapping),
- current landscape structure (the result of analysis part of the landscape planning – a dedicated planimetric mapping results in the framework of the land consolidation projects),
- proposed landscape structure (the result of the evaluation and the design parts of the landscape planning – the results of the draft general principles of functional organization of the territory).

Historical landscape structure Historical maps are one of the most important materials with high information value and interpretative possibilities for multiple disciplines, among others also land-use-sciences and landscape ecology (Žigrai, 2000). They allow us to trace and understand the genesis and function of the studied object in its dependence on certain time characteristics such as evolutionary accumulation potential, continuity and inertia combined with the selected spatial features such as location, shape, size and structure. Thus, we get a more plastic and accurate space-time picture of the examined object, phenomenon and process. For the purposes of interpretation of historical landscape structure, we chose the second military mapping. The second military mapping (Francis) of Austria-Hungary took place in 1806–1869 on the basis of Emperor Franz I decision. Unlike in the 1st military mapping, there have already been established geodetic bases, which served not only for topographic but also for cadastral mapping. Recently, a precisely these map data are used intensively in several publications aimed at assessing the development of the country (Bičík, Jeleček, Štěpánek 2001; Boltížiar, Olah, 2008; Faltán et al., 2008; Hofierka, 2008; Izakovičová, Mozyeová, 1999; Miklós, Izakovičová, 1997; Olah, Boltížiar, 2009; Otáhel et al., 2000; Petrovič, Muchová, 2008). These maps show the historical character of the environment, which has already completely disappeared or is gradually disappearing, including memories of it, going away with the oldest generation. These documents can be and should be a guide e.g. for the revitalization of river systems, restoring the original road network and so on.

Current landscape structure

Onset of collectivization in the fifties gave the landscape, through landscape consolidations, a completely different dimension, namely to establish as quickly as possible the so called large-scale socialist agriculture. Collectivization did not alter the ownership of land, ownership was unchanged, land was further inherited (in the cooperative complex, however, the owners could not exercise their right to property). The cooperative gained in this way during the collectivization process always the greater area of the cadastral territory. Finally, a new form of economic organization of the territory and technical adjustments to land led to the plowing away of all limits, elimination of redundant crossings and roads and creation of conditions for large-scale farming on land. The size and shape of the plots was adjusted to fit the parameters of a large-scale agricultural farming. To the present time, the situation in the country reflects the

large-blocks management, the matrix of the country is in many cases very simple, on the one hand continuous acres of intensively farmed arable land, intensive and large-blocks vineyards, hop gardens and orchards on the other hand, complexes of forest land and trees overgrowing grubbed non-forest habitats. For purposes of interpreting the existing landscape structure, we selected the output of dedicated planimetric mapping made in the frame of the land consolidation projects. Special-purpose planimetric mapping focuses on the measurement of the actual state of the ground and detecting the changes between actual and recorded state in the cadastre. Planimetric mapping is performed in the 3rd accuracy class with details for the scale 1:1000. The subjects of mapping are all planimetric elements.

The proposed landscape structure

In all three cadastral areas, the land consolidations have been initiated in accordance with the law on land consolidations. Currently, they are in the stage of creation of the rules for placement of the new plots and therefore the stage, addressing new spatial and functional organization of the territory is already processed. The issue of landscape design (in accordance with the aim of creation of landscape nature) is a part of the land consolidation projects in the design stage of the general principles of functional organization of the territory (GPFOT). The Land Consolidation Act states that GPFOT consists of a reorganization of the road network, creation of a new system of erosion and flood protection, network of ecological stability of the area, and so on. GPFOT result is the definition of areas in the perimeter of the land consolidation project in terms of the new structure and the frame of existing and design measures.

3) Geographic information technologies and their use

For the purposes of data processing and decision support, standard methods of solving/analysis/processing of specific sub-problems have been used. Usual methods and activities in the field of GIS have been applied, including: input of secondary (cartographic) data, input of attribute data, data transformation, data generalization, data interpretation, vectoring of data manipulation with digital terrain model, interpolations, reviewing databases, map algebra, analysis and synthesis operations, overlay, spatial analysis, visualization, and so on. Similar approach is used in greater detail in Halva, 2009; Ďuriš, Halaj, 2007.

Results and discussion

Hájske

Historical landscape structure

Agricultural activities were the dominant form of land use in the cadastral area of the Hájske village already in the 1839. This fact is mainly due to an appropriate location of the village on the contact of Danube plains and Nitra hills. Nearly 2/3 of village (63.93%) cadastre in this period was made of mainly arable land located in the northern and southern part of the area. The village was surrounded in the central part of the cadastre mainly by the permanent grassland in the form of meadows, filling also the eastern edge of the area toward Močenok (originally Sládečkovce). Overall, grasslands covered more than 30% of the area. Ecological stability of the country has been improved by liner vegetation along roads, in blocks of arable land to the north and south of the village. The proportion of liner vegetation was almost 1% of the cadastral area. Single compact forest in the village – „Mladý háj“ was located in the SE of the cadastral area on 10.75 ha (0.75% of the area). A mill, a chapel and an orchard were nearby. Built-up areas consisted of almost 9 ha (0.63%) in the central part of the land accompanied by courtyards before the individual housings (5.76 ha) and kitchen gardens (24.32 ha). In the central part of the community, we were able to identify, beside the houses



Fig. 5. Historical landscape structure.

also the church, cemetery and manor. The village was crossed by the communications associated with the neighbouring municipalities Močenok, Pata, and Šoporňa.

Table 1. Representation of plot types in the landscape consolidation project (LCP) Hájske.

LCP Hájske Representation of plot types in the area of LCP						
Plot types	Historical landscape structure		Current landscape structure		Proposed landscape structure	
	ha	%	ha	%	ha	%
Arable land	898	63.93	1128	91.16	1083	87.53
Vineyards	-	-	24	2.00	24	1.99
Gardens	24	1.73	0	0.00	0	0.00
Orchards	2	0.18	-	-	-	-
Permanent grassland	432	30.79	24	2.01	3	0.27
Forests	10	0.75	3	0.32	3	0.28
Water areas	14	0.32	7	0.61	7	0.61
Urbanized areas	18	1.29	-	0.94	31	2.57
Other areas	4	1.01	36	2.96	83	6.76

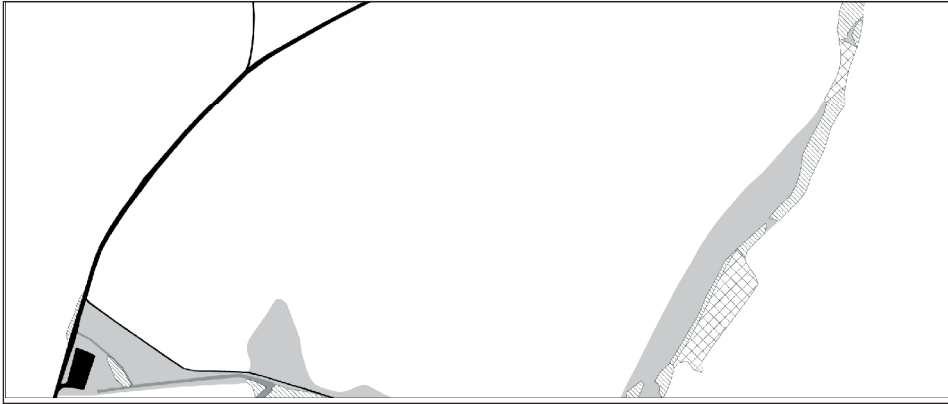


Fig. 6. Current landscape structure.

Current landscape structure

Majority of Hájске cadastral area is now covered by the arable land, up to 91% of the project area, both permanent grassland and vineyards make up only 2% of the area each. Agricultural land occupies 95% of the total area of the project. Forest land in the territory has only a minor representation. Non-forest woody vegetation occupies almost 3% of the perimeter of the project. This means that the land consolidation perimeter in Hájске cadastral area is under intensive agricultural use. The detailed specification of the current landscape structure is given in Table 1.

Proposed landscape structure

The main principles of GPFOT for the territory were proposals of measures (listed in order of urgency to as identified by owners themselves):

- to serve a better accessibility of land, i.e. roads and objects on/around them,
- to slow or suppress the degradation of agricultural land, i.e. preserving and promoting the natural production capacity of soils;
- to conserve and develop the environment, enhance the country and increase the ecological stability (TSES and promotion of biodiversity of the country);
- to preserve and create the landscape nature (support for structural landscape elements and aesthetic values, the variety and uniqueness of the country).

The priority of these measures is based on the location of the cadastral territory and subject to high quality soils and thus focused on agriculture. The owners concentrate first on the accessibility of their land plots and subsequently their appropriate economic use

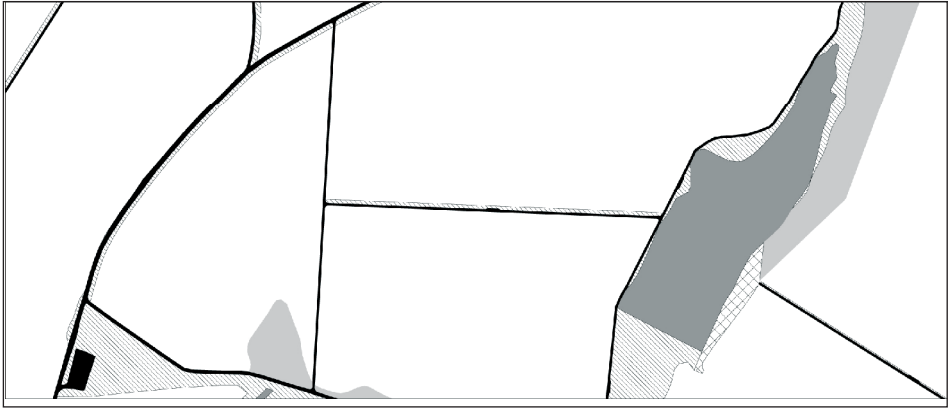


Fig. 7. Proposed landscape structure.

(preventing erosion). Protection and creation of environment and landscape preservation is only secondary to them. The interest of the owners on “making the country green” is positive as large-blocks land management without natural elements is distorting the overall aesthetic view of this landscape.

Velké Vozokany

Historical landscape structure

Location of the village is historically causing the focus on human agricultural activities. Arable land covered over 62% of the entire land as early as 1843. Groups of trees occurred in rare places on the arable land. The largest cluster of forest land has been located in the western part of the cadastral area; its remains are visible even today. Forests have been the second largest land landscape elements then. Besides the already mentioned forest in the western part, forest complexes have been located also in the eastern part of the land at the contact with the cadastral areas of the Čierne Kľačany a Závada, as well as in the south in the touch with the community of Malé Vozokany. In the northern part of the area, there was successfully identified a river bank tree vegetation surrounding Širočina water flow. Permanent grassland surrounded the forests, mainly pastures and pastures with trees, which accounted for more than 7% of the cadastral area. Permanent grassland in the form of meadows was located mostly in the floodplains of Širočina that were flooded at times. Village itself is located in the flood plains of Širočina in the southern part of the cadastral area in contact with the cadastral area of the Malé Vozokany village. Neighbourhoods of the residential area were covered by the kitchen gardens and to a minimal extent also by orchards, vineyards, church

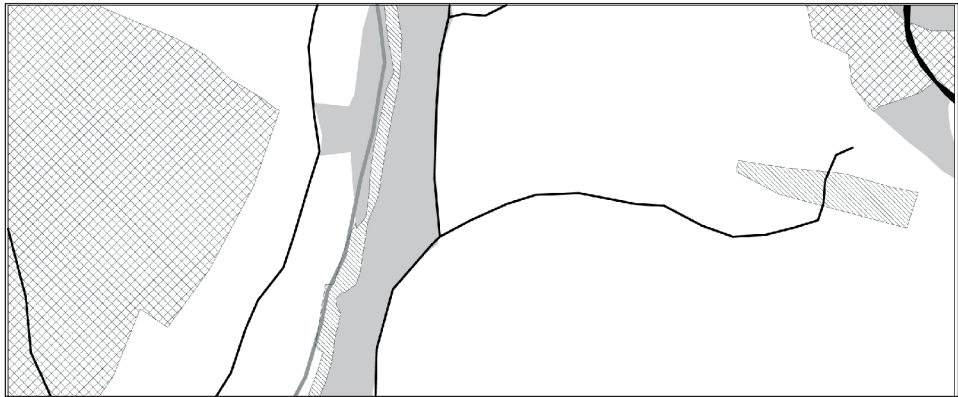


Fig. 8. Historical landscape structure.

and a mill. The shape of the historical landscape has a character of a balanced country with an appropriate proportion of the forests, meadows, fields and water areas.

Table 2. Representation of plot types in the LCP Velké Vozokany.

LCP Velké Vozokany						
Representation of plot types in the LCP						
Plot types	Historical landscape structure		Current landscape structure		Proposed landscape structure	
	ha	%	ha	%	ha	%
Arable land	620	62.77	675	75.38	655	73.12
Vineyards	1	0.16	3	0.38	3	0.39
Gardens	8	0.86	4	0.47	4	0.43
Orchards	5	0.56	0	0.00	0	0.00
Permanent grassland	128	13.01	89	10.02	76	8.46
Forests	213	21.63	86	9.61	77	8.59
Water areas	4	0.48	3	0.42	3	0.36
Urbanized areas	7	0.72	11	1.29	27	3.04
Other areas	3	0.29	21	2.43	50	5.61

Current landscape structure

Landscape has significantly changed during collectivization, there is complete control of watercourses, most of the grasslands were turned into arable land, and limits have been removed. This results in very low ecological stability and reduced aesthetic quality of the

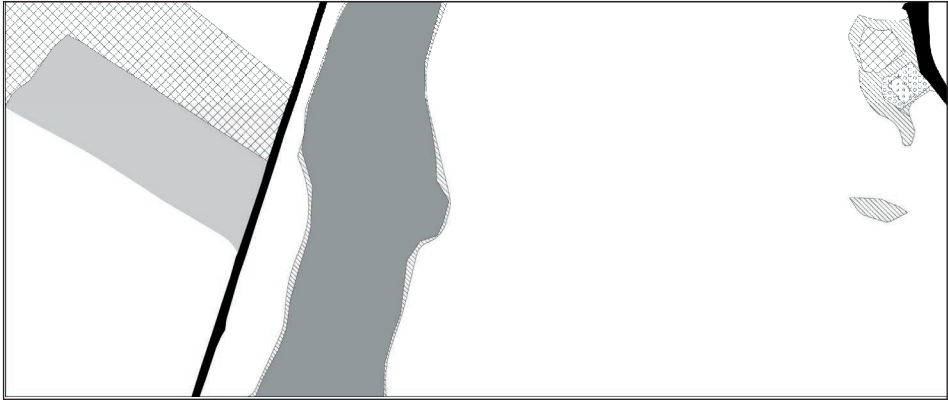


Fig. 9. Current landscape structure.

territory. Another problem is the water in the area, given the low density hydrographic network; the water is drained predominantly by thalwegs which are working as occasional watercourses. Thalwegs in the western part of the area are tunneled by pipelines under the state road into the watercourse and reservoir. The eastern area is directly drained into the water flow and water reservoir. Given the intense management of the soils surrounding the flood plains, there is sedimentation which blocks watercourses and reservoir. Majority of the cadastral area of Velké Vozokany is occupied by the arable land, 75%, permanent grassland and vineyards have only 10% share of the area each. Agricultural land occupies 86% of the total area of the LCP perimeter. Forest land in the territory has a 10% share. Non-forest woody vegetation occupies almost 3% of the area. This means that the land consolidation perimeter in Velké Vozokany cadastral area is under intensive agricultural use. The detailed specification of the current landscape structure is given in Table 2.

Proposed landscape structure

The landscape consolidations in the cadastral area of Velké Vozokany were launched in 2003, in accordance with the law on land consolidations. Proposal for a new, future, landscape structure was based on identification of problems in the area. The principal problems which have been identified are: water erosion, flooding, poor environmental stability, promoting the development of recreational potential of the area, the future construction of highway, a high degree of use of the agricultural land and so on. Assessment and proposal of a functional, spatially, and aesthetic solution must be based on compromise and multifunctional character of proposed measures. Water flow Širočina with the water reservoir are a green axis of the area, which must be appropriately maintained, enhanced by river bank vegetation and paths for walking, in order to avoid the use of the road by the pedestrians wishing to go to the

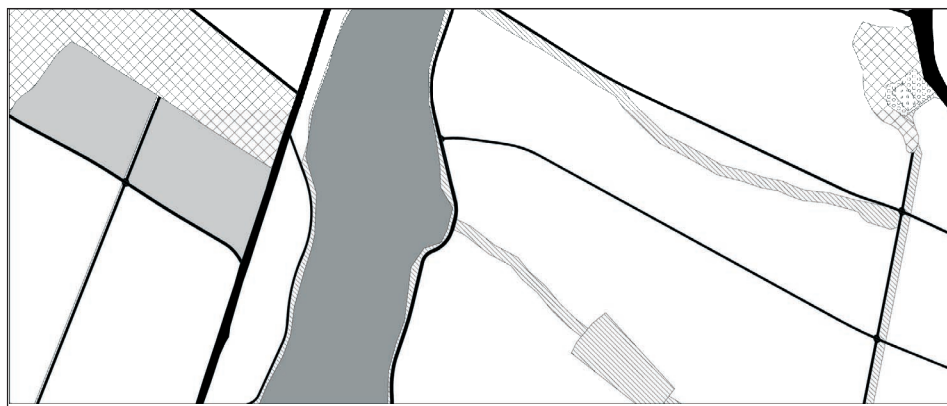


Fig. 10. Proposed landscape structure.

reservoir. River bank vegetation will also create a scene, which will appropriately direct/hide views to large-blocks fields. GPFOT proposes to create an area network of field roads that are traced besides Calvary and crosses, always in combination with the trees. Roads are designed not to be dull, to pass alternately field, permanent grassland, forest edge, along rivers and so on. They are situated so that at the end of the route is oriented to a sensible target (e.g. outlook tower, fast food, memorial, bench, etc.). Cadastral area has great potential for development of recreation, especially by cycling. Examples include a bicycle path toward Tesárske Mlyňany along the Vozokany bronze lion monument. Current, loose, often not-drivable field road is proposed in the draft GPFOT for the territory for reinforcement with accompanying vegetation on both sides of the road. GPFOT of the area takes into account the perspective of spatial development. Landscape of Veľké Vozokany will be permanently torn by a new motorway body. Particularly interesting is also how the large blocks of arable land are dealt with. GPFOT proposal for the area creates the illusion of natural landscape in these locations through the break of slope length using jump-in belts, field roads and grassing thalwegs always combined with a proposal for accompanying vegetation.

Kanianka

Historical landscape structure

Location of the Kanianka community at the contact of Strážovské vrchy Mts and Hornonitrianska kotlina basin did significantly influence the use of the cadastral area of the village already in the 1845. Strážovské vrchy Mts formed relatively compact complex of predominantly mixed forest, 57% of the area. Even nowadays, there are similar complexes. Mixed forests have been interrupted in the NW part of the cadastral area (Ploský mountain area),



Fig. 11. Historical landscape structure.

which was probably due to the effort for dispersed urbanization and intensive agricultural use at that time, as confirmed by the local names Kanianske lazy. SE part of Kanianka in the Hornonitrianska kotlina basin was intensively used for agriculture. Arable land was the second largest landscape element with almost 28% of the area. It surrounded the grassland in the form of meadows (partially overgrowing) that on an area of more than 11% surrounded themselves the creek Kanianka south of the village. In the northeastern part of the land around the creek Zlatná, we located large areas of overgrowing meadows. The village was surrounded by the creek Kanianka at the contact of Hornonitrianska kotlina basin and Strážovské vrchy Mts. Individual houses had kitchen garden (almost 1% of the area). Field roads led mostly to the neighbouring villages: Lazany, Dubová, and Poruba.

Table 3. Representation of plot types in the LCP Kanianka.

LCP Kanianka						
Representation of plot types in the LCP						
Plot types	Historic landscape structure		Current landscape structure		Proposed landscape structure	
	ha	%	ha	%	ha	%
Arable land	221	27.84	122	17.23	118	16.63
Gardens	7	0.94	0.1	0.02	0.1	0.02
Permanent grassland	54	12.44	47	6.62	42	5.97
Water areas	2	0.52	10	1.46	10	1.46
Urbanized areas	3	0.63	9	1.28	14	1.97
Other areas	3	2.34	17	2.47	28	3.99
Forests	459	57.80	500	70.92	498	69.96

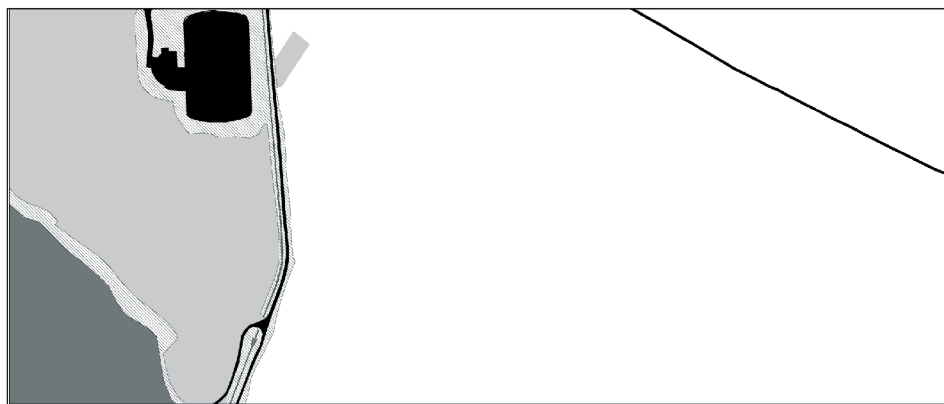


Fig. 12. Current landscape structure.

Current landscape structure

In the current landscape structure within the perimeter of the project, the majority has the forest land, 70% of the area. Arable land has 17% and permanent grasslands occupy only 6% of the project area. This means that the country is heavily used by forestry and agricultural land use is only complementary. At the junction of the watercourse Kanianka and its right tributary a water-management dam is built – Kanianska reservoir with area of approximately 9 ha. The dam was built as a regulatory reservoir and water supply for irrigation. It is also used for recreational purposes. The country has a high ecological stability especially in areas of continuous forest units in Strážovské vrchy hills. The specification of the current landscape structure is given in Table 3.

Proposed landscape structure

Land consolidations in the cadastral area of Kanianka were initiated in 2007. Design activities are aimed at a comprehensive settlement of the countryside, with the basic idea of protecting and preserving renewable resources (water, soil), plant and animal species and their communities, and new land use. The main goals of the plan of general principles of functional organization of the territory were proposals of measures:

- a) to serve a better accessibility of land, i.e. roads and objects on/around them,
- b) to slow or suppress the degradation of agricultural land, i.e. preserving and promoting the natural production capacity of soils,
- c) to conserve and develop the environment, enhance the country and increase the ecological stability (TSES and promotion of biodiversity of the country),

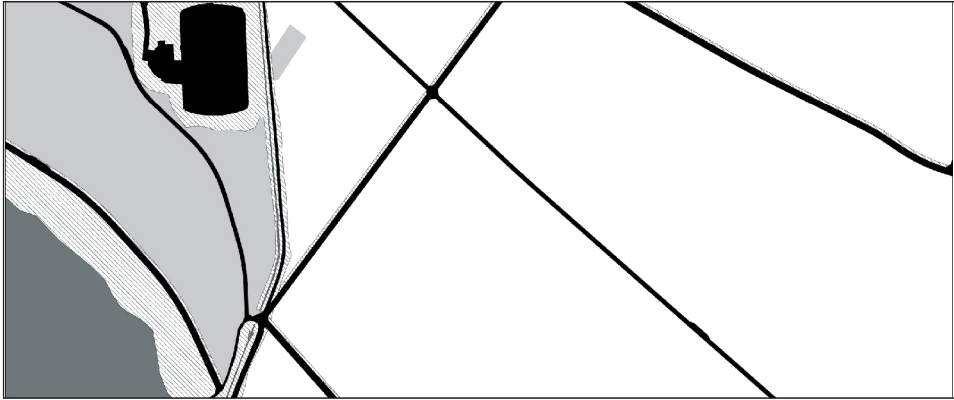


Fig. 13. Proposed landscape structure.

d) to preserve and create the landscape nature (support for structural landscape elements and aesthetic values, the variety and uniqueness of the country).

In comparison with previous model villages (Hájske, Velké Vozokany), this village location is less suitable for agriculture with steep slopes inducing a fairly different type of dominant use, namely forest land. This also explains the tendency of owners to preserve arable land as far as possible, since the negative environmental factors, according to their opinion, do not influence their territory (Muchová, Konc, 2008).

Assessment of changes in the landscape due to land consolidations

Land consolidation projects are not serving only the owners respectively the users, but are important for the whole country. Priority shall be given to environmental measures, including erosion control and water management. These measures made up 75% share of all common measures in Velké Vozokany and Hájske (Table 4). In forest type Kanianka, they accounted for more than 50% share. The rest of the land use went to the communication measures. This ecological character of the land consolidation projects is the more visible; the more is the type vulnerable to anthropogenic impacts and intensive, predominantly agricultural use. On flatlands (Hájske) with intensive agricultural activity aimed at large-blocks management, the ecological measures (along with water-management) accounted for more than 81%. In hilly landscape (Velké Vozokany), where there are still remnants of forest and permanent grassland, ecological measures took lower proportion of (but more than 70%) and the share of land for communication measures grew (almost 30%). In the highlands (mountains) with a high proportion of forest and permanent grassland (Kanianka), which occupy more than 75% of the land area, the land use for environmental action (55.6%) and for communication measures (44.4%) are almost equal.

Table 4. Table of land use for common facilities and measures.

Land use (m ²)	Hájske	Veľké Vozokany	Kanianka
for communication measures	196 515	179 467	136 966
for water-management measures	84 841	-	-
for erosion control measures	-	28 074	-
for environmental measures	767 529	401 564	171 385
for common facilities and measures in total	1 048 884	609 105	308 352

Land Consolidation projects are a tool that greatly affects the landscape nature. In the case of realization of common facilities and measures as have been projected in the proposals, it is possible to induce a significant positive change. Given that in 19 areas of Slovakia implementations of proposed common facilities and measures are under way and in two cadastral areas, they have already been completed, it can be assumed that by the successive steps the landscape will be (re)shaped in the desired extent, provided the political activities and short-sighted interests will not influence the whole process in a wrong way.

Conclusion

Currently, the land consolidations proceed in 422 cadastral areas of Slovakia, the projects are completed in 56 cadastral areas and a project is developed in 366 cadastral areas. On the territory of Slovakia, there were 21 simple land consolidation projects in progress, of which 13 projects are completed. Implementation of projects is under way on the area of 393 635 ha, completed projects are recorded on the area of 44 891 ha. Land consolidation projects are designed to take into account the consistency between production and landscape values of the country. Thus, land consolidation projects, inter alia, contribute to the enhancement of landscape in their area. They result in a new spatial and functional organization of the territory, which is represented by changing the types of land plots, thus changing the landscape structure. Landscape structure belongs to one of the key components of the landscape nature. We evaluated the landscape structure of the territory in three time horizons: historical landscape structure (2nd military mapping), current landscape structure (the result of analysis part of the landscape planning – a dedicated planimetric mapping results in the framework of the land consolidation projects), and the new landscape structure (the result of the evaluation and the design parts of the landscape planning – the results of the draft general principles of functional organization of the territory). As indicators of changes in the landscape, the elements characterizing the land use have been used: arable land, forest land, vineyards, gardens, orchards, permanent grassland, water areas, urbanized areas and other areas. In the paper we have tried to describe the role of land consolidations in developing proposals for changes that will significantly contribute to the preservation and creation of landscape nature.

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