TRANSFORMATION OF PHYSICAL-GEOGRAPHIC STRUCTURE OF LANDSCAPE OF PARADYNAMIC SYSTEM OF NORTHERN HINTERLAND OF ZEMPLÍNSKA ŠÍRAVA WATER RESERVOIR

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Abstract: *The paper analyses the landscape structure on the example of a paradynamic system (contrast region) in the hinterland of Zemplínska šírava reservoir delimited by the cadastral territories of the villages of Vinne, Kaluza, Klokocov, Kusin and Jovsa. For this purpose a set of aerial photographs and topographical maps were used. The changes of the landscape structure stem from the land use analysis assessed by the methods of GIS and mathematical statistics. Different economical, social and political development is visible also in the land use. In 1826 the studied area was a half-natural landscape with small society influence that started to increase after the collectivization development.*
Key words*: landscape structure, land use, natural landscape, cultural landscape, GIS, function changes*

INTRODUCTION

Physical-geographical complex of landscape presents a complex of natural landscape that is being recreated by a man. Nowadays it cannot be told about a natural landscape per se and it cannot be reconstructed scientifically. It is of big importance in evaluating landscape as it presents the basis for revitalization.

Transformation of a natural landscape into a cultural one is thus necessary to be understood in time-spatial context. Time and space present to the most important universal quantities – dimensions, in which the natural and and human forces mutually form and permanently create the natural landscape to the cultural one and imprint the unique character to it (Žigrai 2000).

The current development of GIS brings the progressive possibilities of mapping the landscape structure using Earth remote sensing methods. Using the aerial photographs from various periods of time enable us to trace the dynamism of the landscape development at the relatively large territories. It is also successfully applied in case of regional and local scales.

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Analysis of the landscape structure that is evaluated by the method of multitemporal analysis can be found in the works of the following authors: (Feranec, Oťaheľ, 2001, Boltižiar 2003, 2005, Feranec, Oťaheľ, Cebecauer, 2004, Oťaheľ et. al. 2004, Cebecauerová, Cebecauer 2005, Cebecauer, Hofierka 2007, Michaeli, Hofierka, Ivanová 2008a, 2008b, Ivanová 2006).

The aim of this article was to analyze and evaluate the changes in a physical-geographic structure of landscape and functional use of landscape of a paradynamic system of the northern hinterland of Zemplínska šírava reservoir specified by the cadastral territories of the following villages of Vinné, Kaluža, Klokočov, Kusín and Jovsa. The identification of changes was realized by process of covering the layers in the GIS software Arc View. The results that we gained by layers covering were elaborated to the contingency tables and graphs of transformation of changes in land use. For the land use analyses the maps from the second military mapping in 1826 and military topographic maps from1956 were used.

PHYSICAL-GEOGRAPHICAL CHARAKTERISTICS OF THE STUDIES REGION

The studied territory is situated on the northern bank of Zemlínska šírava, on the border of two genetically different, contrastive units, namely: volcanic Vihorlat mountains built mainly by the Neogen effusive rock and Podvihorlatska upland built by the loose clastic sediments of Miocene with the thick cover of Aeolian and polygenetic Quaternary sediments. It is situated in a tectonically most active zone, on the border of the East Slovakian lowland and Podvihorladská upland, that that dropped approximately 500 m during the period between the upper Badenite and the upper Pliocene. The tectonic activity was decreasing until the Sarmat period. The tectonic disturbances were also manifested in Pliocene and partly they continued into Quaternary period. The Quaternary neotectonic shifts present mainly new, as to the area and character, independent phase with the beginning that can be set to the period of Early Pleistocene. It resulted in the creation of tectonic depression – the Sub-Vihorlat rift valley, the part of which the Šírava rift valley is. Till the end of the Riss it was tectonically inactive. The intensive shifts started at the beginning of the Würm and in the Postglacial. Its subsidiary character was presented by the swampy environment, where the peat - soil arose. The earthy fluvial and slope sediments were piled up here. The total decrease of the Šírava structure in that period was 10 – 15 m (Baňacký 1987). Currently, we have been recording 1 – 0,5 mm tectonic decrease of the territory yearly. The geographic position of the studied territory is very important considering the above mentioned morphostructures. It influenced its future development of its landscape structure to great extent and this is also a subject matter of our article. Considering other position factors – the climatic and hydrological conditions had also an important role. Considering the climate aspect, the territory belongs to the warm climate zone, area A_6, that is warm, moderately humid with cold winter with an average temperature in January –3º up to - 5º C. Hydrologically the territory belongs to the Laborec basin. The soil cover is presented by cambisols and luvisols with epiphenomenon types of intrazonal soils. The original plant-association were mostly eliminated and the landscape was changed to the cultural steppe, later in the sixties after Zemplínska šírava was constructed, dominant agricultural function, in the central and southern part of our region it decreases in favor of recreational one.

METHODS

The methodology was focused on the evaluating of the information sources, topographic maps and aerial photographs from the different time periods. The landscape changes evaluation was realized using the method of layers covering in GIS Arc View 3.2 software in the years 1826 and 1956. The results that we gained by layers covering were elaborated to the contingency tables and graphs of changes in land use.

LAND USE CHANGES EVALUATION

Landscape structure underwent serious changes in 1826. From the point of use the studied period presented in 1826 half-natural landscape. The forests were covering more than 50% of a total territory, 23% was arable land (with a scattered lineary and solitary vegetations and without it) and 22% sustainable grasslands (wet meadows, sustainable grasslands with a scattered line and solitary vegetation and without it, table 1). From the sources available it is evident that this character with the gradual continual changes had been kept by the land of the studied area until the beginning of the 50ties of the 20th century.

The citizens were usually working at the manor houses, small handicrafts, skidding logs out of wood until the abolishment of subjection in 1849, they were not allowed to have their own soil. Land reforms that were run in the later period should have diminish the excessive disintegration, to enable citizens to get soil and thus at least partly to balance the differences between squires and small peasants. Unfortunately, their realization was rather difficult and big size of soil still stayed in the hands of small group of rich feudals.

There were rapid changes in the property shares in the fifties of the 20th century when the government was forcing the idea of collectivization what was also reflected in the changes of its use. The share of the arable land without scattered vegetation in the absolute values raised in more than 700 ha (8,9%, table 1), what was influenced by the transformation of the unused sustainable grasslands with scattered vegetation (fig. 1). An increasing effort to use land more effectively for agricultural purposes led towards the gradual diminishing of the scattered vegetation, namely from the arable land as well as from the sustainable grasslands (table 1, fig. 1). The evidence of the developing agricultural activity is the origin of three areas of agricultural cooperatives: JRD Vinné, JRD Klokočov and JRD Jovsa. From the second mapping military map from the year 1826 is evident that there was a relatively extensive (4,5 ha) sheepfold. It was located at the southwestern part of the cadastral territory of Vinné village. It disappeared until the year 1956 (table 1).

The most remarkable change in the studied period 1826 – 1956 can be considered the transformation of wet sustainable grasslands into their non-wet form (fig. 1). Overflowing of the river lines in spring storm water caused marshing the sustainable grasslands that were prevented by the by extensive land drain that were realized before the construction of Zemplínska šírava. Blatský potok with its tributaries Kamenný jarok and Viniansky potok was together with Skalný jarok flowing through the village Klokočov connected to Čierna voda. It was similar in case of Kusínsky and Jovsiansky potok that were conducted to Čierna voda on the common confluence. As the width of the riverbed was too small from the point of the used map scale in 1826, these rivers are missing on the maps of land use in that year (table1).

Comparing the second military mapping maps with a military topographic maps from 1956 one can notice another significant change. It is presented by approx 9 ha Vinianske

jazero that is missing at the map from the second military mapping. In that period of time there were sustainable grasslands. It is not a natural lake. Lake basin was modeled by the mass flows rising under Kyjov. After the marked tectonic movements the currents of water diverted their direction. They were flowing westerly from Šútova or they disappeared. Subsequently, the lake basin was blocked by the artificial reservoir and its donation by water the Viniansky potok. Since the end of the 19th century it was used as fishpond for the carp breeding.

In percentual statements and comparisons of changes in the landscape structure the most dominant was transformation of the sheepfold area into arable soil with scattered vegetation with its 96,8% followed by 81,9% change of the sustainable grasslands without trees and shrubs into sustainable grasslands with trees and shrubs, 81,5% transformation of scrubs into forests and 55,0% change of arable land with scattered vegetation into arable land without scattered vegetation (fig. 2).

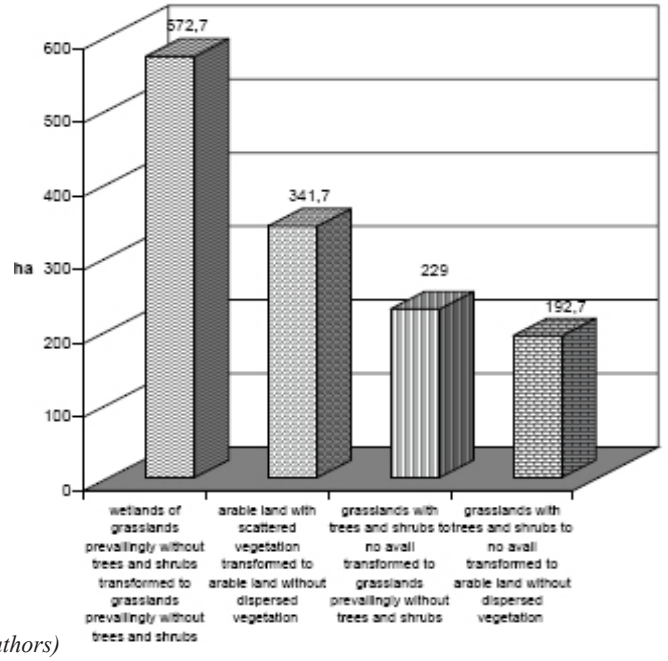
Tab. 1: *Comparison of selected land use forms in the years 1826, 1956 and 2005*

Land use forms		Area (in ha) in the year 1826	Area (in ha) in the year 1956	Difference (in ha) 1826-1956
1	built-up areas with family houses and gardens	129,317	228,2	98,883
2	built-up areas of individual recreation	-	-	-
3	areas of special installations	-	-	-
4	road network associated land	33,096	35,547*	2,451
5	protective dams	-	-	-
6	mineral extraction sites	-	4,421	4,421
7	cemeteries	-	3,561	3,561
8	sports and leisure facilities	-	-	-
9	areas of agricultural cooperatives, sheepfold	4,461	4,303	-0,158
10	arable land without scattered vegetation	1192,904	1900,729	707,825
11	arable land with scattered vegetation	629,466	218,31	-411,156
12	arable land to no avail	-	-	-
13	fruiting vineyards	133,912	177,319	43,407
14	vineyards to no avail	-	-	-
15	fruit trees	-	7,796	7,796
16	grasslands prevailingly without trees and shrubs	465,849	1342,866	877,017
17	grasslands with trees and shrubs to no avail	566,177	300,913	-265,264
18	garden's settlement	-	-	-
19	broad-leaved forests	4078,338	3397,518	-680,82
20	undergrowth	-	51,706	51,706
21	scrubs	33,395	243,493	210,098
22	beaches	-	-	-
23	bank vegetation of the water basins	-	-	-
24	vegetated areas along the water streams	26,293	42,881	16,588
25	water streams and regulated water streams	-	25,065**	25,065
26	artificial water reservoirs	-	9,372	9,372
27	wetlands of grasslands prevailingly without trees and shrubs	700,792	-	-700,792

* *In case of transport communications only the most important transport lines were mapped*

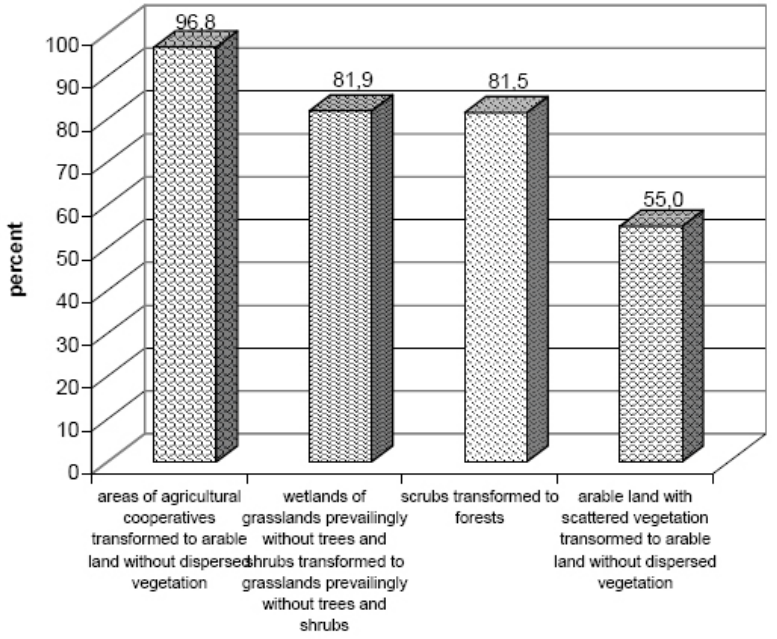
** *Only water flows with minimal width of 13 m were displayed*

Fig. 1: *Land use changes (in ha) in 130 years (1826 –1956)*



Source: (authors)

Fig. 2: *Land use changes (in %) in 130 years (1826 –1956)*



Source: (authors)

CONCLUSION

The landscape structure of the studied area has undergone significant changes. In 1826 the studied territory presented the half-natural landscape from the point of its use. The forest areas were covering more than 50% out of total territory, 23% was arable land (with scattered lineary and solitary vegetation but also without it) and 22% sustainable grasslands. There were rapid changes in the property shares in the fifties of the 20th century when the government was forcing the idea of collectivization what was also reflected in the changes of its use. The share of the arable land without scattered vegetation in the absolute values raised in more than 700 ha (8,9%, table 1), what was influenced by the transformation of the unused sustainable grasslands with scattered vegetation (fig. 1). An increasing effort to land use more effectively for agricultural purposes led towards the gradual diminishing of the scattered vegetation, namely from the arable land as well as from the sustainable grasslands.

The original paradynamic system of the Vihorlat mountains and adjacent part of the East Slovakian lowland evoked the marked interference of a man by the physiogeographical structure that was caused by a dominant agricultural function of the whole East Slovakian lowland. Its quality was lowered by the floods and the vast melioration modifications had to be done here.

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TRANSFORMÁCIA FYZICKOGEOGRAFICKEJ ŠTRUKTÚRY KRAJINY PARADYNAMICKÉHO SYSTÉMU SEVERNÉHO ZÁZEMIA VODNEJ NÁDRŽE ZEMPLÍNSKA ŠÍRAVA

Zhrnutie

Súčasná štruktúra krajiny je výsledkom dlhodobého antropogénneho pôsobenia človeka na prírodnú krajinu. Interaguje a odráža dôležité informácie o krajinných zložkách, faktoroch, procesoch, ako aj mnohých javoch nemateriálnej podstaty. Je výsledkom ich vzájemného pôsobenia v priestore a čase a vyznačuje sa určitou kvalitatívnou a kvantitatívnou väzbou jej prvkov na dané procesy a javy (Dobrovodská 2000).

Jednou z možností vyhodnotenia zmien v krajinnej štruktúre je analyzovať zmeny vo využívaní krajiny v jednotlivých časových horizontoch. Pre tento účel sme využili mapové podklady z druhého vojenského mapovania a vojenské topografické mapy z roku 1956.

Cieľom príspevku bolo analyzovať zmeny vo využívaní krajiny a funkčného zamerania obcí na príklade kontrastného regiónu – paradynamického systému severného zázemia Zemplínskej šíravy.

Výber časových intervalov nebol náhodný. Jeho snahou bolo zachytiť najmarkantnejšie zmeny za 130 ročné obdobie. Z analýzy zmien vo využívaní krajiny vyplynulo, že najväčší vplyv na rozvoj skúmaného regiónu mala kolektivizácia, vplyvom ktorej sa pôvodný poloprírodný charakter skúmaného územia postupne transformoval v kultúrnu krajinu s dominantnou pozíciou poľnohospodárskej a obytno-službovej funkcie.

Recenzovali: Prof. h.c. prof. Ing. Ondrej Hronec, DrSc.
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