Plants in Urban Areas and Landscape
Slovak University of Agriculture in Nitra
Faculty of Horticulture and Landscape Engineering
DOI 10.15414/2014.9788055212623.138–142

LANDSCAPE STRUCTURE CHANGES WITH REGARD TO LANDSCAPE ARCHITECTURE AND ECOLOGICAL VALUES

Jan SUPUKA

Slovak University of Agriculture in Nitra, Slovakia

Landscape structural changes were studied at Oponice cadastral territory within three time horizons of 1869, 1949 and 2010 years. For assessment were used historical and contemporary maps, aerial photos and supported by field research. Identified changes shows almost balance proportion in forest, arable land and water elements within study horizons. To the category, where landscape element proportions were increased belong built-up areas, roads, gardens and vineyards and non forest woody vegetation. Proportion of grassland has been decreased rapidly from almost 10% to 1% within 1869 and 2010s. Landscape architecture changes and values show in mosaic plot structure, when small size were alternated by large scale ones. The all identified changes are close related to social economy development land use form and management technology intensification. During 60s of last century passed hard process of agricultural collectivisation related to land consolidation and land ownership changes. Many small groves were cute down, wet-lands drainages, and grassland plough-up and new wind breaks established by planting of black locust (*Robinia pseudoacacia* L.) predominantly. Landscape variability and colourfulness were decreased. New technical human works were constructed as three dimension space elements. Culture historical values were suppressed and landscape being enriched by new elements as reflection of standard landscape development. Contribution describes particular landscape changes and values.

Keywords: landscape structure, changes, values, assessment

Introduction

In the recent period, there are several authors who study development changes in the land use. They assess the secondary landscape structure in different time periods. The reason consists in the identification of changes and the trend development in land use forms, cultural and historic value of the landscape, landscape image, ecological stability of the landscape, natural and cultural diversity, biodiversity and the gene-pool value of the landscape. Pucherová (2004) presents the results of landscape structure development and changes by the example of 5 cadastral territories of the Nitra Self-governing Region. She compares the period of the 2nd half of the 19th century (1863, 1879 and 1892) with the year 2002. Petrovič (2005) deals with landscape development in a dispersedly settled area by the example of Pohronský Inovec and Tribeč in 1783, 1956 and 2002, Šolcová (2012) assesses the development of a dispersedly settled landscape in the region of Nová Baňa in five time periods (1780, 1844, 1956, 1992 and 2008). By the example of the Nitra city and its contact area, the changes between 1995 and 2004 are assessed and published by Mišovičová (2008). A land cover assessment is elaborated and published by Ivanová (2013) by the example of the hinterland of the Zemplínska Šírava dam in 1956, 1991, 2005 and 2009.

However, human activities are dominantly visible on land use and land cover changes, floristic and phenological composition of the vegetation cover of natural or cultivated character. These changes appear not only in urban areas but also in their contact zones, in the agricultural and forest landscape (Feriancová and Schlampová, 1998; Jančura and Kočík, 2003; Pucherová, 2004; Reháčková and Ružičková, 2004; Supuka et al., 2008).

One land use form replaces the other one, usually the more progressive the less progressive one. This process is generally called alternative (Alternative = the possibility to choose between two forms, alternation, substitution).

Land reforms, variable ownership relations, farming methods, intensification processes, all of these have had a direct impact on the landscape image development, which can be defined in following landscape-structural expressions:

- land segregation and separation,
- land consolidation,
- change in land shapes and sizes in time and space,
- reduction of covers, lines and solitaries of woody plants and natural biotopes,
- change in the structure of road networks,

*Correspodence: Jan Supuka, Slovak University of Agriculture in Nitra, Faculty of Horticulture and Landscape Engineering, Department of Garden and Landscape Architecture, Tulipánová 7, 949 01, Nitra, Slovakia, e-mail: Jan.Supuka@uniag.sk.

DOI 10.15414/2014.9788055212623.138–142

- change in the scale of the landscape,
- change in the landscape mosaics and colourfulness,
- change (reduction) in visual, aesthetic and perceptual values of the landscape

The geo-ecological potential, the form of land use and the transformation level of the original landscape represent basic criteria to classify the cultural landscape (Hrnčiarová, 2004; Supuka et al., 2008). Many elements of the cultural landscape bear the marks of historic continuity. They document forms and methods of land use, ownership relations, technological and knowledge level of utilisation or extraction of natural resources, building of settlements, technical constructions and other human artefacts. Their presentation and physical allocation in the landscape represent historic landscape structures. These can be also an initial criterion for cultural landscape classification (Huba, 2004).

All identified and described types of the historic landscape are bounded up with the form and intensity of natural resource utilisation and the economic activity of man in the landscape (Chalupová, 2004; Supuka et al., 2004). In principle, they are linked to the forms of land use and categories of socioeconomic activities of the human society. These underlie the differentiation of geographic and cultural regions in Europe (Agnoletti, et al. 2010; Coeterier, 1996; Dower, 1998) as well as in Slovakia, including diverse types of cultural landscapes like urban, mining, agricultural, viticulture, religious and other landscapes (Drdoš, 1995; Hrnčiarová, 2004; Kozová, Hrnčiarová and Oťaheľ, 2008; Kraková, 2001; Štefunková, 2004; Supuka, Verešová, Šinka, 2011; Verešová, 2011). A specific type of cultural landscape are the so called composed or designed landscapes, landscape parks, historic style parks and gardens, which are richly represented mainly in historic cultural regions but also in Slovakia (Majdecki and Majdecka-Strzezek, 2010).

Urban landscape has also been passed over changes during development time, but mostly after industrial revolution and second war world one. The city content involves buildings, built-up areas and green structure. Each of them passed on development and changes. European cities have had similar changing ways and other than American and Asia because other history and style backgrounds. In Europe to the typical historical style buildings and inner urban structure has been added to outskirts new urban structure elements as were housing estate zones, family house, industrial, sport and recreation zones, as well as shopping centres. Cities have become enhanced in size density, and vertical dimension (also), the new urban structure, architecture-style, colour and construction materials are seen nowadays (Antrop, 2004; Pivko and Špaček, 2007).

Green structure from tradition historical parks and gardens have been advanced and classified to the new system representing green net and open spaces (Fabos, 2004; Feriancová, 2008). They have been served many positive ecology and environmental functions according to area size, natural origin or cultural level changes and location in city structure. New forms and green components contributes to the urban architecture features, aesthetic and environmental quality (Supuka, 2011; Tóth and Feriancová, 2013).

Material and methods

Landscape structure in different time periods were assessed by mapping landscape elements showed in the elaborated maps. They represent historical landscape development and continual changes due to different land use form. The second part of landscape changes is focussed to landscape architecture elements and composition feature changes, as well as culture historical landscape elements in antropogenous and natural level. For assessment of defined landscape feature changes was chosen the Oponice cadastral territory located on south boundary of Topoľčany district in Nitra Self-governing Region. For this area the elements of landscape structure and architecture changes were evaluated based on available maps from the year of 1869, 1949 and 2010 and field valuation and description in 2010 as well. More particular methodical approaches are published in science monograph (Supuka et al., 2013).

Results and discussions

The historical landscape structure of the Oponice cadastral territory was analysed from 2nd military mapping of 1869 year, secondary landscape structure from aerial photo of 1949s and contemporary landscape structure from the orthophoto map of 2010 year.

The results are presented according to 11 classification landscape element units (Table 1).

Historical layer of 1869s has been documented low level of agricultural technologies and land use mostly on suitable relief conditions. As dominant landscape element is being seen arable land in 54.02% located mostly at lowland and medium slope inclination.

Second position takes forests by 29.41% proportion in the south eastern part of studied cadastre. Surveyed forests are represented by oak-hornbeam and beach-oak stands predominantly. High proportion takes grassland cover and achieved 9.35%. This landscape element was located at flooded flats close to Nitra river as meadows and at the boundary to the forests. Built-up areas cover mostly Oponice village intravilane by 1.17% only that has been reflected also in small areas of gardens as a part of family houses. From interested landscape elements taking into account as composition

DOI 10.15414/2014.9788055212623.138–142

Table 1 Historical and current landscape structure in the Oponice cadastral territory

Landscape element	Area in ha according to years				Area in % according to years			
	1869	1949	2010	Proposal 2010	1869	1949	2010	Proposal 2010
Arable land	665.82	685.60	647.92	642.97	54.02	55.62	52.17	52.15
Grasslands	115.24	80.91	10.51	10.51	9.35	6.56	0.85	0.85
Orchards	–	–	20.15	20.15	–	–	1.63	1.63
Vineyards	0.00	15.66	18.82	18.82	0.00	1.27	1.53	1.53
Non forest woody vegetation	38.94	36.73	64.24	+4.95 69.19	3.16	2.98	5.21	5.57
Forests	362.52	334.94	362.23	362.23	29.41	27.17	29.39	29.39
Water streams and areas	11.25	21.58	13.96	13.96	0.91	1.75	1.13	1.13
Gardens	19.68	26.17	45.23	45.23	1.60	2.12	3.67	3.64
Built-up areas	14.41	22.60	43.50	43.50	1.17	1.83	3.53	3.53
Roads	4.69	8.36	9.49	9.49	0.38	0.68	0.77	0.77
Other areas	–	–	1.45	1.45	–	–	0.12	0.12
Sum	1232.55	1232.55	1232.55	1232.55	100.00	100.00	100.00	100.00

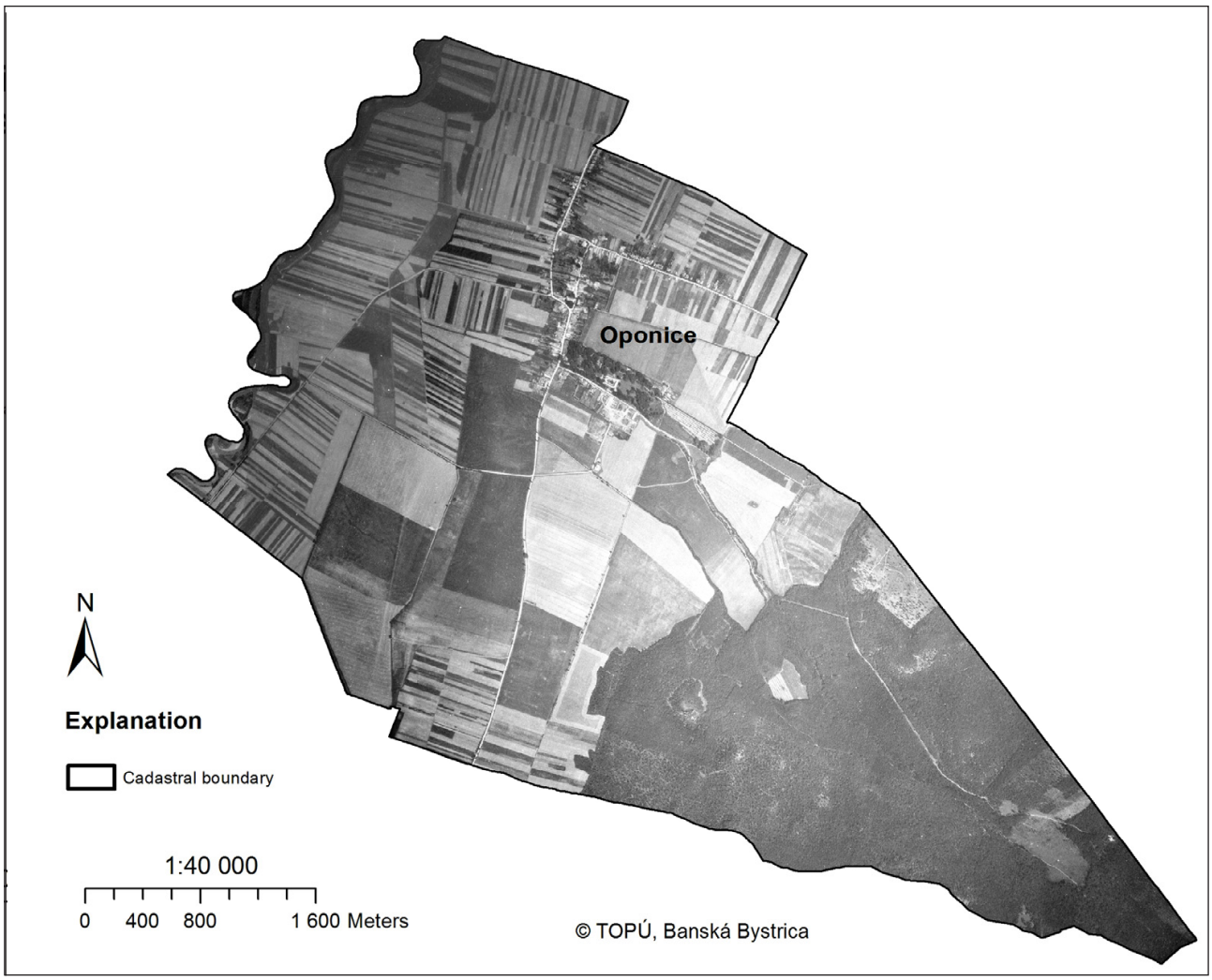

Figure 1 Aeral photo of historical landscape structure of the Oponice cadastral territory from 1949 year. Elaborated by K. Šinkaa

DOI 10.15414/2014.9788055212623.138–142

and ecological landscape stability are categories of non-forest woody vegetation covered by 3.16% of agriculture landscape that is considered as low cover proportion.

Distribution of landscape element in cadastral area is showed at aerial photo where the space distribution of land-use forms and landscape element structure were assessed by elaborated time layer of map of 1949 years (Figure 1). Aerial photo from 1949s shows interesting two categories of agriculture landscape plots. Western part of cadastral territory cover small size mosaic plots represented small former land property. Eastern part of cadastral territory shows large size plots belongings to feudal lordship of the Aponyi family residing in the manor house in Oponice village.

Regarding changes between time horizons 1869 and 1949 according to landscape elements during 80s has been increased proportion of arable land, vineyards, water streams and basins, built-up areas and accompanying family house gardens and road net as well. On the other hand area size had decreased at forest cover grassland and non forest woody vegetation landscape elements. The all identified changes are close related to social economy development land use form and management technology intensification.

During 60s of last century passed hard process of agricultural collectivisation related to land consolidation and land ownership changes. Many small groves were cute down, wet-lands drainages, and grassland plough-up and new wind breaks established by planting of black locust (*Robinia pseudoacacia* L.) predominantly. Those processes finally caused rapid decreasing of grassland, small decreasing of arable land and water areas. Significantly increased proportion areas of vineyards, non forest woody vegetation, forests, built up areas and gardens (Figure 1, Table 1). More particular presentation of the landscape structure changes by map documents from 1869, 1949 and 2010 are have published in monograph of Supuka et al. (2013).

Regarding culture-historical features of landscape the soft small size plots were substituted by large size plots and many old regional fruit trees were disappeared mostly on plough-up grasslands. Landscape-ecological stability decreased over creation of large size arable land culture blocks.

Regarding to landscape architecture changes and values in horizontal layers to mosaic plot structure, land variability and colourfulness has been decreased. Road net straight forward water stream and non forest woody vegetation lines have occurred. New technical human works were constructed as three dimensional elements as are power energy lines and masts, telemetric and transmission towers, chimneys and vertical water globes, 2–3 (or more) story buildings, family and block houses. Building façade and roof colourfulness have got turned to better and more variable. The arranged and designed open spaces, ornamental gardens and parks in village urban structure have became as more frequent features of culture and landscape-architecture values.

Landscape changes are being normal visible features of assessed time layers in Oponice cadastral territory in open landscape and built up village structure. Some historical marks were disappeared and a new elements and human works have arisen and spaces are being enriched by them. On the other hand ecological stability has decreased caused by large size arable plots arrangement.

Similar landscape changes were identified at many cadastral territory in eastern part of Tribeč hills (Pucherová, 2004) and Čajkov Cadastre and south pant of Štiavnické hills (Verešová, 2011). Intensity and structure of landscape changes in sense of architectonical composition and ecological stability depend on land ownership and economy activities in assessed region (Chalupová, 2004).

Conclusion

Landscape development changes were assessed at the study cadastral territory of Oponice in upper Nitra sub region. The compared time horizons were 1869, 1949 and 2010 years. Dominant tool for landscape structure assessment were historical and contemporary maps and aerial photos. Changes are seen in agriculture plot structure, proportion of landscape elements, changes in landscape architecture features and social economy development of study territory.

Acknowledgement

The contribution was elaborated thanks financial supporting by the grant No. KEGA 003SPU-4/2014.

References

AGNOLETTI, M. (ed.) et al. 2010. Paesaggi rurali storici. Roma-Bar : Laterza et Figli, 2010, 566 p. ISBN 978-88-420-9617-7.

ANTROP, M. 2004. Landscape Change ant the Urbanisation Process in Europe. In: Landscape and Urban Planning, vol. 67, 2004, pp. 9–26. ISSN 0169-2046.

COETERIER, J. F. 1996. Dominant attributes in the perception and evaluation of the Dutch landscape. In: Landscape and Urban Planning, 1996, no. 34, p. 27–44. ISSN 0169-2046.

DOWER, H. J. 1998. Countryside character. The character of England´s natural and man-made landscape. Northampton : Countryside Commission, UK, 1998, 143 p. ISBN 086170-497-5.

DRDOŠ, J. 1995. Krajinný obraz a jeho hodnotenie. In: Životné prostredie, vol. 29, 1995, no. 4, p. 202–205. ISSN 0044-4863.

FABOS, J. G. 2004. International Green Way Planning: An Introduction. In: Landscape and Urban Planning, vol. 68, 2004, pp.143–146. ISSN 0169-2046.

FERIANCOVÁ, Ľ. – SCHLAMPOVÁ, T. 1998. Dendrologická a krajinná štruktúra kontaktnej zóny sídla Očová. In: Acta Facultatis Ecologiae, 1998, no. 5, p. 73–83. ISBN 80-228-0788-5.

DOI 10.15414/2014.9788055212623.138–142

FERIANCOVÁ, Ľ. 2008. Nové trendy v záhradnej a krajinnej architektúre v kontexte mesta. In: Životné prostredie, vol. 42, 2008, no. 5, pp. 252–255. ISSN 044-4863.

HRNČIAROVÁ, T. 2004. Prírodné a kultúrne aspekty krajiny a jej potenciál. In: Životné prostredie, roč. 38, 2004, č. 2, s. 61–65. ISSN 0044-4863.

HUBA, M. 2004. Historické štruktúry krajiny v kontexte súčasnej reality. In. Životné prostredie, roč. 38, 2004, č. 2, s. 86–89. ISSN 0044-4863.

CHALUPOVÁ, M. 2004. Premena historického prostredia vidieka na príklade hornooravskej obce Podbiel. In: Životné prostredie, roč. 38, 2004, č. 2, s. 90–93. ISSN 0044-4863.

IVANOVÁ, M. 2013. Zmeny krajinnej pokrývky zázemia Zemplínskej šíravy v rokoch 1956–2009. Prešov : Prešovská univerzita, 2013, 233 s. ISBN 978-80-555-0728-6.

JANČURA, P. – KOČÍK, K. 2003. Perspektívy vývoja krajinnej štruktúry vo vzťahu k poľnohospodárstvu. In: IV. ekologické dni. Zvolen : TU, 2003, s. 42–48.

KOZOVÁ, M. – HRNČIAROVÁ, T. – OŤAHEĽ, J. 2008. Príprava metodiky pre klasifikáciu kultúrnej krajiny Slovenska. In: Enviromagazín, roč. 13, 2008, mimoriadne číslo, s. 20–21. ISSN 1335-1877.

KRAKOVÁ, A. 2001. Sakrálne objekty v krajinnom obraze stredného Spiša. In: Jančura, P. (ed.): Krajina, človek, kultúra. Banská Bystrica : SAŽP, Slovensko, 2001, s. 41–43. ISBN 80-88850-40-1.

MAJDECKI, L. – MAJDECKA-STRZEZEK, A. 2010. Historia ogrodow, Tom 1, 2. Warszawa : PWN SA, 2010, p. 486 and 491. ISBN 978-83-01-15329-8 t.

MIŠOVIČOVÁ, R. 2008. Krajinnoekologické predpoklady rozvoja mesta Nitra a jeho kontaktného územia. Edícia Prírodovedec č. 273, Nitra : UKF, 2008, 113 s. ISBN 978-80-8094-212-0.

PETROVIČ, F. 2005. Vývoj krajiny v oblasti štálového osídlenia Pohronského Inovca a Tribeča. Bratislava : Ústav krajinnej ekológie SAV, 2005, 209 s. ISBN 80-9692-723-4.

PIVKO, H. – ŠPAČEK, R. 2007. Tvorba mesta – ideály, charty, vízie. In: Životné prostredie, vol. 41, 2007, no. 5, pp. 233–239. ISSN 0044-4863.

PUCHEROVÁ, Z. 2004. Vývoj využitia krajiny na rozhraní Zobora a Žitavskej pahorkatiny (na príklade vybraných obcí). Edícia Prírodovedec č. 141, Nitra : UKF, 2004, 147 s. ISBN 80-8050-735.

REHÁČKOVÁ, T. – RUŽIČKOVÁ, J. 2004. The Analysis of Plant Species Composition of Forest Fragments in Bratislava. In: Folia Oecologica, 2004, no. 31, p. 85–93. ISSN 1336-5266.

SUPUKA, J. – FERIANCOVÁ, Ľ. – JANČURA, P. – SCHLAMPOVÁ, T. 2008. Krajinárska tvorba. Nitra : SPU, 2008, 256 s. ISBN 978-80-552-0135-1.

SUPUKA, J. 2011. Vegetačné štruktúry sídel v kontexte kontinuálnych premien. In: Životné prostredie, vol. 45, 2011, no. 3, pp. 146–150. ISSN 0044-4863.

SUPUKA, J. – VEREŠOVÁ, M. – ŠINKA, K. 2011. Development of vineyards landscape structure with regard to historical and cultural values. In: Ecology, vol. 30, 2011, no. 2, p. 229–238. ISSN 1335-342X.

SUPUKA, J. – ŠINKA, K. – PUCHEROVÁ, Z. – VEREŠOVÁ, M. – FERIANCOVÁ, Ľ. – BIHUŇOVÁ, M. – KUCZMAN, G. 2013. Landscape structure and biodiversity of woody plants in the agricultural landscape. In: Folia Universitatis Agriculturae et Silviculturae Mendelianae Brunensis. Monographic series, vol. 6, 2013, no. 9, 187 pp. ISBN 978-80-7375-905-6.

ŠOLCOVÁ, L. 2012. Vývoj krajiny s disperzným typom osídlenia v Novobanskej štálovej oblasti. Edícia Prírodovedec č. 531, Nitra : UKF, 2012, 207 s. ISBN 978-80-558-0208-4.

ŠTEFUNKOVÁ, D. 2004. Posúdenie vizuálnej kvality krajiny v krajinnej ekológii. Dizertačná práca. Bratislava : ÚKE SAV, 2004, 120 s.

TÓTH, A. – FERIANCOVÁ, Ľ. 2013. Green Infrastructure in the Context of Rural Space Restoration and Design. In: Nordic Journal of Architectural Research, vol. 25, 2013, no. 2, pp.187–212. ISSN 1893-5281.

VEREŠOVÁ, M. 2011. Krajinno-architektonické hodnoty vinohradníckych lokalít Západného Slovenska. Dizertačná práca. Nitra : SPU, 2011, 52 s.