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Ekológia (Bratislava) - Journal of the Institute of Landscape Ecology, Slovak Academy of Sciences Vol. 41, No. 4, p. 361–374, 2022

DOI:10.2478/eko-2022-0037

PROPOSALS TO PROMOTE ECOLOGICAL STABILITY AND LANDSCAPE BIODIVERSITY CONDITIONS IN THE LAND CONSOLIDATION PROJECT: A CASE STUDY OF HORNÝ VINODOL, SLOVAKIA

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Received: 13 July 2022 / **Accepted:** 20 October 2022

Abstract

Diviaková A., Veverková D., Belaňová E.: Proposals to promote ecological stability and landscape biodiversity conditions in the land consolidation project: A case study of Horný Vinodol, Slovakia. Ekológia (Bratislava), Vol. 41, No. 4, p. 361–374, 2022.

The paper discusses proposals for measures to protect the environment by promoting ecological stability and biodiversity conditions of agricultural land. It is a proposal of elements of the local territorial system of ecological stability (LTSES) for the purposes of land consolidation project (LCP) projects in compliance with specified methods, by way of the example of cadastral unit of Horný Vinodol. The proposal of the LTSES project comprised analytical, synthetical and design parts. Within the proposals, 12 elements of local importance were selected: two biocorridors, seven interacting elements and three windbreaks. In order to increase the ecological stability of the landscape, 10 framework management measures were proposed. The proposals were fully transferred into the LCP in the so-called general principles of the functional organisation of the territory. At the same time, all allocated elements of the LTSES meet the criteria of green infrastructure elements, providing ecosystem services.

Key words: ecological network, land consolidation project, biodiversity, management measures, green infrastructure.

Introduction

Human influence on natural ecosystems is the most important driving force of the current mass extinction of species and one of the biggest problems of biodiversity protection. Multiform and varied rural landscape was degraded to agricultural and industrial production environment (Buček, 2009). Human activities transformed the landscape to large agricultural areas, where original and natural ecosystems were often reduced to small, isolated areas. Biotopes of many species were significantly reduced, degraded and fragmented to such an extent that their survival and functionality are often seriously threatened (Sala et al., 2000). Biotopes' fragmentation is one of the main threats of species survival (Wilcove et al., 1998; Fahrig, 2003). The so-called Theory of Island Biogeography proceeds from the hypothesis about the unity of natural geobiocenosis and geobiocenoses transformed by human activities that originated in the areas of original type of natural geobiocenosis (Buček, Lacina, 2001). The theory states that the smaller and the more distant the 'islands' are, the smaller number of species is able to find conditions for permanent existence there (Maděra, Zimová, 2004). This theory pointed out the importance of spatial aspects for biodiversity, that is, how size and distance among the biotopes affect their composition. Taking ecologically stable segments of the landscape for specific 'islands' that get out of ecologically less-stable basis of the cultural landscape was the inspiration for the analysis of spatial relationships among different landscape ecosystems and for the searching of criteria and parameters for such organisation that would ensure preservation of the gene pool and would affect positively the ecological stability of the whole landscape (Buček, 2009).

Regarding these problems, a series of concepts such as corridors, landscape linkages, or ecoducts was theoretically developed within landscape ecology and protection of nature and landscape (Turner et al., 2001; Turner, 2005). Ecological network became the result of expanding the list of the concepts related to ecological linkage. This network is in general defined as a network of areas that are related in order to improve biodiversity protection (Boitani et al., 2007). Ecological networks are basic tools for biodiversity protection, for the protection of nature and landscape, while the emphasis is put on natural elements and their mutual linkage (Badidová, 2009). Buček (2013) takes ecological network for a system of existing ecologically signifi-

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cant landscape segments, also marked as a skeleton of ecological stability. Bennett and Witt (2001) consider ecological network to be a coherent system of natural and/or seminatural landscape elements that are configurated and managed in order to preserve or restore ecological functions as a means for biodiversity conservation and providing suitable options for sustainable use of natural sources at the same time. According to Pešout and Hošek (2012), ecological network is a system of sufficiently large core areas (biocentres), mutually interconnected by ways (biocorridors) or interacting elements (smaller areas allowing temporary occurrence of species also outside the core areas, and thus enabling their migration through the landscape). It is a spatially connected network of landscape elements, which ensure preservation or improvement of the state of species populations and biotopes, and subsequently ecosystems and their inner processes, including stability of landscape structure and sustainability of renewable natural resources.

Close attention has been paid to the idea of ecological networks, especially in Europe, since the 1980s (Jongman, 1995). The landscape ecology as a discipline of ecology was studied there for the first time. Currently, there are many initiatives in Europe, some of them at a national level (Mackovčin, 2000; Nowicki, 1996; Jongman, Kristiansen, 2001; Michal, Plesnik, 2002). Creation of ecological networks is one of the principal conceptions of landscape ecology and protection of nature and landscape.

Under our national conditions, the ecological network is represented by the territorial system of ecological stability (TSES). Definition of ecological networks is similar to the definition of TSES. Therefore, it is often understood as an equivalent of such a network under our conditions (Pešout, Hošek, 2012). The TSES represents a whole space system of ecologically optimal landscape structure, constituted by individual landscape elements of different degrees of ecological stability with different uses, but providing internal functioning of individual core ecosystems and functioning of spatial relations among them as prerequisites for spatial ecological landscape stability, and thus preserving diversity of life conditions and forms (Miklós, 1994, 1996; Miklós et al., 2011, 2019). The content of activities related to nature protection and landscape creation follows Act No. 543/2002 Coll. on Nature and Landscape Protection, as amended. According to this act (§2 (2)), the TSES is a structure of interconnected ecosystems, their components and elements, which ensures diversity of conditions and forms of life in the landscape. The base of this system consists of biocentres, biocorridors and interacting elements of over-regional, regional, or local level. Biocentre is an ecosystem or a group of ecosystems that create permanent conditions for reproduction, shelter and nutrition of living organisms and for the preservation and natural development of their communities. Biocorridor represents a spatially related complex of ecosystems, which connects biocentres, allowing migration and exchange of genetic information of living organisms and their communities and to which interacting elements are spatially connected. Interacting element is an ecosystem, its element, or a group of ecosystems linked to biocentres and biocorridors, allowing their favourable effect on surrounding parts of the landscape, which is modified or disrupted by people.

In the Slovak Republic, the TSES is legislatively incorporated not only in conservation acts, but also in spatial and planning, as well as agricultural legislative regulations. The concept of the TSES is fully convergent with other laws which have been created and applied to landscapes in Europe and all over the world (Smith, Hellmund, 1993; Buček, Lacina, 1993; Bani et al., 2001; Drobilová, 2010). Being incorporated into the laws managing spatial and planning practices, the TSES became a key element of integrated landscape management (Miklós et al., 2011; Diviaková, Belaňová, 2014).

Local TSES (LTSES) is a base mainly for the land plan of the village and for the land consolidation project (LCP). The structure of the LTSES documents is determined by Regulation No. 170/2021 Coll., amending Regulation No. 492/2006 Coll. and Regulation No. 24/2003 Coll. Land consolidation is a key tool for rural development. The basic legislative regulation for land consolidation is the Act of the Slovak National Council No. 330/1991 Coll. on Land Consolidation, the Settlement of Land Ownership, District Land Offices, the Land Fund and Land Associations, as amended. According to this Act (§1 (1)), the content of land consolidation is rational spatial organisation of land ownership in a certain area and other related immovable agricultural and forest property, conducted for public interest and in compliance with the demands and conditions of environmental protection and creation of the TSES, functions of agricultural landscape, and organisational and economical viewpoints of modern agriculture and sylviculture and rural landscape development. According to §1 (2) of the Act on Land Consolidation, determination and new organisation of property and use conditions, as well as other related tenure in the district of land consolidation and new division of estates (unification, division or other adjustments of estates) are included. Technical, biological, ecological, economical and legal measures, related to the new organisation of legal conditions, are provided, too.

Land consolidation is a set of geodetic and design activities that are formed into stages (in terms of time and content). The stages are closely related to each other or may overlap mutually (Muchová et al., 2015). The LTSES proposal for land consolidation purposes serves as a base for the creation of the proposal of the so-called general principles of functional land management, which is the basic input for the definition of ecological measures in the district of land consolidation. The aim of general principles of functional arrangement of the territory in the district of land consolidation is to lay down rules for the ecologically optimal way of landscape management in terms of spatial and functional organisation. It proposes a new way of functional land use in the district of land consolidation, as well as the infrastructure of the rural landscape in the form of technical, biological, ecological, economic and legal measures. The result is the delimitation of the areas in terms of the new organisation and skeleton of existing and design measures. Methodologically, a distinction is made between facilities and measures defining areas of public interest of the inhabitants of the municipality (public facilities and measures) and for the common interest of owners and users of the land (common facilities and measures). Environmental protection measures consisting mainly of the creation of ecological stability and landscape biodiversity conditions (biocorridors, biocentres, interaction elements, etc.) are so-called common facilities and measures (according to § 12 (4) of the Act on Land Consolidation). The preliminary framework for the proposal of ecological facilities and measures in the LCP is set at the stage of drafting of general principles for the functional layout of the

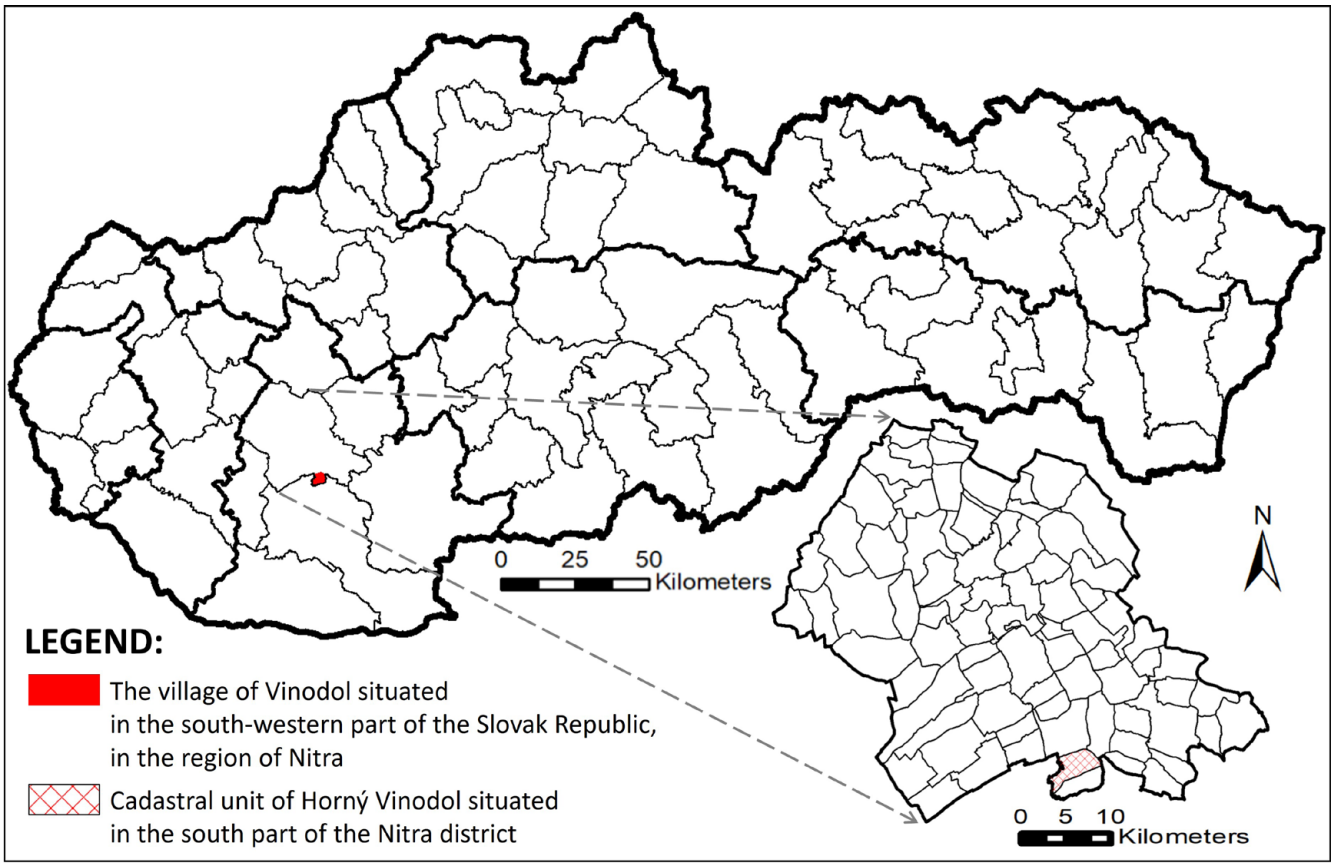


Fig. 1. The location of the area under discussion within the administrative organisation of the Slovak Republic.

territory, and the definitive framework (spatial requirements) is addressed by the plan of common facilities and measures.

The paper deals with the proposals of measures for the protection of the environment, support of ecological stability and biodiversity in the landscape using LTSES, as well as integration of ecological measures into the proposal of general principles of functional organisation of the area, using the cadastral area of Horný Vinodol as an example.

Material and methods

The area under discussion was delimited by LCP of the cadastral unit of Horný Vinodol village with a total area of 312.339 ha. The cadastral unit of Horný Vinodol (the area is 838.9 ha) with an adjacent cadastral unit of Dolný Vinodol (the area is 658.8 ha) are part of the village of Vinodol with the total area of 1497.7 ha. The village was established in 1960 after the unification of villages of Dolný Vinodol and Horný Vinodol. According to the administrative organisation of the Slovak Republic, the village belongs to Nitra region (Fig. 1). It is situated on the western foothills of Žitavská pahorkatina hills, 15 km to the north from Šurany, on the left bank of the river Nitra. The closest bigger municipalities are towns of Vráble and Šurany. From the point of view of transport, the village position is good, due to its connection via a communication network to other municipalities.

Supported by its natural conditions, the village of Vinodol represents a typical vinicultural and agricultural landscape. The river Nitra flows through the western part of the village. Since 1969, antiflooding dikes (few metres higher than the surrounding relief) have been built on the river. There is a body of water in the village – a pond. Part of the northern border of the area is created by Paniansky potok stream. There are vineyards in the north-eastern part of the village, on the slopes of Žitavská pahorkatina hills. The area under discussion is a climatically warm area, typical for long dry summer and mild dry winter, with short formation of snow cover (Lapin et al., 2002).

From the point of view of geomorphological division of Slovakia (Mazúr, Lukniš, 1980), majority of the territory belongs to Alps-Himalaya system, Pannonian Basin subsystem, West Pannonian Basin province, Malá dunajská kotlina (Little Danubian basin) subprovince, the area of Podunajská nížina (Danubian Lowland), the part of Nitrianska niva and the subpart of Dolnonitrianska niva. Only the north-eastern part belongs to the unit of Podunajská pahorkatina hills and subunit of Žitavská pahorkatina hills.

The largest morphological and morphometric type of relief in the western part of the territory consists of disaggregated flats. In the eastern part, there are horizontally and vertically disaggregated flats and slightly indented hills (Tremboš, Minár, 2002). The shape of the relief in the western part of the territory represents the relief of planes and river flats with negative, young, declining morphostructures of the Pannonian Basin with aggregation. In the eastern part, it is a relief of lowland hills of central river terraces, with negative, slightly differentiated morphostructures of the Pannonian Basin without aggregation (Mazúr, Lukniš, 1980).

The range of altitudes of the area under discussion is an interval from 127 to 216 m a. s. l. The prevailing relief slope up to 3° allows standard forms of agricultural land management.

Geologically, the area is made up by the Tertiary sediments. Fluvial sediments – lithophacial undivided clays or sandy to gravel clays of valley bottom lands and stream bottom lands – stretch through the northwest boundary of the territory. In the middle part, fluvial sediments – gravel, sandy gravel and sands in low terraces with cover of dust and diluvial flushes – dominate. The eastern tip of the territory is characterised by the occurrence of diluvial–polygenetic sediments – loam-clay and sandy-sloped hinges (Biely et al., 2002).

According to the phytogeographic division of Slovakia (Plesník, 2002), the territory of Horný Vinodol lies in the oak zone, in the lowland sub-zone, on the Žitavská Niva. The following units of potential natural vegetation (Sládek et al., 1986) were defined in the territory: ash–elm–oak forests in the basins of large rivers (*Ulmenion*), Carpathian oak–hornbeam forests (*Carici pilosae–Carpinenion betuli*), oak and European turkey oak forests (*Quercion confertae cerris*).

Initial materials

Materials for LTSES implementation (Diviaková et al., 2021) were adopted from the final documents of preceding phases of LCP processing, for example, a special purpose map of topography and altimetry for LCP or a map of updated soil ecological units. Other data were taken from available sources, for example, basic physical and geographical map materials, regional geomorphological division, geological maps, map of climatic zones, geobotanical division of Slovakia, phytogeographical division, zoogeographical division, databank of flora and fauna, databank of biotopes, NATURA 2000 area, results of measurements and monitoring of environmental components, cartographic and text materials on landscape and ecological valuable elements of landscape structure, elaborated TSES documents (over-regional, regional), orthophotomosaic and others.

Most of the data was obtained by field survey, which was mainly focused on mapping of current landscape structure (CLS) and real vegetation. A preliminary legend of the CLS mapping units was created based on current orthophotos and consequently updated in the field. In the case of biotopes, a full-scale mapping was carried out, within the previously allocated landscape structures, in the months of July–August 2021. Plant taxa were captured by a one-time pass through the given locations, and their coverage was determined in terms of Tansley's degree of coverage (Tansley, Chip, 1926). Vegetation mapping results were used in the characteristics of the isolated elements of LTSES. Biodiversity of individual landscape structures was assessed according to the number of characteristic species of the mapped biotopes. Positive and negative elements and phenomena were singled out on the basis of identified elements of CLS and socioeconomic phenomena resulting from the protection of natural resources.

Ecological stability coefficient (ESC) by Miklós (1986) expresses the degree of naturalness of the area based on quality (degree of ecological stability) and quantity (area) of individual elements of the CLS. Calculation of ESC is possible in several ways. The following formula was used to calculate ESC:

$$ESC = (\Sigma Si \times Pi)/Pz \quad (1)$$

where Pi: area of all elements of landscape structure with the same degree of biotic stability, Si: degree of stability of the CLS elements and Pz: assessed area of the basic territorial unit (borders of the area).

The elements of LTSES were selected according to the quantitative and qualitative criteria (Izakovičová et al., 2000; Muchová, Vanek, 2009). The proposal consisted of existing and newly proposed elements, as well as the proposals for anti-erosion measures. When describing each single element of the LTSES, we present the area, ecological functions, potential natural vegetation, characteristics, current state, negative phenomena, target communities and a proposal for management measures.

The LTSES in the LCP district of the cadastral territory of Horný Vinodol is processed in accordance with the Methodological Letter (2021) for processing the LCP for the purposes of land consolidations, the content and conclusions of which are based on the relevant legislation, technical regulations and other documents:

- Act of the Slovak National Council No. 330/1991 Coll. on Land Consolidation, Settlement of Land Ownership Rights, District Land Offices, the Land Fund and Land Associations as amended (hereinafter 'Act on LC'),
- Act of the Slovak National Council No. 543/2002 Coll. on Nature and Landscape Protection as amended (hereinafter 'Act 543/2002'),
- Decree of the Ministry of Environment of the Slovak Republic No. 170/2021 Coll., implementing Act No. 543/2002 Coll. on Nature and Landscape Protection as amended (hereinafter 'Decree 170/2021'),
- Muchová, Z., Vanek, J.: Methodological standards for land consolidation design. Nitra: Slovak University of Agriculture in Nitra, 2009. ISBN 978-80-552-0267-9 (hereinafter 'Methodological standards') and
- Temporary methodological manual – Geodetic activities for the LCP.

The LTSES project for the LCP purposes is prepared in a simplified way to the content of the LTSES document, stated in the annexe No. 27 of the Regulation 170/2021, taking into account the landscape consolidation demands. It contains written part of the LTSES document for the LCP purposes (technical report), where analytic data are processed (natural conditions, CLS, positive and negative elements and phenomena in a landscape), synthesis of analytical inputs and assessment, LTSES proposal. It also includes graphical part of the LTSES document for the purposes of LCP with compulsory cartographic outcomes (maps): broader relations, historical use of the estates, relief downslope, length of slopes, geological conditions, engineering and geological areas, soil ecological quality units and mainly soil units, hydrogeological regions, potentially natural vegetation, CLS, projection of positive elements and phenomena in the landscape, projection of negative elements and phenomena in the country, intensity of wind and water erosion according to Bonited Soil Ecological Units (BSEU) and proposal of LTSES for LCP purposes.

Results

Current landscape structure

The area under discussion is an open agricultural country, where large, arable land occupies the largest area. The second most

Table 1. Areal representation of individual elements of CLS and their percentage in the LCP district of the cadastral unit of Horný Vinodol.

CLS element	Area (ha)	Percentage (%)
Large blocks of arable land (fields)	258.733	82.837
Small blocks of vineyards	26.370	8.443
Linear non-forest woody vegetation	8.915	2.852
Forests	7.774	2.489
Second and third class roads	3.857	1.235
Residential areas with low buildings	1.892	0.606
Useless parts	1.349	0.432
Group non-forest woody vegetation	1.221	0.391
Civic amenities	1.133	0.363
Gardens	0.549	0.176
Watercourses	0.375	0.119
Unpaved roads	0.171	0.055

Note: CLS = current landscape structure, LCP = land consolidation project.

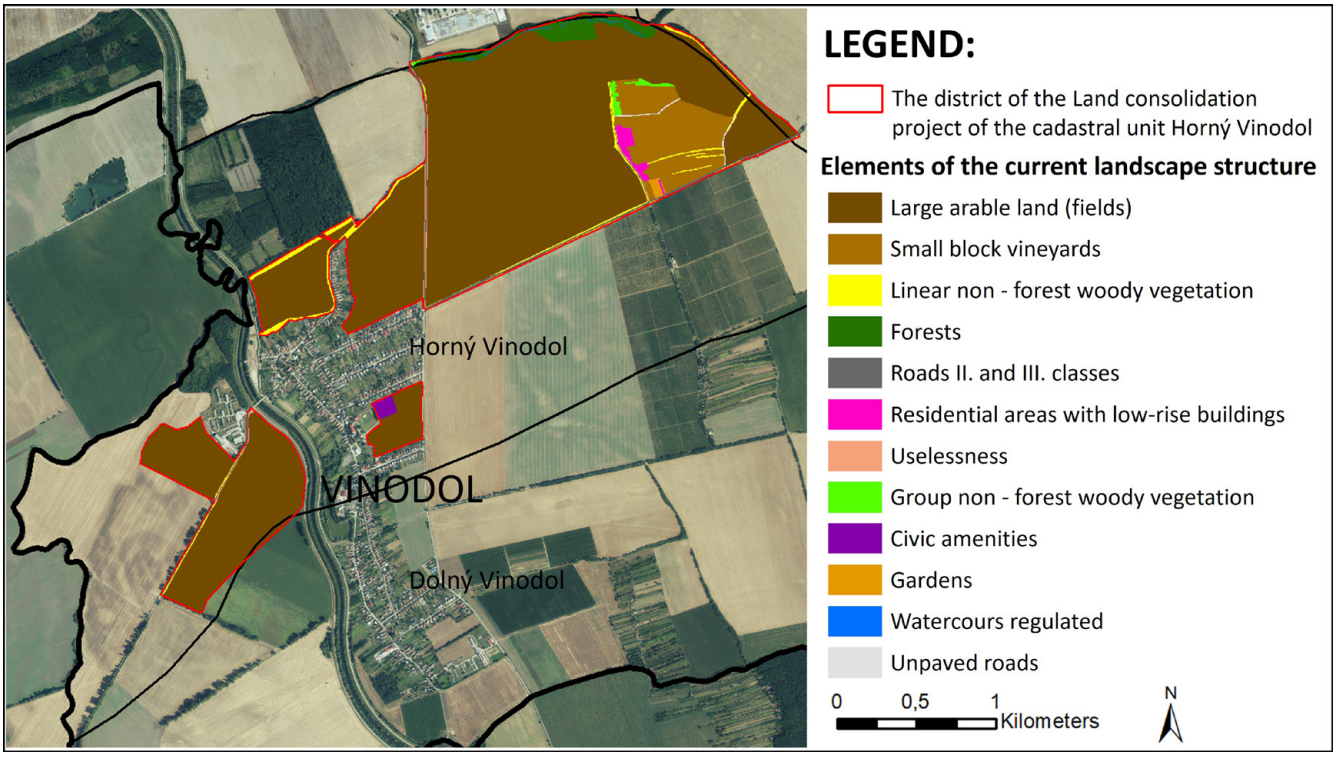


Fig. 2. Spatial distribution of CLS elements in the LCP district of the cadastral area of Horný Vinodol.
Note: CLS = current landscape structure, LCP = land consolidation project.

represented elements of the CLS are small blocks of vineyards. They represent a structurally varied mosaic of vineyard strips (managed, as well as neglected), narrow strips of fields (as well as the abandoned ones) and scrub stands on Hornovinodolská Hora Mountain (Fig. 2). This element is a significant segment of the territory from the viewpoint of landscape. Linear non-forest woody vegetation occurs in the territory, mainly as accompanying vegetation of paved and unpaved roads in the western and north-eastern part of the territory or as accompanying vegetation of the balks of large blocks of arable land. Forest stands (acacias) occur near the northern boundary of the territory along the Paniansky potok. There is a network of unpaved field roads in the territory. The areal representation is presented in Table 1, and spatial distribution of individual elements of CLS is graphically depicted in Fig. 2.

The area under discussion is considerably affected by anthropogenic activities. Intensive agricultural activities prevail and the occurrence of real vegetation and biotopes is related to this fact. Ruderal (anthropogenically affected) types of biotopes, as well as natural types predominate. However, nearly in all of them, the

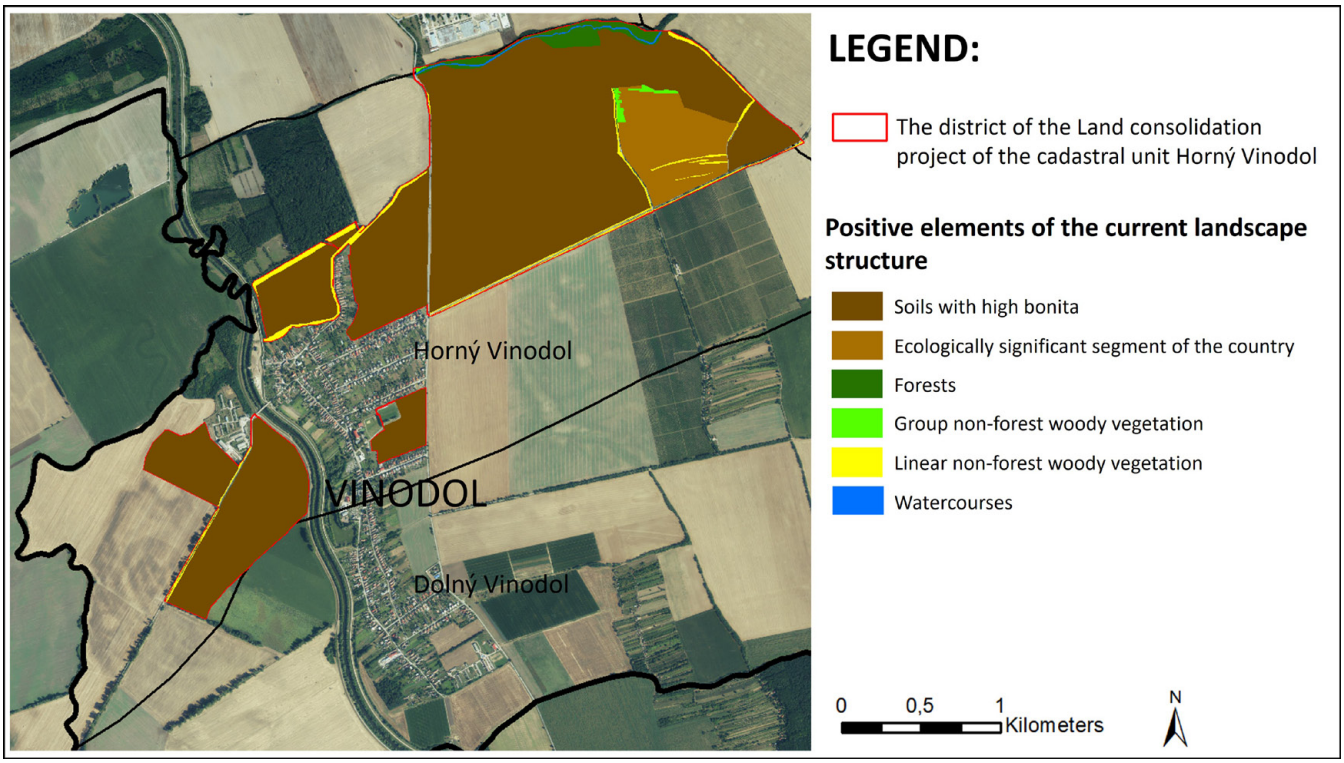


Fig. 3. Spatial distribution of positive elements and phenomena in the LCP district of the cadastral territory of Horný Vinodol.
Note: LCP = land consolidation project.

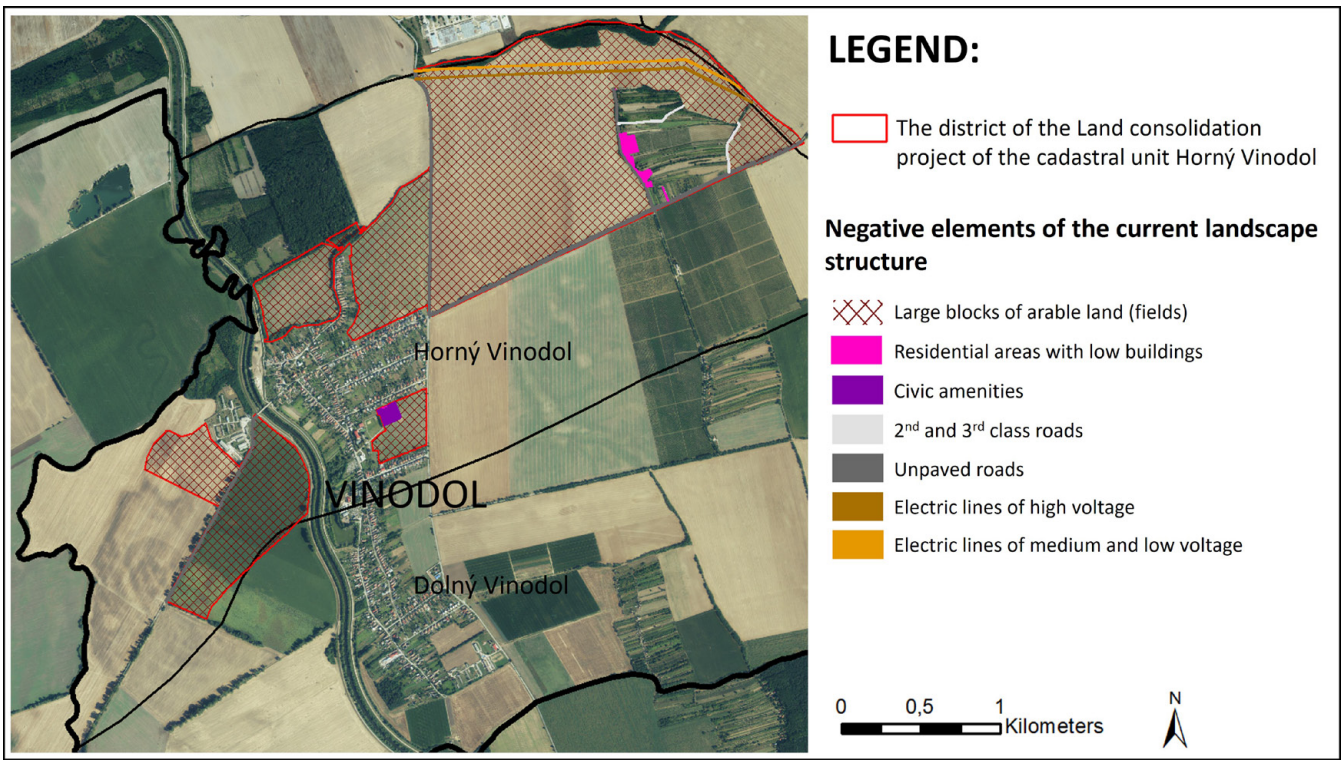


Fig. 4. Spatial distribution of negative elements and phenomena in the LCP district of the cadastral territory of Horný Vinodol.
Note: LCP = land consolidation project.

Table 2. Degrees of ecological stability according to ESC.

Ecological stability degree	Type of ecological stability of landscape	ESC
1st	Very low ecological stability	<0.50
2nd	Low ecological stability	0.51–1.50
3rd	Medium ecological stability	1.51–3.00
4th	High ecological stability	3.01–4.50
5th	Very high ecological stability	> 4.50

Note: Methodological standards for land consolidation design. RTSES, Slovak Environment Agency, 2014; ESC – ecological stability coefficient.

Table 3. LTSES elements and anti-erosion measurements in the district of the LCP of the cadastral area of Horný Vinodol.

Level of TSES elements		ID of TSES elements	Number of TSES elements	Area of TSES elements (ha)	Proportion of the LCP district (%)
LTSES for the LCP	Local biocorridors	LBcr	2	6.963	2.229
	Interacting elements	IE	7	28.301	9.061
	Windbreaks	W	3	2.629	0.842
	Total		**12**	**37.893**	**12.132**

Note: LCP – land consolidation project, LTSES – local territorial system of ecological stability, TSES – territorial system of ecological stability.

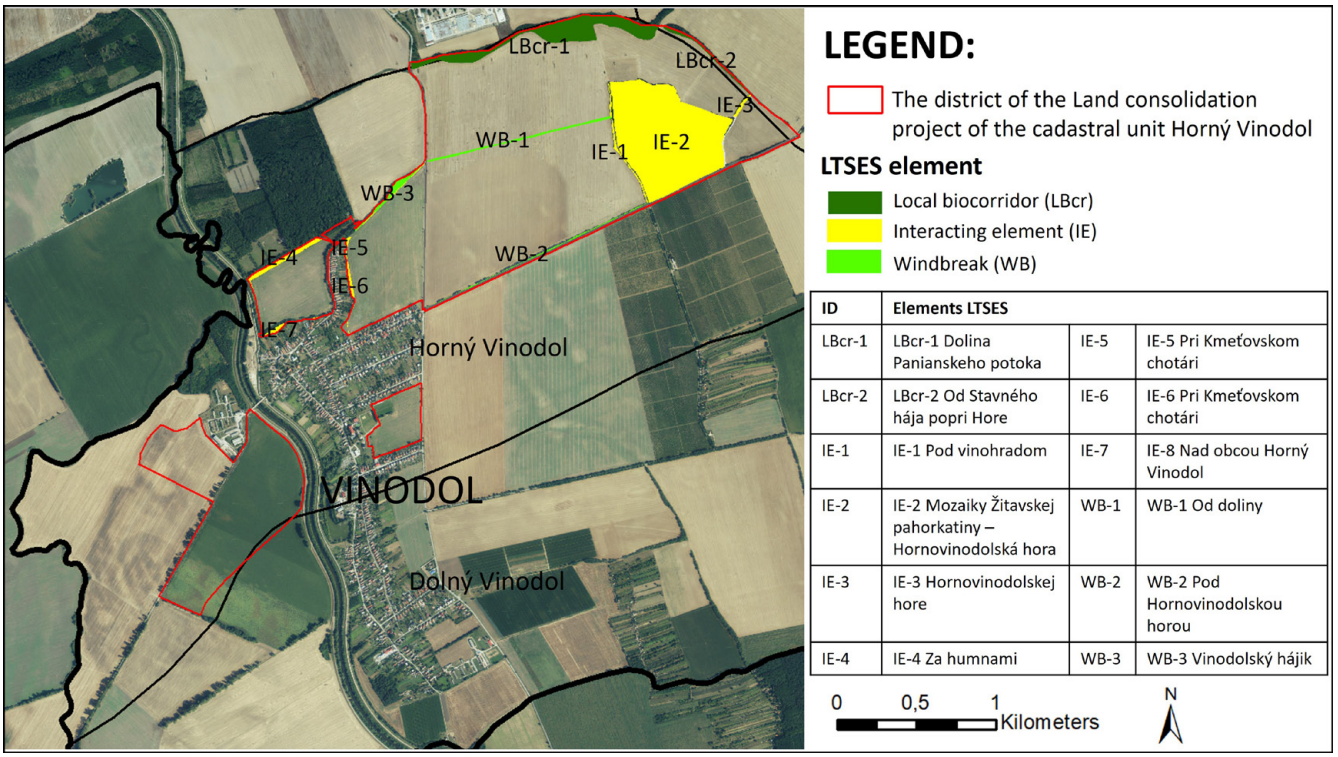
occurrence of invasive and not original species can be observed. Within the district of LCP of the cadastral area of Horný Vinodol, 15 types of biotopes were recorded in the research: two of them were forests (Ls1.2, Ls1.3), two were shrubs (Kr7, Kr9), two were meadows (Lk1, Lk11), five were ruderal (X4, X5, X7, X8 and X9) and one each was a water biotope, alley, abandoned vineyard and tree groups and groves. A small block vineyard, partly abandoned, definitely belongs to the biotopes of higher species diversity. Forest cover in the valley of Paniansky potok stream, as well as its bank covers are rich in species, too. From the viewpoints of fauna and flora, all formations of non-forest woody vegetation are worth consideration (linear and group ones). There was no occurrence of protected or endangered species in the area under discussion. Majority of the biotopes are not in favourable conditions, considering the criteria and indicators for the assessment of favourable conditions of biotopes, that is, species composition and cover of typical species, biotope structure, size parameters of the biotopes, as well as negative effects (intensive agriculture, health state of woody plants, etc.).

In the area under discussion, there are predominantly biotopes of national significance or other biotopes that can be classified according to the classification of biotopes of the Slovak Republic into the following types (Stanová, Valachovič, 2002; Ružičková et al., 1996):

- Ls1.2 (91F0) oak–elm–ash lowland riparian forests (biotope of European importance),
- Ls1.3 (91E0*) ash–alder submontane riparian forests,
- Kr7 blackthorn and hazel scrubs,
- Kr9 willow scrubs on flooded riverbanks,
- Lk1 (6510) lowland and submontane meadows (biotope of European importance),
- Lk11 reed wetland communities,
- X4 thermophilic ruderal vegetation outside the settlements,
- X5 fallow lands and extensively managed fields,
- X7 intensively managed fields,
- X8 covers of invasive neophytes,
- X9 covers of not original woody plants (*Robinietea*),
- water biotopes – 8141000 Nížinný potok stream,
- shrubs and covers of woody plants outside forest – 2,163,000 groups of trees, groves and
- anthropogenic biotopes – A210000 alleys, A122100 abandoned vineyard.

Positive elements and phenomena

There are no legislatively protected elements in the discussed area. Part of the territory is the ecologically significant segment of the landscape 'Mosaics of the Žitavská pahorkatina' defined within the regional territorial system of ecological stability (RTSES) of the Nitra district (Kočický et al., 2019). These are mosaic structures with a traditional way of using the territory with a historical aspect, with vineyards, a narrow belt form of arable land and bushes located in the eastern part of the territory. Another single positive element is the forest in the vicinity of Paniansky potok stream and the watercourse itself. Positive elements also include elements of CLS with a positive (or even neutral) impact on the landscape (Miklós et al., 2011). In the discussed area, there are formations of non-forest woody vegetation (group and line non-forest woody vegetation of a natural character) that fulfil important ecological and environmental functions here. Line formations of non-forest woody vegetation in the territory accompany unpaved roads on agricultural land; group non-forest woody vegetation occurs in the territory in the immediate vicinity of an ecologically significant segment (mosaic structures). As positive elements from natural resources, which are evaluated as part of the project of the LTSES, the following are found in the treated area: BSEU-protected lands with high bonita, this is the largest part of the territory in area (the most represented element



ID	Elements LTSES		
LBcr-1	LBcr-1 Dolina Panianskeho potoka	IE-5	IE-5 Pri Kmeťovskom chotári
LBcr-2	LBcr-2 Od Stavného hája popri Hore	IE-6	IE-6 Pri Kmeťovskom chotári
IE-1	IE-1 Pod vinohradom	IE-7	IE-8 Nad obcou Horný Vinodol
IE-2	IE-2 Mozaiky Žitavskej pahorkatiny – Hornovinodolská hora	WB-1	WB-1 Od doliny
IE-3	IE-3 Hornovinodolskej hore	WB-2	WB-2 Pod Hornovinodolskou horou
IE-4	IE-4 Za humnami	WB-3	WB-3 Vinodolský hájik

Fig. 5. Proposal of the TSES structure worked out within the project of the LTSES for the LCP of the cadastral unit of Horný Vinodol.
Note: LCP = land consolidation project, LTSES = local territorial system of ecological stability.

of the CLS in area). A graphic representation of the spatial distribution of positive elements and phenomena in the territory is shown in Fig. 3.

Negative elements and phenomena

The primary stress elements within the discussed area are the following ones: large blocks of arable land, which is the most widespread element of the CLS in the discussed area, roads of third class, unpaved roads intended for the arrival of agricultural machinery to the arable land, and an unpaved road in the northern part of the territory, power lines, residential areas and areas of civic amenities. A graphic representation of the spatial distribution of negative elements and phenomena in the territory is shown in Fig. 4.

Ecological stability assessment

The six-degree scale by Löw (1995) is often used to assess the importance of a landscape element in terms of ecological stability (Si):

- 0: no importance (e.g. built-up areas and asphalt or concrete roads);
- 1: very little importance (e.g. large blocks of fields, unpaved field roads, etc.);
- 2: little importance (from the viewpoint of TSES aims: intensified meadows, extensively used permanent cultures, useless parts, etc.);
- 3: medium importance (e.g. gardens, small vineyards, small blocks of arable land, etc.);
- 4: big importance (e.g. water courses, group non-forest woody vegetation, natural succession communities, mosaic strictures, non-forest woody vegetation, permanent grasslands, etc.) and
- 5: exceptionally big importance (especially, natural forests, etc.).

According to the valid regional TSES Nitra (Kočický et al., 2019), the village of Vinodol has a value of ESC of 1.55. It means that it is an area of medium ecological stability (1.51–3.00, see Table 2).

Based on areal representation of individual CLS elements (Table 1) and their degree of ecological stability (Table 2) in the area under discussion, the ESC was calculated to be 1.4. The area of the LCP district of Horný Vinodol is an area of low ecological stability, with the need for implementation of new ecostabilising elements and ecostabilising management measures.

Proposal of the LTSES elements and anti-erosion measures

The area under discussion represents a landscape that is nearly exclusively used for agriculture. The aim of the TSES is creation of the most favourable landscape.

Within the proposals of the TSES structure, two biocorridors of local importance (LBcr), seven interacting elements (IE) and three windbreaks (WB) were set aside in the area under discussion (Fig. 5). Their total surface area and proportion of the LCP district are summed up in Table 3.

Description and characteristics of the LTSES elements and anti-erosion measurements

Biocorridors

Original name: MBK-1 Dolina Panianskeho potoka
ID: LBcr-1
Area in the district of LCP: 6.291 ha
Ecological function: Local hydric and terestric biocorridor (only a part of the biocorridor is involved in the LCP district).
Potential natural vegetation: Predominantly oak and hornbeam Carpathian forests, only a small eastern part of the biocorridor represents oak and European turkey oak forests.
Characteristics: Local biocorridor is involved in the LCP district by a part crossing the northern border of the territory, connecting to regional biocentre Vinodolský hájik grove in the western part and to the local biocorridor (LBcr-2) in the north-eastern part. Size parameters are satisfactory.
Current state: Watercourse is Paniansky potok stream, running on the northern frontier of the territory, and there is bank vegetation around. There are undermined by water wetland communities of shrubs – willow shrubs, reed communities and woody plants vegetation of riparian forests on the banks, for example, *Populus nigra*, *Alnus glutinosa*, *Salix* sp., *Phragmites communis*, *Padus racemosa*, *Ulmus minor*, *Fraxinus excelsior*, *Quercus robur* and so on. Forest cover in the area of Stavný háj is an important part of the biocorridor. It is a production forest, the age of cover is approximately 45 years, and the crop density is 0.55. The forest is low and originated in the process of natural vegetation recovery. It is situated on the slopes of northern exposition, at an altitude of 135–150 m a. s. l. Forest type (FT) is represented by nettle–elm–ash trees and hornbeam (PHSLT – hornbeam riparian ash trees – hardwood riparian forests). Acacias represent real vegetation, cover type (CT) 78. Among the most common tree species, there are *Robina pseudoacacia*, *Ulmus minor*, *Carpinus betulus* and *Fraxinus excelsior, Sambucus nigra*, *Parthenocissus quinquefolia*, *Rosa canina*, *Euonymus europaeus* and *Ligustrum vulgare* are the most dominant shrubs. The most prevalent herbs are *Urtica dioica*, *Chelidonium majus* and others.
Negative phenomena: A watercourse with its bank cover, as well as the surrounding forest cover are affected by intensive agricultural or forestry activities. During intense precipitation, especially eastern part of the biocorridor is influenced by middle water erosion, that is, also by greater flushing of agrochemicals into covers and the watercourse.
Target communities: Hardwood riparian forests – hornbeam riparian ash trees, Carpathian oak–hornbeam forests and oak and European turkey oak forests, willow shrubbery, ash trees and alder riparian forests
Proposal of management measures: Ensure restoration of natural species composition in stands with monocultures and unsuitable woody plants, manage in compliance with the valid forest care programme, eliminate invasive species, prevent felling of bank cover, strictly protect the remnants of original vegetation, prefer natural vegetation species when replenishing bank vegetation, revitalise watercourses and restore bank covers and pay close attention to prevent illegal landfills and the spread of invasive and invasively behaving species of woody plants and herbs

Original name: MBK-2 Od Stavného hája popri Hore
ID: LBcr-2
Area in the district of LCP: 0.672 ha
Ecological function: Local terestric biocorridor.
Potential natural vegetation: Oak and European turkey oak forests.
Characteristics: Local terestric biocorridor, which could simultaneously fulfil the anti-erosional function (eastern part of the territory is menaced by water erosion, especially during the season of intensive precipitation), forms the north-eastern border of the territory and joins the local biocorridor (LBcr-1) to the local interacting element (IE-3).
Current state: It is linear non-forest woody vegetation on large blocks of arable land, which fulfils the size criteria in the first part of the biocorridor in the direction of northwest– southeast. The second lower part is created only by a narrow zone of shrubs (missing in some places). It is necessary to replenish them with trees. The species cover consists of *Robina pseudoacacia*, *Ulmus minor*, *Negundo aceroides*, *Fraxinus excelsior*, *Populus* spp. and *Quercus robur*. In the shrub layer, there are *Sambucus nigra*, *Acer campestre*, *Prunus spinosa*, *Rosa canina*, *Euonymus europaeus* and *Ligustrum vulgare*.
Negative phenomena: Intensive agriculture, threat of increased potential water erosion.
Target communities: We propose to revitalise the biocorridor, especially its lower half, as at least 6-m-wide line, rich in species and two storeys of non-forest woody vegetation, comprising the woody plants with highly ecostabilising effect, with the species of oak–European turkey oak forests and oak–hornbeam forests – *Carpinus betulus*, *Quercus robur*, *Q. cerris*, *Acer campestre*, *Tilia cordata* and *Ulmus minor* with the species of high value of honey-producing potential and with a positive effect on visual impact – fruit tree species, for example, *Cerasus avium*, *Pyrus* sp. The shrub layer should be solved by discontinuous lines, created by *Crataegus* spp., *Sambucus nigra*, *Ligustrum vulgare* and *Euonymus europaeus*.
Proposal of management measures: Especially in the lower part of the biocorridor, to ensure keeping minimal spatial and areal parameters of the proposed element (6–15 m), as well as keeping the proposed composition of the vegetation. It means to implement consistently planting of original species or to support their succession, to eliminate invasive species and prevent their spreading, to leave existing self-seeding woody plants when planting vegetation and to prevent thoroughly the existence of illegal waste landfills.

Interacting elements

Original name: IP-1 Pod vinohradom
ID: IE-1
Area in the district of LCP: 0.017 ha
Ecological function: Interacting terestric element of local level.
Potential natural vegetation: Oak and European turkey oak forests.
Characteristics: Discontinuous line of non-forest woody vegetation, or alley along the road passing below the vineyard, in interaction with IE-2.
Current state: Size parameters are convenient; species composition is partly convenient. Predominant species are *Robinia pseudoacacia*, followed by *Juglans regia*, *Carpinus betulus*, *Sambucus*

nigra, *Rosa canina*, *Prunus spinosa*, *Clematis vitalba* and others.
Negative phenomena: Spreading the invasive species, potential occurrence of illegal landfills
Target communities: Woody plants of oak and European turkey oak forests, fruit tree species; the occurrence of acacia should be eliminated.
Proposal of management measures: To prevent invasive species or unoriginal woody plants from spreading. To prevent potential cutting of woody plants. To stop the occurrence of illegal landfills. To keep, or to replenish connectivity of the interacting element by planting or succession, especially by original species of woody plants of target communities.

Original name: IP-2 Mozaiky Žitavskej pahorkatiny – Hornovinodolská hora
ID: IE-2
Area in the district of LCP: 23.818 ha
Ecological function: Interacting terestric element of local level and ecologically significant landscape segment of regional level (Kočický et al., 2019).
Potential natural vegetation: Oak and European turkey oak forests.
Characteristics: It represents partly abandoned, originally cultivated vineyard, partly intensively farmed. The abandoned vineyard parts provide a shelter for precious species of xerothermic vegetation. They are an important segment in the succession when colonising by natural vegetation.
Within this element of the CLS in the territory, lines of xerothermic vegetation of unused areas alternate with lines of non-forest woody vegetation – lines of shrubs (predominantly thermophilic species of roses, thorns, etc.) and trees (in some, acacias predominate, while in some others, fruit tree species predominate), lines with planted sunflower, maize or pumpkin, as well as rows of intensively farmed permanent vine cultures. It is a mosaic structure with a traditional way of land use with a historical aspect, that is, vineyards, narrow-band form of arable land and shrubs. In the south-western part or along the western border of the vineyard, there are cottages or wine-growing houses with gardens. The element is linked to IE-1 and IE-3 elements.
Current state: Within unused ruderal xerothermic meadow vegetation, the following species were recorded: dominant *Chenopodium album*, *Conyza canadensis*, *Balota nigra*, *Stenactis annua*, *Calamagrostis* sp., *Arctium lappa*, *Artemisia vulgaris*, *Lamium maculatum*, *Datura stramonium*, *Sambucus ebulus*, *Carduus acanthoides*, *Urtica dioica*, *Setaria verticillata*, *Stachys annua*, *Mercurialis annua*, *Rubus caesius*, *Aristolochia clematitis*, *Hordeum murinum* and others. Many of the mentioned species are 1-year therophytes and weeds. Others are classified as 2-year and persistent species characteristic for thermophilic ruderal vegetation outside the settlements.
Lines of non-forest woody vegetation, creating nearly impassable zones, are typical of the presence of fruit tree species, especially *Juglans regia*, *Cerasus avium*, *Prunus persica*, as well as *Clematis vitalba*, *Vitis vinifera*, *Lycium barbarum*, *Parthenocissus quinquefolia*, *Rosa canina*, *Sambucus ebulus*, *S. nigra*, *Prunus spinosa*, *Robinia pseudoacacia* and others.
Negative phenomena: Occurrence of invasive species, enclosure, ending traditional farming
Target communities: Woody plants of oak forests, fruit tree species, xerothermic shrubs, thermophilic grass and herbs vegetation, or lowland meadows used for mowing.
Proposal of management measures: To eliminate invasive species and to prevent their spreading (e.g. *Lycium barbarum*, *Paarthenocissus quinquefolia*), to prefer original natural species when planting, as well as fruit tree species, support of traditional mosaic structures (altering narrow belts of fields, shrubs and fruit tree species), to mow unused meadows or use them for pastures

Original name: IP-3 K Hornovinodolskej hore
ID: IE-3
Area in the district of LCP: 0.001 ha
Ecological function: Interacting terestric element of local level.
Potential natural vegetation: Oak and European turkey oak forests.
Characteristics: Line of non-forest woody vegetation on balks of large blocks of arable land in the eastern part of the territory, linking LBcr-2 to IE-2.
Current state: Size parameters are convenient. Predominant species are *Robinia pseudoacacia*, followed by *Tilia cordata*, *Caarpinus betulus*, *Sambucus nigra*, *Rosa canina*, *Prunus spinosa*, *Clematis vitalba* and others.
Negative phenomena: Spread of invasive species, potential occurrence of illegal landfills, intensive agriculture.
Target communities: Woody plants of oak and European turkey oak forests, fruit tree species; to eliminate acacias' occurrence.
Proposal of management measures: To prevent further spreading of invasive species of woody plants. To prevent potential cutting of woody plants. To stop the occurrence of illegal landfills. To keep, or to replenish connectivity of the interacting element by planting or succession, especially by original species of woody plants of target communities.

Original name: IP-4 Za humnami
ID: IE-4
Area in the district of LCP: 1.158 ha
Ecological function: Interacting terestric element of local level.
Potential natural vegetation: Ash trees–elm–oak riparian forests within the river basins of large rivers (hardwood forests) and partly Carpathian oak–hornbeam forests.
Characteristics: Size parameters are convenient. Line of non-forest woody vegetation, surrounded by arable land from one side and by a vineyard from the other side, merging into ecotone (forest margin) regional biocentre of Vinodolský hájik. The element is connected to the regional biocentre of Vinodolský hájik and over-regional biocorridor of the Nitra river.
Current state: Continuous line trees layer includes *Robinia pseudoacacia*, *Fraxinus excelsior*, *Populus nigra*, *P. alba*, *Negundo aceroides*, *Carpinus betulus*, *Quercus robur*, *Juglans regia*, *Acer campestre*, *Sambucus nigra* and others.
Negative phenomena: Spread of invasive species and unoriginal species (introduced Euro-American poplar); potential occurrence of illegal landfills; terrain modifications, which significantly alter the environment or draining conditions; modifications of watercourses, dams, ponds and barrages.
Target communities: Woody plants of hardwood riparian forests and oak–hornbeam forests.
Proposal of management measures: To prevent invasive species or unoriginal woody plants from further spreading. To prevent potential cutting of woody plants. To stop the occurrence of illegal landfills. To maintain the area of interacting element.

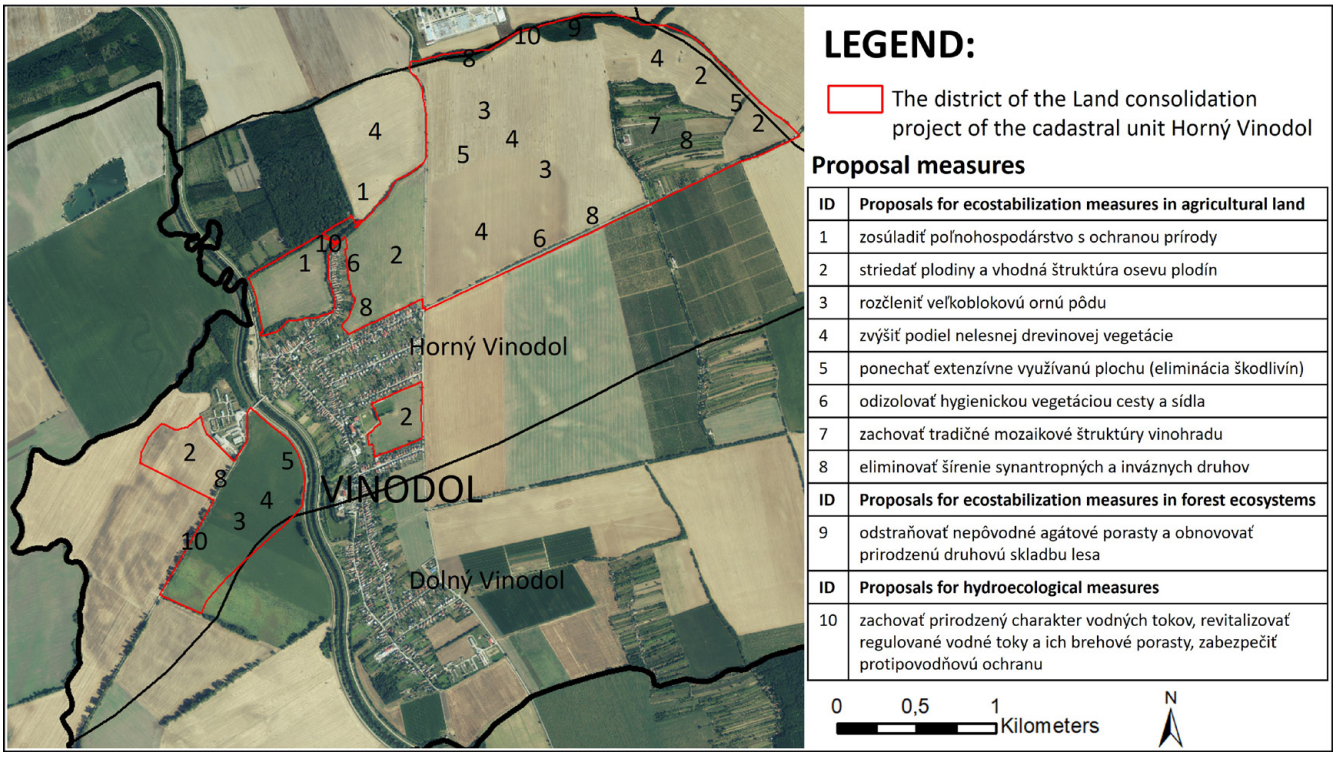
Original name: IP-5, IP-6 Pri Kmeťovskom chotári
ID: IE-5, IE-6
Area in the district of LCP: IE-5 – 0.396 ha; IE-6 – 0.236 ha
Ecological function: Interacting terestric elements of local level.
Potential natural vegetation: Carpathian oak–hornbeam forests.
Characteristics: Newly proposed lines of non-forest woody vegetation, in the northern part of the residential area, which will lead next to gardens. From another side, they will be surrounded by arable land, connecting the WB-3 element. IE-6 is linked to IE-5. Besides the function of interacting elements, they also fulfil the hygienic function.
Current state: Arable land; it is a proposal of completely new elements.
Negative phenomena: Intensive agriculture.
Target communities: Woody plants of oak–hornbeam forests.
Proposal of management measures: To create new interacting elements by planting, especially woody plants of oak–hornbeam forests and fruit tree species, for example, *Carpinus betulus*, *Quercus robur*, *Acer campestre*, *Fraxinus excelsior*, *Tilia cordata*, *Ulmus minor*, *Cerasus avium*, *Juglans regia*, and shrubs *Prunus spinosa*, *Crataegus* spp., *Sambucus nigra*, *Ligustrum vulgare*, *Euonymus europaeus* and others. To prevent invasive species of woody plants from spreading. To stop the occurrence of illegal landfills.

Original name: IP-7 Nad obcou Horný Vinodol
ID: IE-7
Area in the district of LCP: 0.046 ha
Ecological function: Interacting terestric element of local level.
Potential natural vegetation: Ash trees–elm–oak hardwood riparian forests.
Characteristics: Part of a line of non-forest woody vegetation next to the channel and gardens in the northern part of the residential area. Apart from the function of interacting elements, they also fulfil the hygienic function. Potentially in the interaction with IE-5 and WB-3.
Current state: Disconnected and interrupted line of non-forest woody vegetation, created by species like *Robinia pseudoacacia*, *Fraxinus excelsior*, *Populus nigra*, *Acer campestre*, *Sambucus nigra*, *Crataegus monogyna*, *Prunus spinosa*, *Humulus lupulus* and others
Negative phenomena: Spreading the invasive and unoriginal species (introduced Euro-American poplar), potential occurrence of illegal landfills
Target communities: Woody plants of hardwood riparian forests and oak–hornbeam forests
Proposal of management measures: To prevent invasive species of woody plants from spreading. To prevent potential cutting of woody plants. To stop the occurrence of illegal landfills. To widen the area of interacting element by planting, possibly to complete its connectivity mainly by woody plants of hardwood riparian forests, oak–hornbeam forests and fruit tree species, for example, *Carpinus betulus*, *Quercus robur*, *Acer campestre*, *Fraxinus excelsior*, *Tilia cordata*, *Ulmus minor*, *Cerasus avium*, *Juglans regia*, *Prunus spinosa*, *Crataegus* spp., *Sambucus nigra*, *Ligustrum vulgare*, *Euonymus europaeus* and others.

Other ecostabilising elements (windbreaks)

Original name: VET-1 Od doliny
ID: WB-1
Area in the district of LCP: 1.253 ha
Ecological function: Windbreak of local level.
Potential natural vegetation: Carpathian oak–hornbeam forests and oak and European turkey oak forests.
Characteristics: Newly proposed windbreak, which would fulfil the function of interacting element as well, passes large blocks of arable land in the north-eastern part of the territory. It creates a connection between IE-1 and WB-3.
Current state: Arable land; it is a proposal of completely new element.
Negative phenomena: Intensive agriculture, potential wind, and water erosion.
Target communities: Windbreak is proposed as rich in species two-storey linear non-forest woody vegetation, comprising woody plants of high ecostabilising effect, with predominant species of oak and European turkey oak forests, oak–hornbeam forests – *Carpinus betulus*, *Quercus robur*, *Q. cerris*, *Acer campestre*, *Tilia cordata*, *Ulmus minor*. We propose to manage the shrub layer with discontinuous lines of *Crataegus* spp., *Sambucus nigra*, *Ligustrum vulgare* and *Euonymus europaeus*.
Proposal of management measures: Planting the woody plants. To ensure keeping minimal areal and spatial parameters of the proposed element (width of 6–15 m), as well as keeping the proposal of vegetation composition.

Original name: VET-2 Pod Hornovinodolskou horou
ID: WB-2
Area in the district of LCP: 0.366 ha
Ecological function: Windbreak of local level.
Potential natural vegetation: Carpathian oak–hornbeam forests, oak and European turkey oak forests
Characteristics: Tree alley, or a line of non-forest woody vegetation with anti-erosion function, leading beside the road from the residential area to the vineyard (road Vinodol-Paňa). The element is connected to IE-1 and IE-2.
Current state: Discontinuous interrupted lines; predominant tree species are *Robinia pseudoacacia*, *Juglans regia*, *Carpinus betulus*, *Clematis vitalba*, *Rosa canina*, *Sambucus nigra*, *Prunus spinosa*.
Negative phenomena: Spreading invasive species, potential occurrence of illegal landfills, wind erosion.
Target communities: Woody plants of oak–hornbeam forests, oak and European turkey oak forests with elimination of acacia occurrence.
Proposal of management measures: To prevent invasive species of woody plants from spreading. To prevent potential cutting of woody plants. To stop the occurrence of illegal landfills. To keep or possibly widen the area of the interacting element by planting or by succession. To complete the element connectivity by woody plants of oak–hornbeam forests and oak and European turkey oak forests and fruit tree species, for example. *Carpinus betulus*, *Quercus robur*, *Q. cerris*, *Acer campestre*, *Tilia cordata*, *Cerasus avium*, *Juglans regia,* and by shrubs *Prunus spinosa*, *Crataegus* spp., *Sambucus nigra*, *Ligustrum vulgare*, *Euonymus europaeus*, etc.



ID	Proposals for ecostabilization measures in agricultural land
1	zosúladiť poľnohospodárstvo s ochranou prírody
2	striedať plodiny a vhodná štruktúra osevu plodín
3	rozčleniť veľkoblokovú ornú pôdu
4	zvýšiť podiel nelesnej drevinovej vegetácie
5	ponechať extenzívne využívanú plochu (eliminácia škodlivín)
6	odizolovať hygienickou vegetáciou cesty a sídla
7	zachovať tradičné mozaikové štruktúry vinohradu
8	eliminovať šírenie synantropných a inváznych druhov
ID	**Proposals for ecostabilization measures in forest ecosystems**
9	odstraňovať nepôvodné agátové porasty a obnovovať prirodzenú druhovú skladbu lesa
ID	**Proposals for hydroecological measures**
10	zachovať prirodzený charakter vodných tokov, revitalizovať regulované vodné toky a ich brehové porasty, zabezpečiť protipovodňovú ochranu

Fig. 6. Proposal of the management measures worked out within the project of the LTSES for the LCP of the cadastral unit of Horný Vinodol. Note: LCP = land consolidation project, LTSES = local territorial system of ecological stability.

Original name: VET-3 Vinodolský hájik
ID: WB-3
Area in the district of LCP: 1.01 ha
Ecological function: Windbreak of local level.
Potential natural vegetation: Carpathian oak–hornbeam forests.
Characteristics: Line of non-forest woody vegetation with anti-erosion function, linked to IE-6, IE-5 and WB-1.
Current state: Continuous line; predominant trees are *Robinia pseudoacacia*, as well as *Fraxinus excelsior*, *Populus nigra*, *Pyrus domestica*, *Acer campestre*, *Sambucus nigra*, *Crataegus monogyna*, *Prunus spinosa*, *Humulus lupulus*.
Negative phenomena: Spreading invasive species, potential occurrence of illegal landfills, wind erosion.
Target communities: Woody plants of oak–hornbeam forests, elimination of acacia occurrence.
Proposal of management measures: To prevent invasive species of woody plants from spreading. To prevent potential cutting of woody plants. To stop the occurrence of illegal landfills. To keep or possibly widen the area of the windbreak by succession.

Proposal of management measures to increase ecological stability

Proposals of management measures to increase ecological stability in the area under discussion are the proposals of ecostabilising measures in the agricultural landscape, proposals of ecostabilising measures in forest ecosystems and proposals of hydroecological measures (Fig. 6).

Discussion

The TSES is to ensure basic landscape-forming functions. It is a source of renewal of natural landscape gene pool, as well as supports ecological stability and polyfunctional landscape use. The main aim of TSES is to link at least some micropopulations, and thus increase their opportunity to survive, and to create more stable metapopulations (Bínová et al., 2017).

The task of the LTSES project is, therefore, to design a functional ecological network, consisting of existing and newly proposed elements, as well as proposals for anti-erosion measures, with a view to increase the ecological stability and biodiversity of the landscape. Part of the LTSES proposal is also formulation of recommended management measures aimed at landscape or ecologically optimal multifunctional use of the landscape. The LTSES document thus prepared and approved becomes the basis for so-called general principles of functional arrangement of the territory in the district of LCP (§9 (9) of the Act on Land Consolidation).

Several authors have dealt with the practical verification of the use of the LTSES in LCP (e.g. Diviaková 2006, 2013; Kočická et al., 2018; Muchová, Petrovič, 2008; Diviaková et al., 2019; Moyzeová, Kenderessy, 2015), or landscape changes, its effect on the assessment of landscape ecological stability (Muchová, Tarníková, 2018), changes in a landscape by land consolidations (Muchová, Petrovič, 2010; Ružičková et al., 2010), new methods of spatial data collection from LCP (Leitmanová et al., 2015), conservation of natural ecosystems by land consolidation (Lisec, Pintar, 2005) and so on.

There is an interesting case study discussing the advantages and procedures of land consolidations with an emphasis on landscape activities on the example of the cadastral territory of Melek (Slovakia). The authors state in the results of the study (Pagáč et al., 2019), 'From the environmental measures, the greenery 3ZE3, 3-ZE2 was created to the field roads U01, U14 and wind barriers 9-ZE5, 5-ZE3, 2-ZE3. Built environmental measures should be of the length of the 2,573.8 m with an area of 11,944 m^2'. The area of the territory, as well as the proposed spatial parameters of the elements in the mentioned study, are comparable with the results of our study. Spatial parameters of local level elements are clearly defined in the methodological instructions (Izakovičová et al., 2000, Bohalová et al., 2014). However, the specificity of land consolidations is that the size of the proposed elements can be reduced due to the complications in ownership relations and the reluctance of farmers to occupy agricultural land in favour of ecostabilisation measures.

Conclusion

Within the area under discussion, we created a draft of the elements of the LTSES for the purposes of the LCP in terms of detailed methodologies. Specifically, we allocated 12 elements of local importance: seven interacting elements, two biocorridors and three windbreaks. In order to increase the ecological stability of the landscape, 10 framework management measures were also proposed. The proposals were fully transferred to the LCP in the part of general principles of the functional organisation of the territory. Even the element IE-4 was extended by 0.533 ha due to the protection of the immediately occurring SKÚEV0126 Vinodolský hájik grove, which is a biocentre of regional importance, too.

In many countries, landscape consolidations are a major tool of rural area development, lagging behind or with major adjustment problems (Van Huylenbroeck et al., 1996). Finally, the presented results from the case study also confirm the hypothesis that land consolidations in the territory of the Slovak Republic represent an important tool for the development of rural areas.

In the area under discussion, the elements of LTSES, by which natural functions and processes are preserved, are mainly watercourses, forests, linear and group non-forest woody vegetation, meadows (they represent useless, abandoned parts of arable land or vineyards) and also the small-block vineyard itself, which is partially abandoned, and its biodiversity is much greater than the biodiversity of the surrounding large area. At the same time, some of the above-mentioned elements that potentially meet the criteria of the green infrastructure network elements are part of the LTSES, that is, they fulfil the functions of local biocorridors, interacting elements and windbreaks.

The implementation of the proposed ecological, landscape-forming, anti-erosion and management facilities and measures will ensure environmental protection through land consolidations in the form of support for ecological stability and biodiversity conditions of the agriculturally used land. Therefore, we consider ensuring environmental protection, promoting ecological stability and diversity conditions by the LTSES in the LCP as sufficient.

Acknowledgements

This paper was supported by the VEGA scientific grant agency, project No. 1/0076/22, and by the project *ENVIHEALTH No. ITMS 313011T721.*

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