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Research Article

Changes in the Landscape Character of the Studied Area of the Cadastre of the Municipality of Doudleby in the South Bohemian Region in the Czech Republic

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ABSTRACT

The landscape is a part of the earth's surface with a characteristic relief, formed by a set of functionally interconnected ecosystems and elements of civilization. The sustainability of the landscape and its territory is examined on the basis of its ecological stability. This means the ability of a given system to persist even under interfering influence and to reproduce its essential characteristics in the conditions of external disturbance. The aim of the paper is based on content analysis, description of selected landscape, vegetation stage, determination of megatype sensu Meeus and method of calculation of ecological stability coefficient according to Michal and Miklós to determine changes in landscape character of the studied area. The result of the paper is the identification of changes in the landscape character of the researched area, as well as the proposal of a strategic vision for the landscape plan in the researched municipality in the cadastre of the South Bohemian region in the Czech Republic. Despite several uncertainties, this article proves that it is feasible to analyze long-term land-use tendency to generate more meaningful, spatially explicit information, which can form the ground for landscape planning and ecosystem management.

Keywords: landscape, sustainability, coefficient of ecological stability, doudleby, municipality

INTRODUCTION

The current turbulent environment, the globalization of markets, the ongoing economic crisis not only in European but also in world markets, creates conditions directly affecting the state and development of the national economy in each country. The national economy is a set of activities of an economic nature, which are carried out on the territory of a given state by citizens and business entities. The subjects of the national economy include enterprises, households and state authorities. In every national economy, people rely on natural resources, use available human potential, and produce man-made interventions (Čepelová et al., 2019). Natural processes and human land-use are identified as two distinctive processes resulting in different characteristics of patterns in landscapes (Food and Agriculture Organization of the United Nations, 2020: 31-41). Europe is formed mostly by cultural landscape with only very rare exceptions. The concept of a cultural landscape was introduced by F. Ratzel into German geography at the end of 19th century. Since 1960s it is used also in other disciplines, including landscape ecology. Later on it was discussed e.g. by Jones (Lausch et al., 2015: 21-51) who highlights it due to the use of different disciplines and due to the both natural and human impacts (the term cultural landscape is applied in different ways) or by Anthrop (Jones, 2003: 21-34) who points out the sustainability and protection of the cultural landscape towards future generations. Taylor and Lennon (Antrop, 2005) stress the importance of cultural landscape for an identity in the face of globalization processes and Lindenmayer and Fisher (Taylor et al., 2012) mention its role for habitats. Civilizational development generally brings increasing intensity to land use (Míchal, 2002). Everyone will probably acknowledge that with this, the tension between the raised demands on the territory and the use of its potential resources grows in the long run. However, there is no unity as to the growing intensity of land use, the importance of coordination activities motivated by societal long-term interests, activities performed by state administration bodies and implemented, inter alia, by some civic associations (De groot et al., 2010; Michal, 2019: 25-30). The current face of the Czech landscape is marked by many historical events that have taken place in our territory. Changing political regimes or different economic systems have been incorporated into the

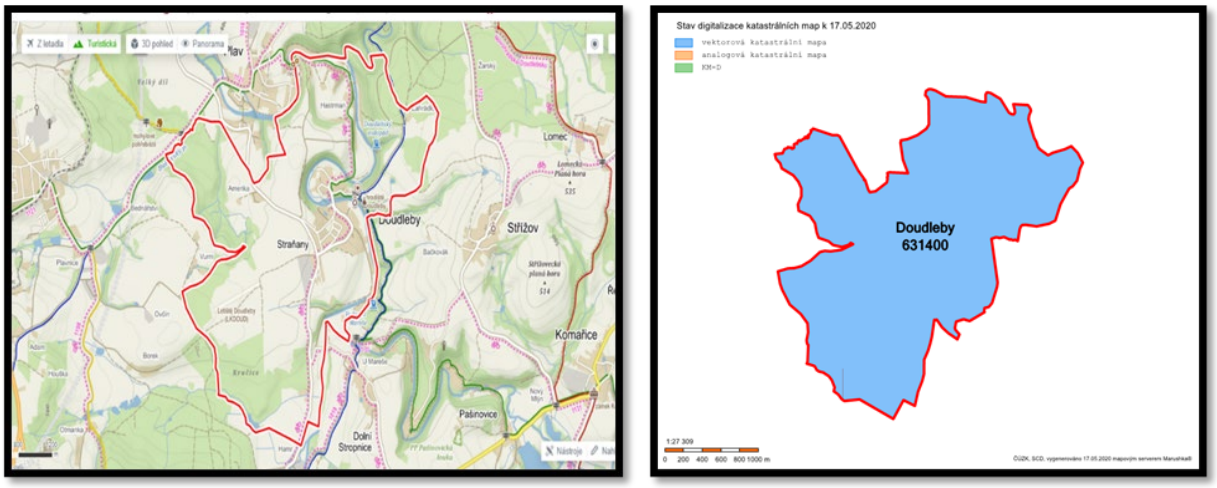

Figure 1. Cadastre of the village Doudleby and Vector map 2020
Source: CUZK (2020)

landscape structure in specific ways (Lipský, 2002: 188-198). Agricultural management has already led to the extensive transformation of about one-third of the global surface, and intensively utilized land expected to extend in the future to meet human needs for living space, subsistence, and food (Lambin et al., 2006; Nelson et al., 2010). Concurrently, the transformation of natural vegetation cover to agricultural land (and urban areas) impacts water flows and the biogeochemical cycle and is nearly linked to climate change (Chytrý, 2012; Milad et al., 2011). The joint effects of land-use and climate change are understood as the most relevant driver of biodiversity loss (Schulp et al., 2008). Because biodiversity is known to represent the main prerequisite for the functioning of ecosystems, and the delivery of ecosystem services (MA, 2005; Sala et al., 2000).

Case Study Area

To identify changes in the landscape character and structure of the area has chosen the cadastre of the village Doudleby. The Researcher has chosen the study of cadastre of the village Doudleby for the processing of this paper because this area is located near district city České Budějovice (about 15 km south), at an altitude of 425 m above sea level and the landscape is interesting from a historical and natural point. This village serves as a good example of the ecological stability of the area and its use in accordance with the basic functions of nature. The cadastre of the named village is located in the South Bohemian Region, in the district of České Budějovice on the river Malša. The first historical mention of the village dates back to 981, in the Cosmos Chronicle (Lindenmayer & Fischer, 2013). Kosmas mentions the death of Prince Slavník and considers Chýnov, Netolice and Doudleby to be the limits of his dominion. However, it is believed that the fortified settlement belonged to the Přemyslids from the beginning and the Přemyslid administrators lived here. However, this does not change the importance of Doudleb as an ancient administrative center in southern Bohemia. The name of the village comes from the Slavic tribe Doudleby, which was supposed to come to Bohemia probably in the 5th or 6th century AD together with other Slavic tribes. The Doudleby established a fortified fort on the promontory of the river Malše. All archaeological finds from Doudleby date back to the 10th century. The cadastral territory of the village of Doudleby has an area of approximately 5.85 km2 and, according to the Czech Statistical Office, 479 inhabitants live here (Obec Doudleby, 2020). The cadastral territory of the village currently fulfills both a residential and a recreational function. The village is fully connected to the basic technical infrastructure, it is relatively well accessible in terms of transport to České Budějovice, civic amenities are sufficient, there is a municipal office, there is a primary and kindergarten Doudleby, cultural house with hospitality, fire station, library, multipurpose building (shop, municipal office, children's counseling) and a sports complex with a ski lift. There is also Doudleby Airport.

It follows from the following that the village of Doudleby can be literally described as a lively and vibrant locality:

> There is an ethnographic ensemble Doudleban, a children's ensemble Doudlebánek or a local volunteer fire brigade, which organizes a traditional fire ball, the village also organizes a municipal ball or a masquerade ball for children. According to the date of Easter, the Shrovetide takes place in the village, when from morning to evening all the houses are surrounded by a youth rosary carol together with a brass band; at each house the band will play the song "Red Rose", carolers will dance and invite those present to the evening entertainment. In the spring there is also a spring pilgrimage, at Easter the so-called barking, in the spring also the so-called unlocking of Malše, the construction of May on Čapek hill. In summer, cyclists go on a cycling trip around Doudleb (30 - 40 km). At the end of the holidays there is a traditional event Wandering around Doudleb, in September there is a folklore festival Doudlebské dožínky, also Locking Malše, tourist event Around Doudleb (15 km), Drakiáda, in Advent time there is a festive lighting of the Christmas tree, lantern parade church or Stephen's pastime. In addition to regular cultural and folk customs, there are sports competitions in football, tennis, darts, table tennis, and hockey.

Figure 2. The village of Doudleby 2020
Source: Doubleby (2020)

The historical-educational (cycling) trail No. 1018 Novohradsko-Doudlebsko passes through the cadastre of the village, loosely connected to the trilogy of stories about the history of life on the Czech-Austrian border (Memory of Novohradsko, Memory of Chicken Mountains and Memory of Vitorazsko). The whole route starts in the village of Srubec near České Budějovice and continues through Nova Ves, Strážkovice to Trhové Sviny and Horní Stropnice, through Benešov nad Černou, Žofínský forest, through the extinct villages of Janova Ves and Cetviny, Tichá, Rychnov nad Malší and up to the village of Svatý Jan nad Malší, Velešín, Římov via Doudleby to Roudný near České Budějovice. In the cadastral territory of the village Doudleby there are also several small sacral buildings, such as lonely chapels, bell towers and the Passion of the Christ. Near the cadastre of the village is the village of Římov, which is surrounded by the famous Stations of the Cross. The authorized municipal office for the cadastral area of Doudleby is the City of České Budějovice. He prepared Territorial analytical documents of the municipality with extended powers, i.e., documents for the analysis of sustainable development of the territory. First of all, the intention is to double the inlet from the Římov dam, i.e., to expose the water in the section Římov - Doudleby - Plav - Heřmaň with a corridor width of 100 meters. The city of České Budějovice included the cadastral area of Doudleby in the so-called agglomerated area (the so-called agglomerated ring) and at the same time among the so-called municipalities dependent on the connection to higher centers and not located on an important transport axis. Among other things, the documents also state that there are landslide areas in the cadastral area (however, they do not encroach on the buildable area). Within the study prepared by Atelier V - Ing. Sheet. Ivan Vorl selected the cadastral area as an area with increased landscape value, for landscape type C (relatively natural), together with the municipalities of Heřmaň, Strážkovice, Střížov, Komařice and Plav. The study draws particular attention to the fact that there are forested parts of the landscape and part of the Malše valley in the area.

The strategic plan of the city of České Budějovice for the period 2017 to 2027, i.e., municipalities with extended powers for the cadastral area of Doudleby, speaks of the researched area only in connection with the construction of cycle paths and cycle routes leading to important attractions in the vicinity of possibility of short bike trips to attractions in the area (Czech Statistical Office, 2020).

From the point of view of nature and landscape protection, the cadastre of the village of Doudleby can be considered good. The air in the cadastre is also generally rated as very good for a long time. Practically in the whole territory of the cadastre, the high quality of the natural environment is preserved, especially forests and water areas, which are not disturbed by anything. In terms of cultural values, there is Doudlebské hradiště, ie a Slavic early medieval castle with an area of about 4.8 ha from the second half of the 10th century, the parish church of St. Vincent from the early 12th century, which was the center of church administration in the Middle Ages. for a wide area, also a sculpture of Pieta in front of the church from 1756, the chapel of St. Barbara behind the church from 1680, parish, house no. 13 from 1851 in the style of peasant baroque, house no. 29 timbered, Čapek's bridge over Malša from 1928 to 1929 connecting Doudleby with Straňany, Max Biaggi's footbridge or the mound burial ground and Doudlebský waterfall. It is interesting that the name of the village bears the asteroid 6060 Doudleby, discovered in 1980 at the Kleť Observatory.

The SWOT analysis states that the overall air quality is not deteriorated due to air pollution limits for health protection; strengths include population growth, the existence of a primary school, sufficient buildable areas for civic amenities, and a high level of Coefficient of ecological stability (CES). Weaknesses include, on the other hand, the threat of flooding of the built-up area and at the same time the built-up area in

Table 1. Individual ways of land use in the cadastre of the village Doudleby

Ways of use	Area (in m2)
Ploughland	1 294 871
Woodland	1 938 437
Gardens	154 680
Grassland (meadows, grassy borders, etc.)	1 817 776
Water areas (artificial reservoirs, ponds, natural streams)	215 322
Built-up areas	79 539
Other areas (track, barren land, roads, greenery, handling areas)	356 635

The data were obtained from the State Administration of Land surveying and Cadastre of the Czech Republic 2020 (Doudleby, 2020; State Administration of Land surveying and Cadastre of the Czech Reublic, 2020)

the active zone of the flooded area, the absence of connection to the railway and the worsened accessibility of the municipality with extended powers (České Budějovice). Opportunities include the development of services aimed at seniors and the high potential of individual recreation and the development of services for recreation and tourism. On the threat side, there is a relative decrease in children, the occurrence of environmental burdens, and an aging population, stagnation of community development due to limited investment in housing and disruption of the traditional structure of the village due to oversizing of buildable areas for housing.

In accordance with the elements of the Territorial System of Ecological Stability (TSES), the municipality has committed itself to creating conditions for the preservation and creation of a diverse, aesthetically balanced and ecologically stable landscape, i.e. to respect the set target characteristics of the landscape and the set principles for activities in the territory and decision-making on changes in the territory for individual types of landscape, to create conditions for the protection and ensuring the functionality of the ÚSES. Within ÚSES there are regional and superregional elements, namely No. NBK169 Červené Blato, NBK117 U Ameriky, RBK3039 K169 Římov, RBC4079 Straňany and LBC1277 V Bor.

The territorial system of ecological stability of the landscape (TSES) is defined in § 3 par. a) of Act No. 114/1992 Coll., on Nature and Landscape Protection, as an interconnected set of natural and altered, but close to nature ecosystems that maintain the natural balance. There is a local, regional and supra-regional system of ecological stability [20]. The basic components of TSES are biocentres and biocorridors. The biocentre is defined by Implementing Decree No. 395/1992 Coll. (§ 1 letter a) as a habitat or set of habitats in the landscape, which by its condition and size allows the permanent existence of a natural or altered, but close to nature ecosystem. The biocorridor is also defined by Implementing Decree No. 395/1992 Coll. (§ 1 letter b) as an area that does not allow a decisive part of organisms to have a permanent long-term existence, but allows their migration between biocentres, and thus creates a network of separate biocentres. According to § 4 paragraph (1) of Act No. 114/1992 Coll. the obligations of all owners and users of the land forming its basis; its creation is in the public interest, in which landowners, municipalities and the state participate. The basis of the actual legislative protection of partial parts of the territorial system of ecological stability is their approval in the spatial planning documentation (Act No. 114/1992 Coll.; Weber, 2007).

The European Landscape Convention (CETS No.176), a new instrument dedicated exclusively to the protection, management and planning of the landscape in all European countries, also responds to many of the problems facing the landscape character of the territory and parts of the territorial system of ecological stability. As of October 1, 2004, the Convention is also binding on the Czech Republic. The idea base of the Convention is based on a full understanding of the landscape, based on the principles of sustainable development. However, it adds a cultural pillar to the economic, ecological, and social pillars of this development. This is already clear from the preamble, which emphasizes, among other things, that the landscape plays an important role in terms of public interest in the cultural, ecological, environmental, and social fields and is a resource favorable to economic activity. Its protection, management, and planning can help create jobs. Landscape contributes to the creation of local cultures and is a substantial part of Europe's natural and cultural legacy (Kocián, 2004).

Vegetation Stage and Megatype of Sensu Meeus in the Village of Doudleby

Vegetation degree (according to Zlatník) is a unit of vegetation degree expressing the difference of biota depending on climate change with altitude and on exposure (State Administration of Land Surveying and Cadastre, 2020). In the concept of prof. Alois Zlatník is the vegetation stage as an extension unit of the geobiocenological classification system, which divides the landscape on the basis of a model of the natural (potential) state of geobiocenoses (Buček & Lacina, 1999). The vegetation stage in the landscape in the village of Doudleby is mostly an oak-beech vegetation stage. The village is located on the border with the oak-coniferous vegetation stage. As for the megatype of sensu Meeeus, the village of Doudleby falls into the category of landscape type A - open agricultural landscapes of the temperate zone - A1 openfields - open fields. The open field is shown in **Figure 3**.

The most widespread biome located in the Czech Republic is broad-leaved deciduous forest, which occurs predominantly in Western and Central Europe. Other biomes are located in the restricted area, including continental forest-steppe, which is at the western edge of its Eurasian distribution, and extra zonal occurrences of boreal coniferous forest (taiga) and tundra (**Figure 4**).

According to these maps (**Figures 4** and **5**), lowlands in Moravia and the northern half of Bohemia would be dominated by oak-hornbeam forests, driest areas of northern and central Bohemia and southern Moravia by a mosaic of oak-hornbeam and thermophilous oak forest, mid-altitudes of western and southern Bohemia by acidophilous oak (partly also pine or fir) forests, submontane and montane areas by beech forests, the highest mountain areas by spruce forests and subalpine and alpine vegetation, and floodplains by alluvial forests. However, there is much uncertainty about actual species composition and distribution of potential natural vegetation types (Neuhäuslová et al., 1997) especially in the lowlands and at mid-altitudes, where humans have long intensively exploited

Figure 3. A1 Open fields 2020

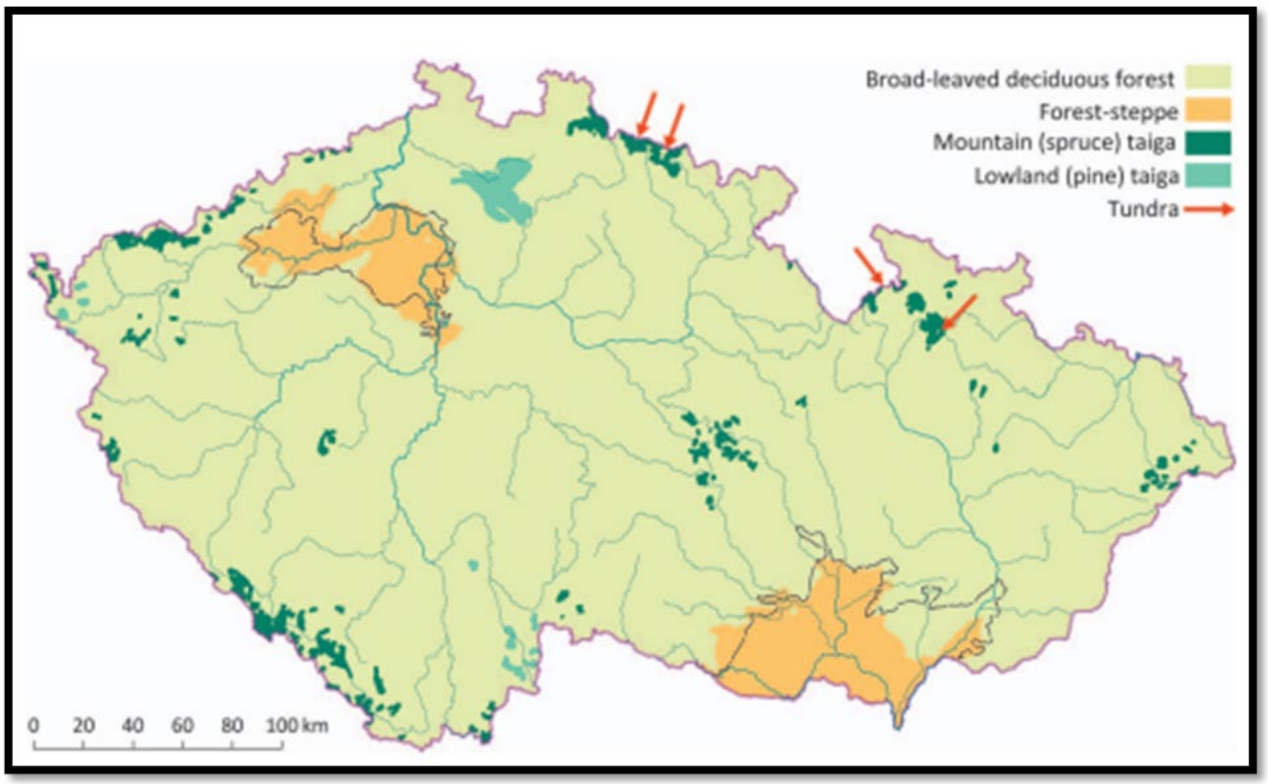

Figure 4. Czech biomes 2020
Source: Chytrý (2012)

forests and their present composition reflects past human impact (Czech Statistical Office, 2014). Human impact is responsible for fundamental differences in the historical development of forests in the lowland and colline belts and those at higher altitudes.

MATERIALS AND METHODS

The landscape is made up of a set of components (=areas) that put together a landscape matrix. The components can be divided into stabilizing and labile. If any activity is carried out in the landscape that could affect the landscape character or functionality of any of its components, or the character of the landscape as a whole, it is necessary to be able to evaluate the positive or negative consequences. It is an objectification of the definition of the dynamics of the landscape system = the exact numerical expression of changes in the landscape. To fulfill the goal and results of the article, content analysis was used, as a method for identifying basic knowledge to determine changes in the landscape of the studied area. Furthermore, qualitative methods were used to fulfill the goal

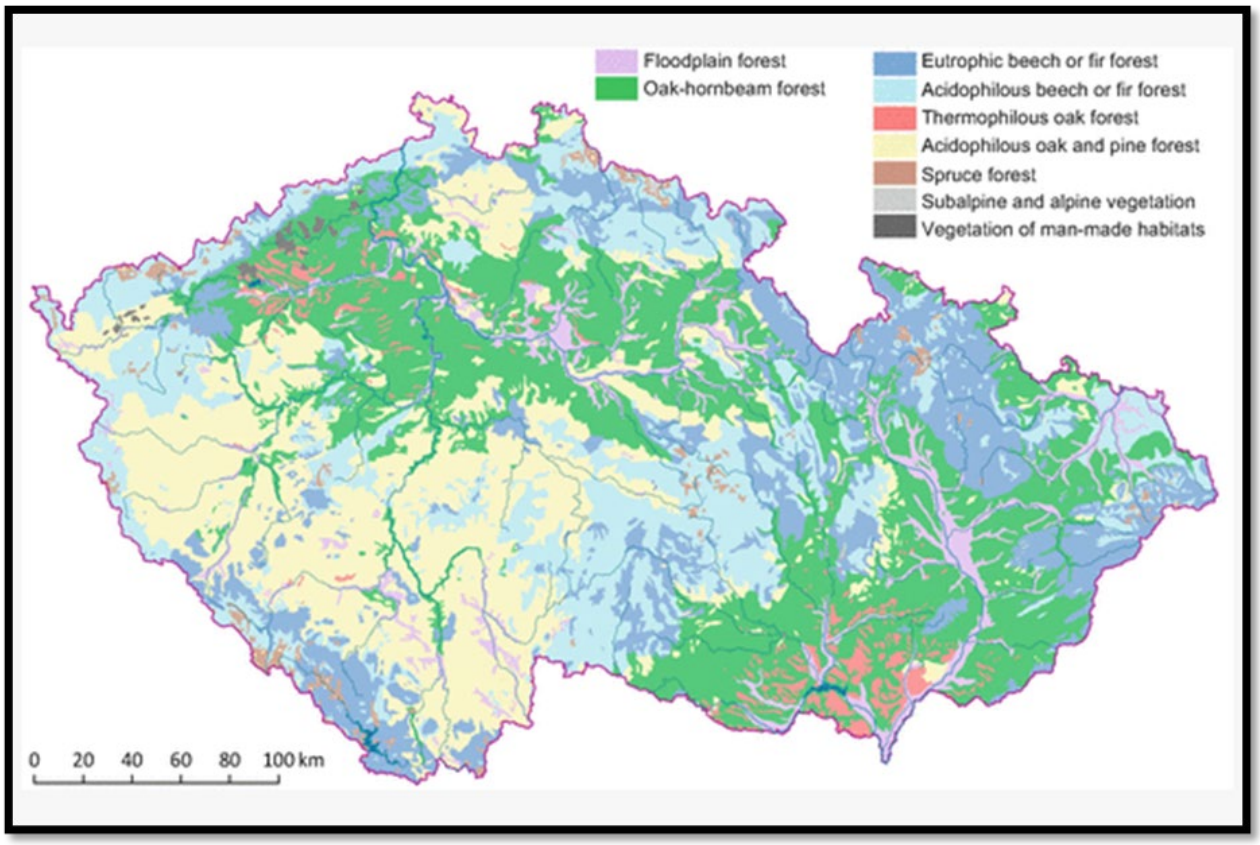

Figure 5. Potential natural vegetation according to Neuhäuslová et al. (1997), simplified
Source: Neuhäuslová et al. (1997)

and results, to examine the calculation of the coefficient of ecological stability of the area according to Michal and Miklós. To capture the landscape multifunctionality and to indicate the environmental quality of the area under study, land use provided in parallel by arable land, forests, and bodies of water were studied.

The coefficient of ecological stability (CES) represents a ratio number (coefficient), which determines the ratio of so-called stable and unstable areas of landscape-forming elements in the monitored area (Míchal, 1994). In addition, ecological stability is actually the ability of an ecological system to persist even under the influence of a disturbing influence and to reproduce its characteristics in the conditions of disturbance from the outside (especially disturbance by humans). CES thus expresses how a certain territory is able to cope with these influences (Kolejka, 2011).

This ratio is calculated according to the following formula:

Stable elements	**Unstable elements**
WL - woodland	PL - ploughland
WS - water areas and streams	AA - anthropogenized areas
PG - permanent grassland	HG - hop-garden
Pa - pastures	
We - wetlands	
Or - orchards	
Vi - vineyard	

The method of calculating CES is based on a clear and final classification of a landscape element into a group of stable or unstable and does not allow the assessment of the specific state of these elements.

The general classification of CES is as follows:

CES $\leqslant$ 0.10 areas with maximum disturbance of natural structures

0.10 < CES $\leqslant$ 0.30 areas used above average with a clear disruption of natural structures

0.30 < CES $\leqslant$ 1.00 areas intensively used with considerable ecological instability

1.00 < CES < 3.00 quite balanced landscape

CES $\geqslant$ 3.00 natural and nature-friendly landscape (significant predominance of ecologically stable structures)

At present, there is no longer a purely natural landscape on Earth, because through the changes of the atmosphere, man affects the entire surface of the planet. However, a natural landscape is one whose construction components and processes do not show man-made manifestations. However, the natural landscape is the material environment (starting point and then background) for each cultural landscape. The natural landscape is therefore of interest to experts even in areas that are deeply man-made and intensively used. In the cultural landscape, under the “cultural layer”, “cultural layer” or “cultural superstructure”, it is necessary to identify the potential natural landscape that would arise under current conditions if one left it and removed one’s products. It largely regulates human behavior in the landscape. Territorial differentiation of the potential natural landscape as a “natural environment” or “natural background” is the main reason for the selection and spatial distribution of human activities in the territory. It is to be stated with some regret that the study of the natural landscape is in the background of the now very

Table 2. Stable and unstable elements in the village of Doudleby

Stable elements	Area (in m2)	Unstable elements	Area (in m2)
Woodland	1 938 437	Ploughland	1 294 871
Water areas (artificial reservoirs, ponds, natural streams)	215 322	Athropogenized areas (built-up areas)	79 539
Permanent grassland	1 817 776		
Gardens	154 680		

Source: The data were obtained from the State Administration of Land Surveying and Cadastre of the Czech Republic 2020 (State Administration of Land Surveying and Cadastre, 2020)

fashionable study of various aspects of the use, changes or damage to the landscape by man (Löw & Míchal, 2003).

The Coefficient of Ecological Stability According to I. Míchal et al. (1985)

Calculation of CES (in ha) = natural and near-natural areas divided by cultural areas.

Specifically, CES = (woodland + water areas and streams + permanent grassland + pastures + wetlands + orchards + vineyard) / (built-up areas + ploughland + hop-garden)

The higher the number, the greater the proportion of permanent vegetation areas, the greater the stability of the area. CES for the Czech Republic (average) is 1,144 (Míchal, 1985).

$$CES = \frac{WL + WS + PG + Pa + We + Or + Vi}{PL + AA + HG} = \frac{\text{Stable elements}}{\text{Unstable elements}}$$

- The higher the value of CES, the more stable and better the landscape - *according to Míchal*

- Ces <0.10 - areas with maximum disturbance of natural structures, basic ecological functions must be intensively and permanently replaced by technical interventions

- 0.10 <Ces <0.30 - areas used above average, with a clear disruption of natural structures, basic ecological functions must be systematically replaced by technical interventions

- 0.30 <Ces <1.00 - areas intensively used, especially by large-scale agricultural production, weakening of autoregulatory processes in agro ecosystems causes their considerable ecological lability and requires high deposits of additional energy

- 1.00 <Ces <3.00 - quite balanced landscape, in which the technical objects are relatively in accordance with the preserved natural structures, the result is a lower need for energy-intensive deposits

- Ces> 3.00 - stable landscape with a predominance of natural and nature-friendly structures (Míchal, 1985).

There are many methodologies, but all are based on the same principle. The calculation is always based on the evaluation of the ratio of ecologically stable and ecol. labile components of the landscape, individual methodologies differ in the categorization of landscape segments, or in the use of more detailed coefficients.

The most used methods include:

1. According to Michal (1985)
2. According to Miklós (1986)
3. According to Agroprojekt
4. According to Rohon (Míchal, 1985; Miklós, 1986).

Miklós ecological stability coefficient (1986)

Unlike the following methodologies, it is not based on the division of areas into stable and unstable, but differentiates their ecological significance by introducing numerical coefficients:

- *pn i - area of individual areas*
- *kpn i - coefficient of ecological significance of areas*
- *p - area of the area of interest (or cadastral)*
- *field - 0.14; meadows - 0.62; pasture - 0.68; gardens - 0.5; fruit orchards - 0.3; forests, water, wetlands - 1.00; others - 0.10 (+ lada - 0.62, vineyards - 0.3, rocks - 0.4, line company - 0.4)* (Miklós, 1986)

$$K_{es} = \frac{\sum p_{ni} * \sum k_{pni}}{\sum p}$$

RESULTS AND DISCUSSION

The following stable and unstable landscape elements are located in the cadastre of the municipality of Doudleby.

CES = The value of CES according to **the Míchal** methodology in the cadastre of the village of Doudleby is 3.00, which is assessed as **a natural and nature-friendly landscape**. There is a significant predominance of ecologically stable structures. In this particular, let us notice especially the high share of forest land and permanent grassland, occupying almost 4 million m2 of the total area of the examined cadastral area. Ecologically unstable structures included urban areas in the extent of 79,539, i.e. built-up area, not other area with a total area of 356,635 m2, representing another area, handling area, barren land, other roads, burial sites, roads, sports and recreational areas and green.

According to Michal, we calculate the CES: 1,938,437 + 215,322 + 1,817,776 + 154,680 / 1,294,871 + 79,539 = 4,126,215 / 1,374,410 = 3.00

CES = The value of CES according to **the Miklós** methodology in the cadastre of the municipality of Doudleby is 0.64623 = the area is **moderately stable.** In the cadastre of the village Doudleby there are the following landscape elements with areas:

- *Field - 1.3 km2*
- *Meadows - 1.8 km2*
- *Gardens - 0.2 km2*
- *Forests, water, wetlands - 2.2 km2*
- *Others - 0.08 km2*

According to Miklós, we calculate CES according to: (1.3 x 0.14 + 1.8 x 0.62 + 0.2 x 0.5 + 2.2 x 1.00 + 0.08 x 0.10) / (1 .3 + 1.8

+ 0.2 + 2.2 + 0.08) = (0.182 + 1.116 + 0.1 + 2.2 + 0.008) /5.58 = 3.606 / 5.58 = 0.64623

Czech landscape schools know and use various methodologies. None of them is anchored in the legislation, the closest to the legal norm is the calculation of CES according to Michal, because it is also implemented in the concept of TSES = Act No. 114/1992 Coll., § 3 letter a. and landscapes. Because each methodology uses division into different landscape segments and different coefficients, the result may be different, see. result of applied methodologies. Miklós medium stable landscape, Míchal natural and close to nature landscape.

CONCLUSIONS

It is clear from the results of the article that the investigated area of the cadastral territory of the municipality of Doudleby falls into the territory where ecologically stable natural structures predominate. This means that the impact of anthropogenic human intervention is at an acceptable level. This territory is therefore in line with the principles set out in the European Landscape Convention. Despite the fact of different results in both applied methodologies, it is necessary to state the fundamental fact that the definition and subsequent implementation of the territorial system of ecological stability is a proven tool for nature and landscape protection, fundamentally involved in protecting and restoring natural ecological functions of the landscape. The biggest change in the landscape character of this researched area and at the same time the biggest threat to the future is the threat of the built-up area by floods and at the same time the built-up area in the active zone of the flooded area. For this reason, a new landscape plan for this area is needed, which sets out the possibilities for solving this problem, also for the possible reason of oversizing buildable areas for housing. It can be stated that the private and, to a greater extent, the public sector emphasizes increasing resource efficiency, the quality and flexibility of services provided to citizens, professionalism and transparency, which ultimately benefit citizens as well as local public institutions themselves. Despite several uncertainties, this study demonstrates that it is possible to analyze long-term land-use trends to generate more meaningful, spatially explicit information, which can form the basis for landscape planning and ecosystem management.

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