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MAPPING AND ASSESSMENT OF LAND COVER CHANGE AND ECOLOGICAL STABILITY: A CASE OF THREE TRANSECTS IN SLOVAKIA

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ABSTRACT

Aim of the study

The aim of this paper is to analyze and assess the land cover change in three transects in Slovakia by applying the coefficient of ecological stability and the coefficient of anthropogenic impact in four different time horizons (1950, 1990, 2000, and 2020). Based on the specific natural and socio-economic factors influencing landscape formation and change, we chose three transects from the territory of Slovakia as study areas. The study areas are located in western Slovakia (transect called Záhorie: Rudava – Buková), central Slovakia (transect called Turiec: Martin – Moškovec), and eastern Slovakia (transect called Poloniny: Stakčín – Ruské).

Material and methods

Several methodological tools have been created to express the level of ecological stability of a given territory. In our study, we used the coefficient of ecological stability (CES). The intensity of changes in the landscape as a result of human activity was also described through the coefficient of anthropogenic influence (CAI).

Results and conclusions

The results of CES and CAI indicate a similar situation in case of the Záhorie: Rudava – Buková transect and the Poloniny: Stakčín – Ruské transect. For the Poloniny: Stakčín – Ruské transect, the CES values are significantly higher than 1.21, which is a landscape with high ecological stability, and the CAI values are close to 0, which also represents a landscape with a minimal intensity of changes due to human activity. In the case of the Záhorie: Rudava – Buková transect it is similar, but the CES values do not reach such high values as in the case of the Poloniny: Stakčín – Ruské transect, which is mainly influenced by the fact that the Poloniny: Stakčín – Ruské transect passes through a protected area of the Poloniny National Park. In the case of the Turiec: Martin – Moškovec transect, there is no correspondence between the CAI and CES values, as the CAI values are less than 1 (the highest value is 0.46), which represents a landscape with a minimal intensity of changes due to human activity. However, the results of CES are values lower than 0.8, which represents a landscape with low ecological stability.

Keywords: land cover, transects, coefficient of ecological stability, coefficient of anthropogenic impact on the landscape, Slovakia

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INTRODUCTION

The long-term activity of natural landscape-forming processes has created several types of landscape, which can also be referred to as geo-ecological types, or types of natural landscape. These types have been influenced to a greater or lesser extent by anthropogenic processes. Human activities concentrate in the specific landscape environment of these types, where the results of their activities are intertwined with natural conditions and processes (Boltižiar and Olah, 2009; Vojteková and Vojtek, 2016; Vojtek and Vojteková, 2019).

The importance of land use/land cover (LULC) for landscape ecology is considerable. Individual LULC classes fulfill diverse functions in the landscape. In addition to production, regulatory, and cultural functions, they also fulfill a range of ecological and landscape-ecological functions, i.e. they strengthen the ecological stability of the landscape, create habitats and refuges for various species of animals, are significant gene pool resources, ensure the protection of individual landscape-forming components, and many more (Izakovičová and Miklošovičová, 2011).

Land-forming processes, whether natural or anthropogenic, cause constant changes in the landscape, which directly affect its stability from an ecological point of view, i.e. the ability of the ecosystem to return to a dynamic balance or to its "normal" development direction through the action of its own internal mechanisms. Several methodological tools have been created to express the level of ecological stability of a certain territory, most of which are based on the calculation of the coefficient of ecological stability (CES) (Löw, 1987; Reháčková and Pauditšová, 2007). Landscape is undergoing constant change. It is transformed for the needs of civilization, and the consequence is often its degradation and reduction of its ecological stability (Bellerová et al., 2014; Morzyniec et al., 2016).

Man's interventions in the landscape cause a kind of "chain reaction" that gradually affects all components of the landscape. The intensity of these human interventions is described by the coefficient of anthropogenic impact (CAI) (Kupková, 2001). It is true that the more significant the anthropogenic interventions, the higher the value of this coefficient and thus the more visible the land change.

A number of studies have dealt with the analysis and assessment of the LULC using the coefficients of ecological stability or the coefficient of anthropogenic influence, such as Labuda and Pavlíčková (2006), Muchová et al. (2013), Ivan et al. (2015), Michaeli et al. (2015), Prus et al. (2017), Tykhenko et al. (2021), Chibilyov et al. (2022) and others. Moreover, the landscape stability can be expressed by other techniques, such as the overlay or fuzzy methods, as described in Vojtek (2018) or Vojteková and Vojtek (2019).

The aim of this paper is to present the analysis and assessment of land cover changes and the ecological stability of three study areas across Slovakia. We have calculated the coefficient of ecological stability, according to Löw (1987), and the coefficient of anthropogenic impact, according to Kupková (2001), based on the land cover mapping in four studied time horizons: 1950, 1990, 2000, and 2020.

STUDY AREAS

The study areas consists of three transects located in the western, central, and eastern Slovakia (Fig. 1), chosen to ensure representative coverage of the country. Each of the selected transects start in a lowland or basin landscape (lower elevations) and gradually move towards the mountainous landscape (higher elevations). Moreover, each transect includes a part of one or more NATURA 2000 sites. The first transect called Záhorie: Rudava – Buková is defined by the following geographic coordinates: 48°29'N, 17°10'E (westernmost point) and 48°32'N, 17°23'E (easternmost point). The transect is located within the geomorphological units Borská nížina and Malé Karpaty and runs in the southwest-northeast direction, starting with the sub-units Bor and Podmalokarpatská zníženina and passing into the sub-units Pezinské Karpaty (parts Plavecké podhorie, Bukovská brázda and Biele hory) and Brezovské Karpaty. The minimum altitude is 179 m a. s. l., which is represented by a point where the Rudava River leaves the transect boundary. The maximum altitude (443 m a. s. l.) is on the southeastern border of the transect. The Rudava River flows through the transect with its left-sided tributaries called Hrudka, Smrekovec, and Rudavka and the right-sided tributary of Stará Rudava. The Buková reservoir is also located in this transect. Based on the

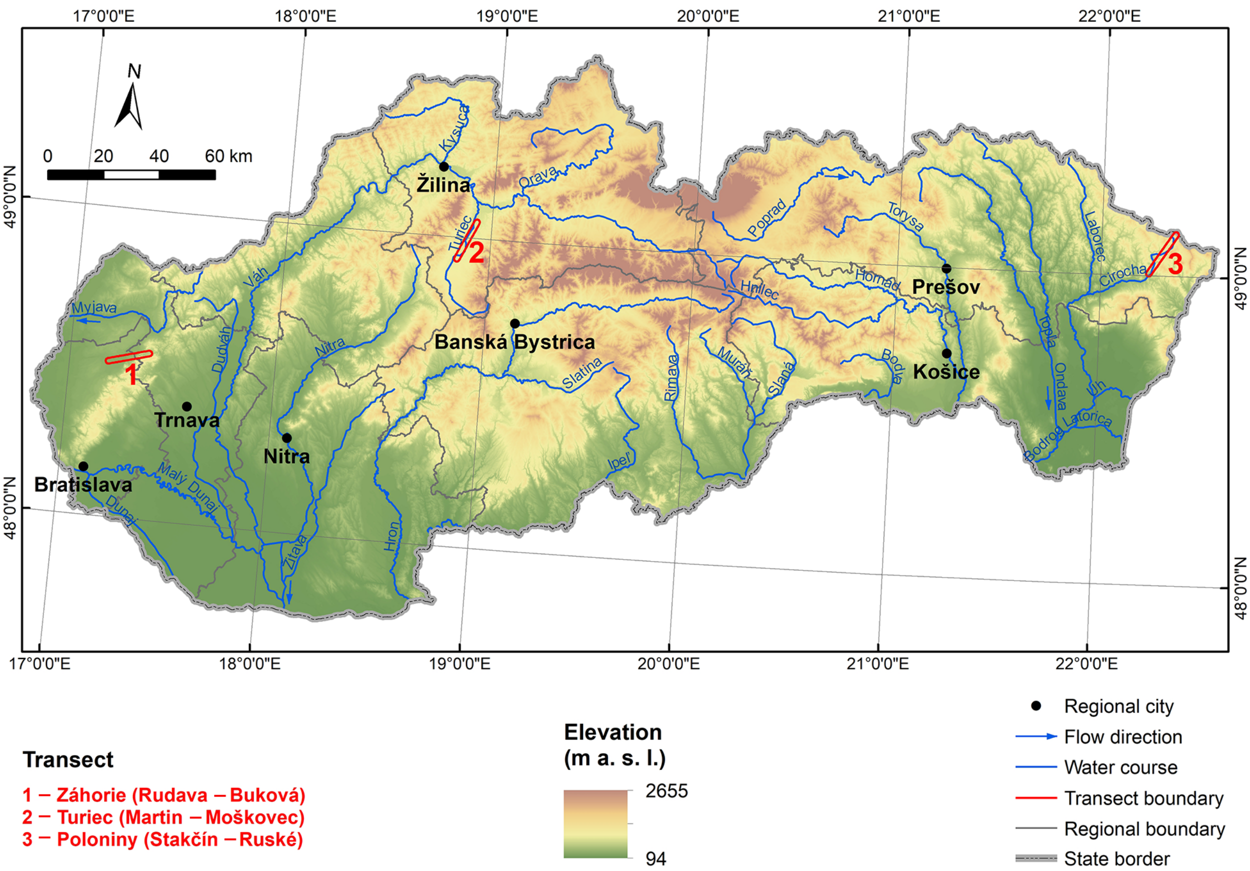

Fig. 1. Study areas. Source: GKÚ Bratislava

administrative division, the transect belongs to three districts: Malacky, Senica, and Trnava (NUTS IV) and two regions: Bratislava Region and Trnava Region (NUTS III). The transect includes the following municipalities: Sološnica, Plavecké Podhradie, Plavecký Mikuláš, Plavecký Peter, Prievaly, Buková and the military district of Záhorie. The area of the transect is 33 km^2, its length is 17 km and its width is 2 km.

The second transect called Turiec: Martin – Moškovec is defined by the following geographic coordinates: 48°55’N, 18°49’E (southernmost point) and 49°03’N, 18°55’E (nothernmoest point). The transect is formed by the geomorphological unit of Turčianska kotlina and dominated by the Turčianske nivy sub-unit. The transect runs in the southwestern-northeastern direction, starting with the Diviacka pahorkatina sub-unit, passing through the sub-units of Mošovská pahorkatina, Turčianske nivy, and partly Valčianska pahorkatina, before ending with the Sklabinské podhorie and Turčianske nivy sub-units. The lowest elevation is 398 m a. s. l., which is represented by a point where the Turiec River leaves the transect boundary. The maximum altitude is reached by the Stráž hill (534 m a. s. l.). The Turiec river flows through the transect with the left-sided tributary of Vríca and the right-sided tributaries of Teplica, Dolinka, Blatnický potok, Čierny potok, Beliansky potok, Žabokrecký potok, and Medokýš. Based on the administrative division, the transect belongs to the districts of Martin and Turčianske Teplice (NUTS IV) and the Žilina Region (NUTS III). The transect includes the municipalities of Jazernica, Abramová, Borová, Blažovce, Moškovec, Socovce, Turčiansky Ďur, Kláštor pod Znievom, Laskár, Slovany, Rakovo, Ležiachov, Benice, Trnovo, Príbovce, Košťany nad Turcom, Trebostovo, Turčiansky Peter, Žabokreky, Bystrička, and the town of Martin. The area of the transect is 33 km^2, its length is 17 km and its width is 2 km.

The third transect is called Poloniny: Stakčín – Ruské is defined by the following geographic coordinates: 48°59'N, 22°13'E (southernmost point) and 49°08´N, 22°21'E (northernmost point). The transect is formed by the geomorphological units of Laborecká vrchovina, Beskydské predhorie, and Bukovské vrchy. The transect runs in the southwestern-northeastern direction, starting with the Laborecká vrchovina geomorphological unit and the Ublianska pahorkatina sub-unit, passing through the Nastaz sub-unit and ending with the Bukovce sub-unit (part of the Ruská kotlina), which occupies the largest part of the transect. The minimum altitude is 250 m a. s. l., which is represented by a point where the Cirocha River leaves the transect boundary. The maximum altitude is 995 m a. s l. located on the northern edge of the transect near the state border with Poland. The Cirocha river flows through the transect with the left-sided tributary of Lukov. The Starina reservoir also extends into the transect. Based on the administrative division, the transect belongs to the Snina district (NUTS IV) and the Prešov region (NUTS III). The transect includes the municipalities of Stakčín and Jalová. It has the area of 37 km^2, length 19 km and width 2 km.

MATERIAL AND METHODS

The identification and interpretation of land cover for the presented study areas was carried out based on black-and-white aerial images from 1950 and true color aerial images from 1990, 2000 and 2020. The identification and subsequent digitization of land cover classes was performed by the manual "on-screen" method (Sabins, 2007; Lillesand et al., 2015) in ArcGIS 10.2.2 software at a scale of 1 : 2,000 in order to identify and digitize the boundaries of individual polygons with higher accuracy. As for the definition of land cover classes, we used the CORINE Land Cover classification system (https://land.copernicus.eu/user--corner/technical-library/corine-land-cover-nomenclature-guidelines/html).

To calculate the ecological stability of land cover classes, we used six degrees (0–5) according to Löw (1987), who divided the land cover classes based on the originality of vegetation between natural and close-to-nature classes (degree of ecological stability equals 5) and anthropic classes, without vegetation, and artificially created (degree of ecological stability equals 0). The spatial structure of the transect is characterized according to the share of land cover classes that have different characters and ecological quality or stability. They were classified into individual categories according to the nature and intensity of changes in the vegetation and abiotic environment. Each mapped class is assigned a degree of ecological stability in accordance with Table 1.

The degree of ecological stability expresses the degree of deviation of the current condition from the natural state. CES was calculated according to the following Equation (1):

$$CES = \frac{D_5 + D_4 + D_3}{D_2 + D_1 + D_0} \quad (1)$$

Based on the determination of the relevant degree of ecological stability, the calculated results can be interpreted in terms of Table 2.

The intensity of changes in the landscape, as a result of human activity, can be described by the coefficient of anthropogenic impact on the landscape. According to Kupková (2001), the index compares areas of high LULC intensity to areas of low LULC intensity. Intensively used areas are classes that are under great anthropogenic pressure (urbanized, large-block arable land, etc.). Areas of less intensive use, such as forests, meadows, pastures, and water bodies, are less affected by human activity. If the coefficient of anthropogenic impact is equal to one, the distribution of both types of areas is balanced. If areas with intensive anthropogenic impact are predominant, this coefficient reaches a value higher than 1. Conversely, if the areas with a lower intensity of use are more than half, the coefficient ranges from 0 to 1. It is true that the greater the share of intensively used areas, the higher the value of the coefficient of anthropogenic impact on the landscape.

Regarding the analyzed transects, intensively used areas included the following land cover classes: Continuous urban fabric (111), Discontinuous urban fabric (112), Industrial or commercial units (121), Road and rail networks and associated land (122), Mineral extraction sites (131), Construction sites (133), Green urban areas (141), Sport and leisure facilities (142). Areas that are less intensively used contained the following land cover classes: Pastures (231), Land principally occupied by agriculture, with significant areas

Table 1. Degrees of ecological stability. Source: Löw (1987)

Degree	Verbal description of the degree of ecological stability	Description of LULC classes
5 (D5)	Very high importance	Landscape with natural and close-to-nature vegetation – natural forests, natural grass-herb communities, wetlands, peatbogs, waterways and areas with natural channel and banks and with characteristic water and coastal communities, etc.
4 (D4)	High importance	Landscape with semi-natural and close-to-nature vegetation, forests, meadows with a predominance of naturally growing species, natural water bodies, etc.
3 (D3)	Moderate importance	Landscape with anthropogenically conditioned vegetation with natural elements, e.g. grassed and extensively used orchards, etc.
2 (D2)	Low importance	Landscape with anthropogenically conditioned vegetation of a synanthropic character, e.g. intensively used orchards, vineyards, reclaimed meadows, etc.
1 (D1)	Very low importance	For example, intensively used and area-wide blocks of arable land, etc.
0 (D0)	Without importance	For example, built-up areas and roads, etc.

Table 2. Interpretation of ecological stability degrees. Source: Kupková (2001)

Coefficient of ecological stability (CES)	Verbal characteristics
< 0.40	Landscape with very low ecological stability
0.41–0.80	Landscape with low ecological stability
0.81–1.20	Landscape with moderate ecological stability
1.21 <	Landscape with high ecological stability

of natural vegetation (243), Broad-leaved forest (311), Coniferous forest (312), Mixed forest (313), Natural grassland (321), Moors and heathland (322), Peatbogs (412), Water courses (511) and Water bodies (512). As for the land cover class of Transitional woodlands (324), we identified predominantly areas of expanding secondary succession in this class due to the abandonment of agricultural activity. For this reason, this land cover class was included in the group of less anthropogenically influenced areas.

RESULTS

Land cover change in the transect Záhorie: Rudava – Buková can be seen in the land cover maps (Fig. 2) and graph presenting the share of changes in land cover classes in studied years (Fig. 3).

By analyzing the changes in land cover in the Záhorie: Rudava – Buková transect, the largest spatial changes in the period 1950-1990 are related to the intensification of agriculture, i.e. a change from Complex cultivation patterns (242) and Pastures (231) to Non-irrigated arable land (211). This process is strongly connected with the large-scale drainage of this area. It is possible to identify the construction of a water reservoir near the municipality of Buková on aerial photographs as well as thematic maps (Fig. 2). Most of the wet meadows along the reservoir are protected by the NATURA 2000 (site SKUEV0268).

The main changes in the period 1990-2020 are mainly related to afforestation, i.e. a change from Transitional woodland-shrubs (324) to Coniferous forests (312), and deforestation, i.e. a change from Coniferous forests (312) in some places to Transitional wood-

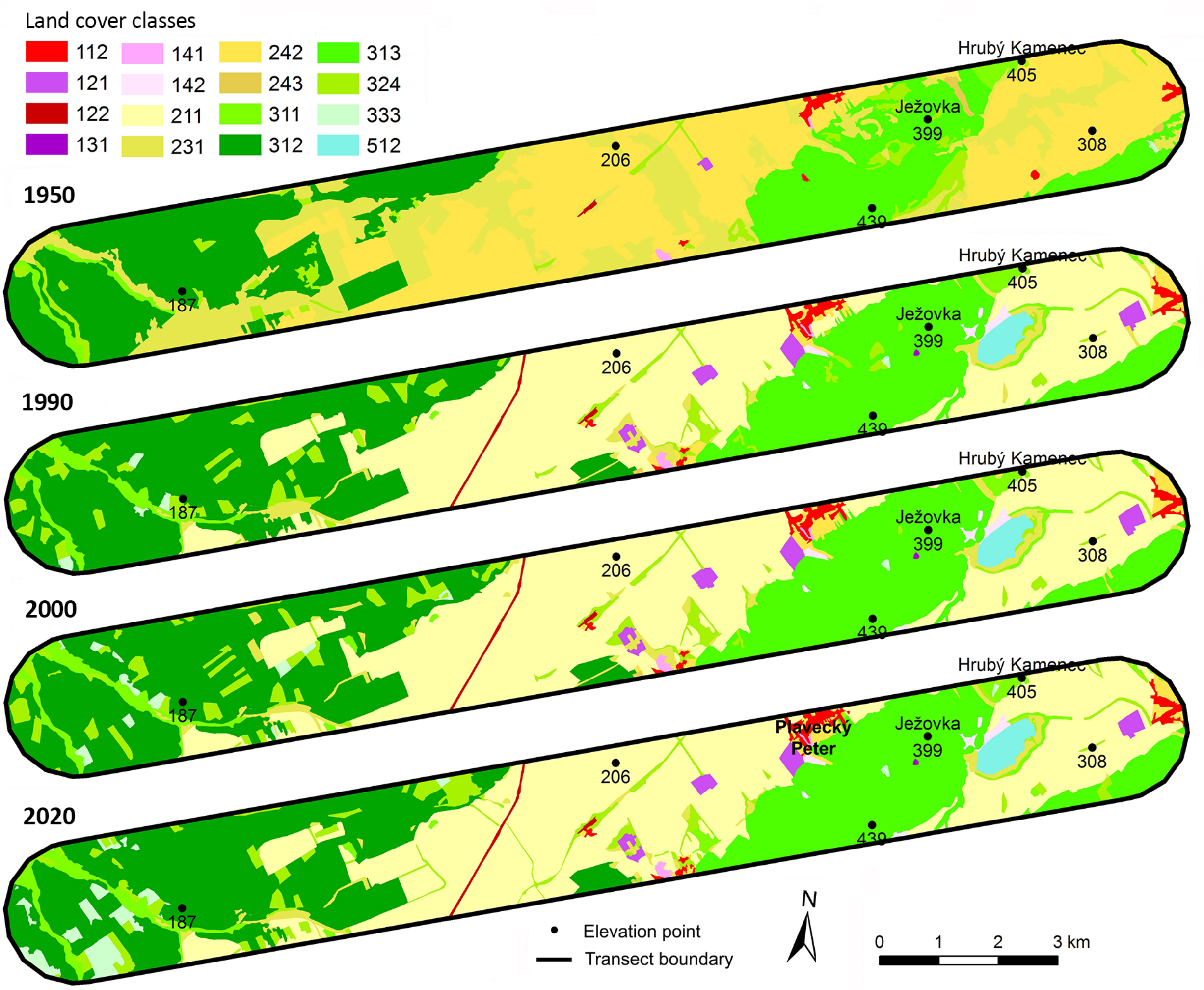

Fig. 2. Spatial distribution of land cover classes in the Záhorie: Rudava – Buková. Source: TOPÚ Banská Bystrica; GKÚ Bratislava, NLC

land-shrubs (324), especially, in areas of pine forest located on the winding sands in the western part of the transect in the NATURA 2000 site. These changes are related to forest management and the techniques used.

Land cover change in the transect Turiec: Martin – Moškovec can be seen in the land cover maps (Fig. 4) and graph presenting the share of changes in land cover classes in studied years (Fig. 5).

As for the Turiec: Martin – Moškovec transect, the largest spatial changes in the period 1950–1990 are related, similarly as in the previous transect, to the intensification of agriculture – a change from Complex cultivation patterns (242) and Pastures (231) to Non-irrigated arable land (211). It can be identified mainly in the agricultural landscape in the floodplain of the Turiec River near the NATURA 2000 site SKUEV0382. An important process is the termination of agricultural use in the area of wetlands connected to this site and the invasion of bushes. Urbanization also represents a remarkable change, especially in the northern part of the transect.

Land cover changes in the period 1990–2020 are not spatially significant in this transect. Major changes are mainly related to the deforestation of small areas in open agricultural land or along a meandering river, i.e. a change from Transitional woodland-shrubs (324) to Non-irrigated arable land (211). Other changes are related to the urbanization around the town of Martin and construction of a new road of 1st class.

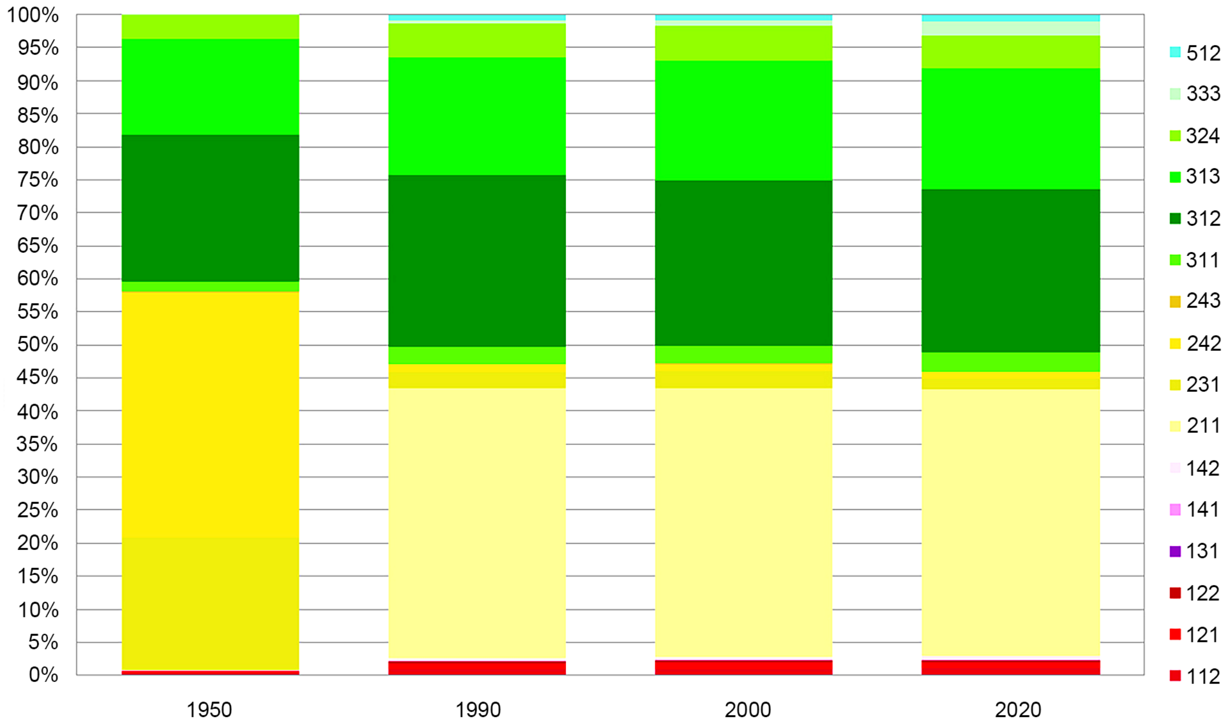

Fig. 3. Share of land cover classes in the Záhorie: Rudava – Buková. Source: own elaboration

Land cover change in the transect Poloniny: Stakčín – Ruské can be seen in the land cover maps (Fig. 6) and graph presenting the share of changes in land cover classes in studied years (Fig. 7).

Most of the changes in the transect Poloniny: Stakčín – Ruské in the period 1950–1990 relate mainly to afforestation of agricultural land – changes from Transitional woodland-shrub (324) to Broad-leaved forest (311), Pastures (231) to Transitional woodland-shrub (324), Pastures (231) to Broad-leaved forest (311), Land principally occupied by agriculture, with significant areas of natural vegetation (243) to Broad-leaved forest (311), Land under predominantly agricultural use, with significant areas of natural vegetation (243) to Transitional woodland-shrub (324), Complex cultivation patterns (242) to Transitional woodland-shrub (324). Complex cultivation patterns (242) were mainly turned into Pastures (231), and less so into Non-irrigated arable land (211). This was mainly due to the construction of the Starina water reservoir as a drinking water reservoir in the 1980s and the subsequent abandonment of the surrounding area (its basin). The land cover maps show the abandoned villages (with the buildings removed) and the subsequent processes of succession in the abandoned landscape.

Afforestation, due to succession, is also a dominant process in the next period of 1990–2020 – a change from Transitional woodland-shrub (324) and Pastures (231) to Broad-leaved forest (311), and a change from Pastures (231) to Transitional woodland-shrub (324).

By analyzing the results of the ecological stability of the land cover in the studied areas using CES and CAI (Table 3), we have found that it is possible to notice a slightly increase in the level of anthropogenic influence (CAI) on the landscape in the Záhorie: Rudava – Buková transect. As for the Turiec: Martin – Moškovec transect, we recorded an increase in the level of anthropogenic influence (CAI) on the landscape in 1990, but after that year, there is a decrease in the level of anthropogenic influence (CAI) on the landscape. In case of the Poloniny: Stakčín – Ruské

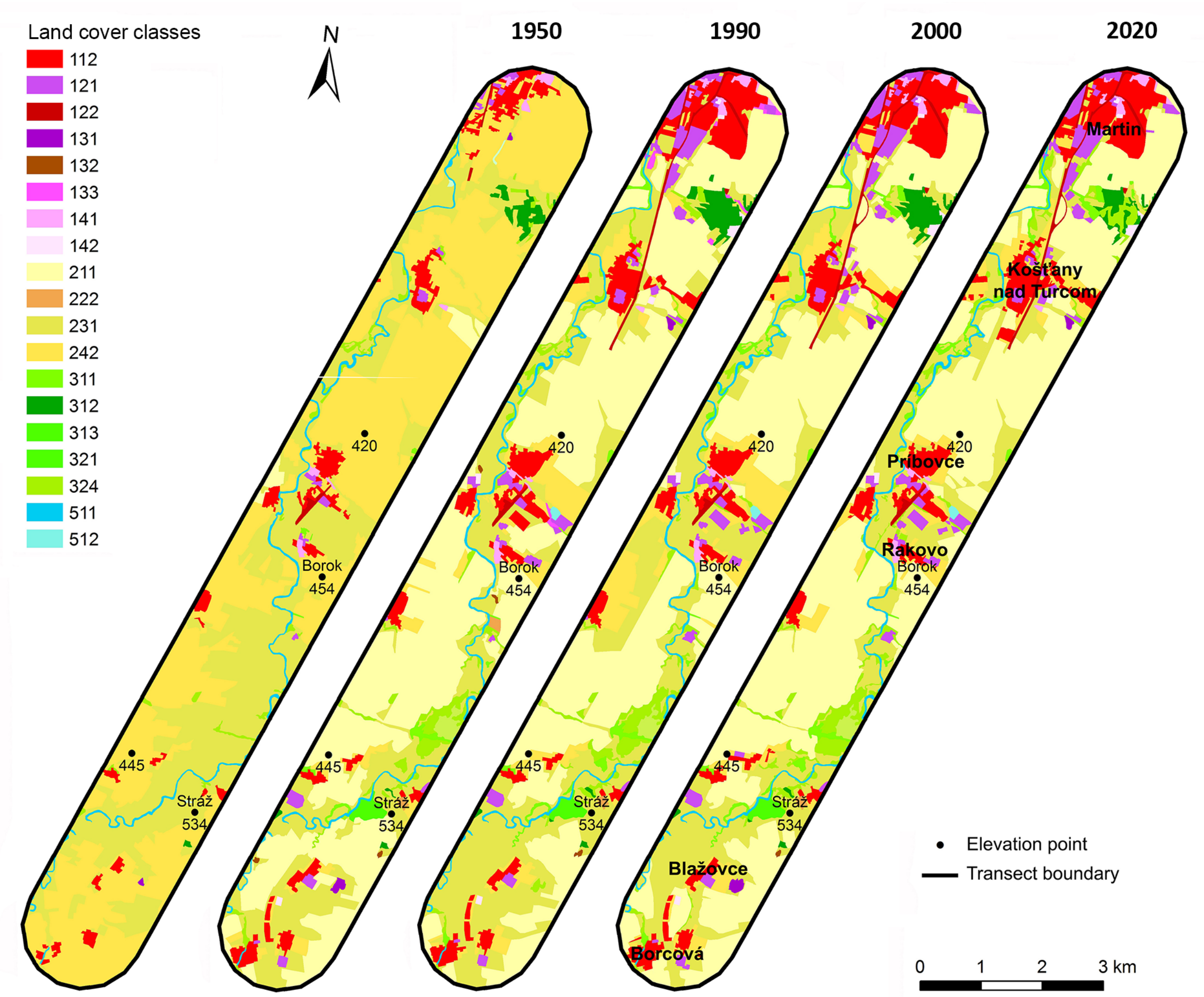

Fig. 4. Spatial distribution of land cover classes in the Turiec: Martin – Moškovec. Source: TOPÚ Banská Bystrica; GKÚ Bratislava, NLC

transect, we can see an increase in the level of anthropogenic influence (CAI) on the landscape in 1990, but since 2000 there is a decrease or stagnation towards the year 2020. The lowest CAI value (0.01) can be observed in 1950 in the Záhorie: Rudava – Buková transect. On the contrary, the highest CAI value can be observed in 1990 in Turiec: Martin – Moškovec transect (0.46). However, in none of the studied years and transects did the CAI value exceed the value of 1 or was equal to 1, which can be interpreted in the way that the transects are dominated by areas with a lower intensity of changes in the landscape due to human activity.

The degree of the coefficient of ecological stability according to Löw (1987) is the highest in the Poloniny: Stakčín – Ruské transect, ranging from 2.68 in 1950 to 15.72 in 1990 (Table 3). Even though this transect has the highest values of CES, they recorded a slight decrease after 1990. Nevertheless, the landscape in this transect has high ecological stability. In the Záhorie: Rudava – Buková transect, we can see a slight increase of the CES value after 1990. All in all, the landscape in this transect can be also described as having high ecological stability in all studied years. Only the Turiec: Martin – Moškovec transect recorded lower values of CES during the whole studied period

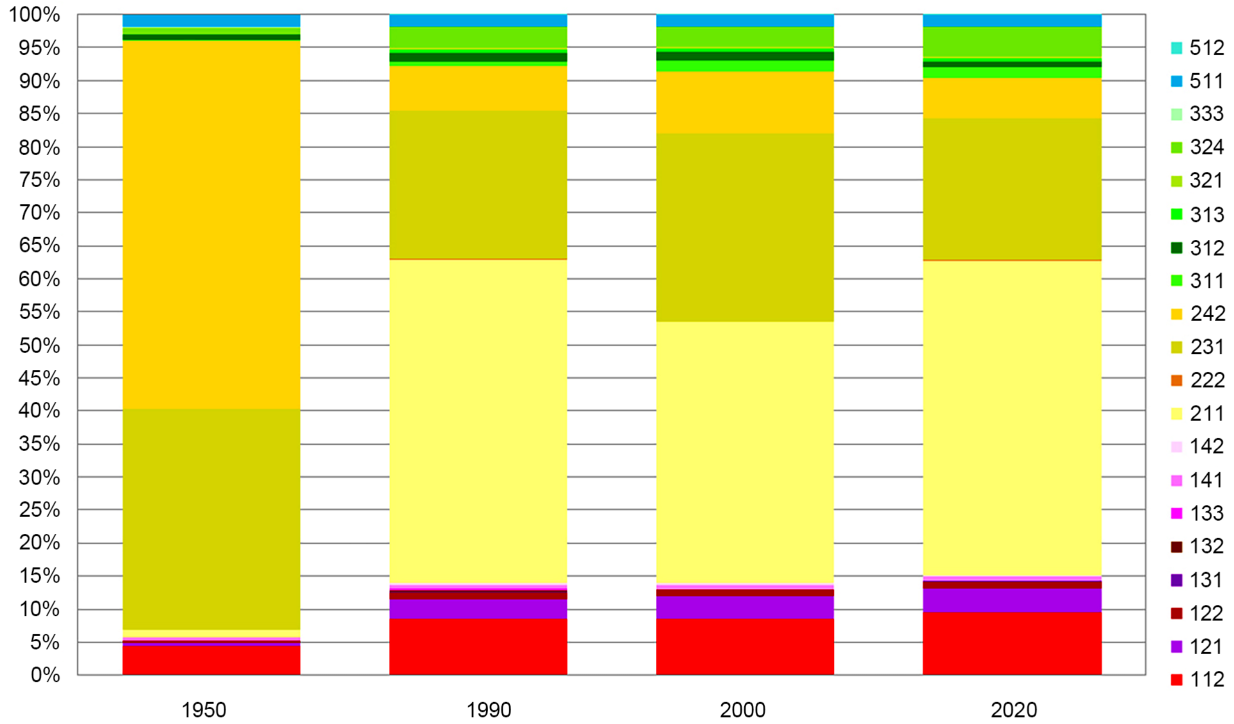

Fig. 5. Share of land cover classes in the Turiec: Martin – Moškovec. Source: own elaboration

Table 3. Results of the CES and CAI in the studied transects. Source: own elaboration

	Transect: Záhorie: Rudava – Buková			
	1950	**1990**	**2000**	**2020**
CAI	0.01	0.05	0.05	0.05
CES	1.62	1.24	1.24	1.26
	Transect: Turiec: Martin – Moškovec			
	1950	**1990**	**2000**	**2020**
CAI	0.15	0.46	0.38	0.27
CES	0.60	0.43	0.59	0.45
	Transect: Poloniny: Stakčín – Ruské			
	1950	**1990**	**2000**	**2020**
CAI	0.02	0.03	0.02	0.02
CES	2.68	15.72	14.15	13.69

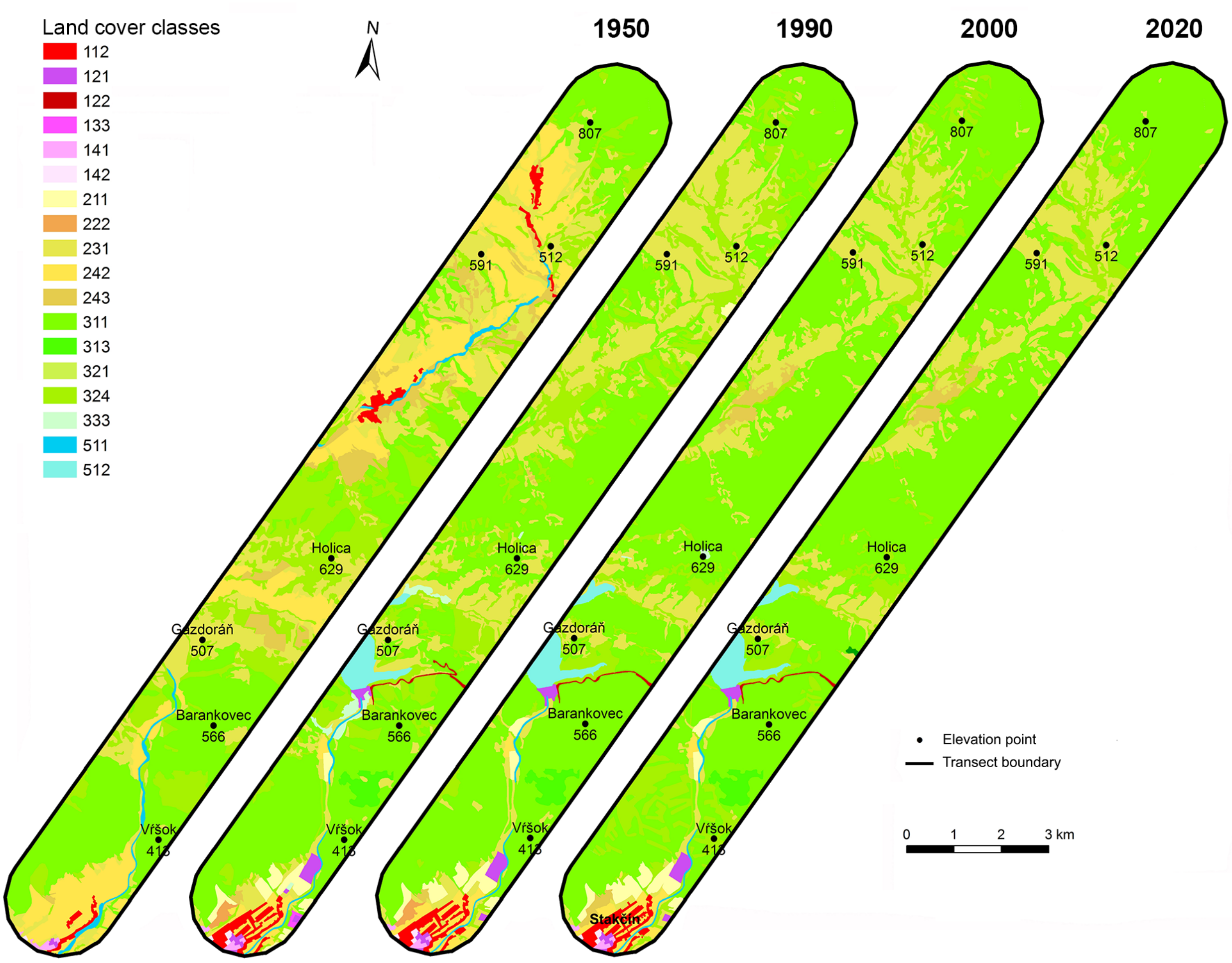

Fig. 6. Spatial distribution of land cover classes in the Poloniny: Stakčín – Ruské. Source: TOPÚ Banská Bystrica; GKÚ Bratislava, NLC

transect. As a result, we can classify this transect as having low ecological stability.

If we comparie the results of CES and CAI, we see a similar result in the case of the Záhorie: Rudava – Buková transect and the Poloniny: Stakčín – Ruské transect. For the Poloniny: Stakčín – Ruské transect, the CES values are significantly higher than 1.21, which is a landscape with high ecological stability, and the CAI values are close to 0, which also represents a landscape with a minimal intensity of changes due to human activity. In the case of the Záhorie: Rudava – Buková transect, it is similar, but the CES values do not reach such high values as in the case of the Poloniny: Stakčín – Ruské transect, which is mainly influenced by the fact that the Poloniny: Stakčín – Ruské transect passes through a protected area of the Poloniny National Park. In the case of the Turiec: Martin – Moškovec transect, there is no correspondence between the CAI and CES values, as the CAI values are less than 1 (the highest value is 0.46), which represents a landscape with minimal intensity of changes due to human activity. However, the results of CES are values lower than 0.8, which represents a landscape with low ecological stability.

DISCUSION AND CONCLUSION

Various coefficients can be used to calculate the ecological stability, including different LULC classes in their formulas. For example, the CES by Míchal

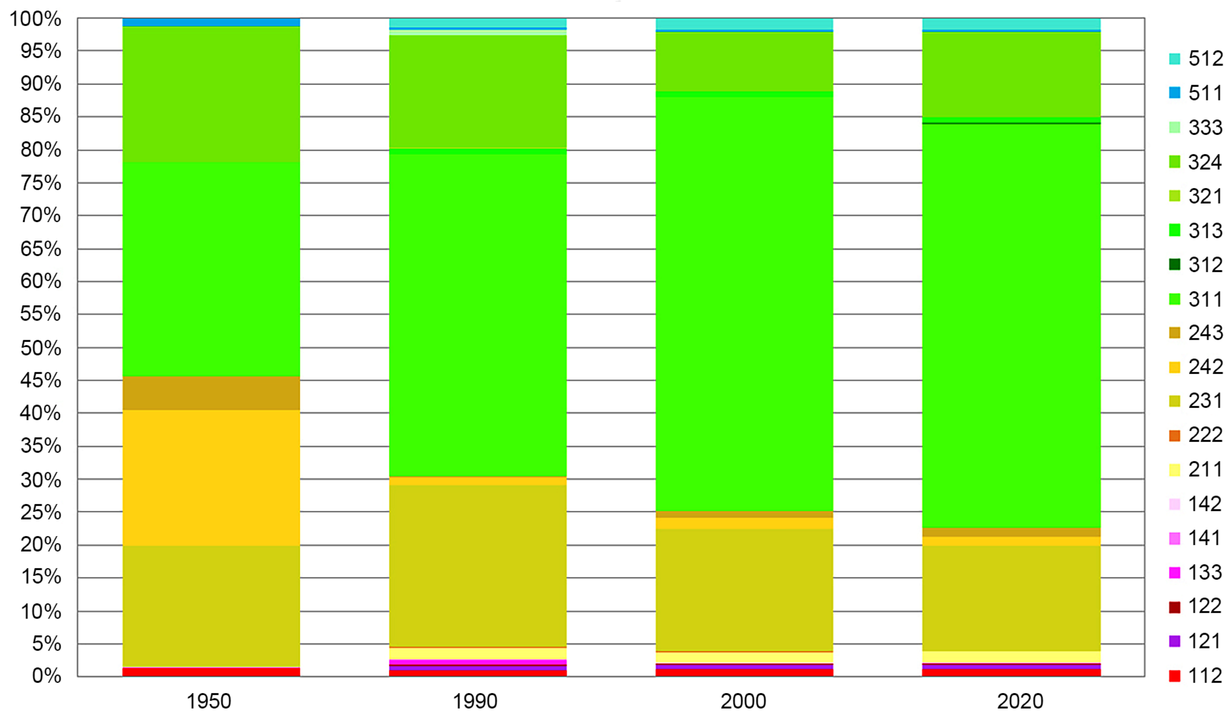

Fig. 7. Share of land cover classes in the Poloniny: Stakčín – Ruské. Source: own elaboration

(1985) does not include all LULC classes in its formula and thus does not take into account the historically different ecological quality and structure of areas within the same LULC class (Lipský, 2000).

The CES by Míklós (1986) appears to be more accurate than the CES by Míchal (1985), but its disadvantages are: the general inclusion of areas in the formula (e.g. logging sites cannot be included in forest land). According to Kopp (2004), the ecological stability of the landscape is determined not only by the quality of its ecosystems, but also by their functional arrangement. Furthermore, the CES by Míchal (1985) and the CES by Míklós (1986) were originally designed for agricultural landscapes while our case studies include also mountain landscapes. Therefore, the CES by Löw (1987) proved to be the most suitable for us because it includes in its formula all land cover classes and types of landscape and classifies them according to the degree of ecological stability (Vojteková and Vojtek, 2016).

The aforementioned formulas for calculating the CES were also used in other works, such as Buček and Míchal (1990), Žigrai (2001), Reháčková and Pauditšová (2007), Malenová (2008), Hruška and Petrovič (2018), and others. On the other hand, Streďanský and Šimonides (1995) used their own CES, which was also used by Petrovič (2005). Most of these studies used CES in agricultural land, thus confirming the significance of these coefficients. Furthermore, CES was also used in the mountain landscape, such as Boltižiar (2007).

Our results show that in the case of the Turiec: Martin – Moškovec transect, there is no correspondence between the CAI and the CES results. However, it should be noted that CES does not take into account many important aspects: different internal quality of areas, their individual size, interconnectedness and mutual connection, i.e. important characteristics of LULC. Chromčák et al. (2021) claim in their paper that the correct interpretation of CES results depends not only on the precise definition of the LULC patches, but also on the correct formula used to calculate the coefficient. As a result, calculations according to different formulas may point to the inconsistency of interpretations of the CES. In addition, Lipský (2000) states that when assessing the ecological stability of the landscape using various CES, it is also important to take into account the map scale or resolution of the data and the nature of the study area in which the research is carried out.

For a long time, the determination of CES was considered to be an academic problem that did not have a serious practical implications. Currently, however, CES represents a key element in the design of measures within the framework of the proposals for local territorial systems of ecological stability processed for land development projects. Thus, the calculation of CES has moved to a practical level, which created the need to develop a methodological tool that will allow CES to be determined in such a way that the accuracy and objectivity of the assessment of LULC is maintained to the highest degree, even at small or large spatial scales. The essence of applying a unified method for calculating the CES in practice is also to ensure data and spatial compatibility. On the basis of a methodically uniformly determined ecological stability of the landscape, there will be a natural possibility of territory comparison (Reháčková and Pauditšová, 2007; Leitmanová et al., 2015).

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MAPOWANIE I OCENA ZMIAN POKRYCIA TERENU I STABILNOŚCI EKOLOGICZNEJ: PRZYPADEK TRZECH TRANSEKTÓW NA SŁOWACJI

ABSTRAKT

Cel pracy

Celem niniejszego opracowania jest analiza i ocena zmiany pokrycia terenu w trzech transektach na Słowacji przez zastosowanie współczynnika stabilności ekologicznej oraz współczynnika wpływu antropogenicznego w czterech horyzontach czasowych (1950, 1990, 2000 i 2020).

Materiał i metody

Stworzono kilka narzędzi metodologicznych, aby wyrazić poziom stabilności ekologicznej określonego terytorium. W naszym badaniu wykorzystaliśmy współczynnik stabilności ekologicznej (CES). Intensywność zmian w krajobrazie w wyniku działalności człowieka opisano również za pomocą współczynnika wpływu antropogenicznego (CAI).

Wyniki i wnioski

Wyniki CES i CAI wskazują na podobną sytuację w przypadku transektu Záhorie: Rudava – Buková i Połoniny: Stakčín – Ruské. Dla transektu Połoniny: Stakčín – Ruské wartości CES są znacznie wyższe niż 1,21, co świadczy o tym, że jest krajobrazem o dużej stabilności ekologicznej, a wartości CAI są bliskie 0, czyli również reprezentują krajobraz o minimalnej intensywności zmian z powodu działalności człowieka. W przypadku transektu Záhorie: Rudava – Buková jest podobnie, ale współczynnik CES nie osiąga tak wysokich wartości jak w przypadku transektu Połoniny: Stakčín – Ruské, na co głównie wpływa fakt, że transekt Połoniny: Stakčín – Ruské przechodzi przez obszar chroniony Parku Narodowego Połoniny. W przypadku transektu Turiec: Martin – Moškovec nie ma zgodności między wartościami CAI i CES, gdyż w przypadku CAI są one niższe od 1 (najwyższa wartość to 0,46), co świadczy o tym, że jest to krajobraz o minimalnej intensywności zmian z powodu działalności człowieka. Jednak współczynnik CES przyjmował wartości niższe niż 0,8, czyli że reprezentuje krajobraz o niskiej stabilności ekologicznej.

Słowa kluczowe: pokrycie terenu, Słowacja, transekty, współczynnik stabilności ekologicznej, współczynnik wpływu antropogenicznego na krajobraz