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Contents

ADOLESCENTS' SMARTPHONE USAGE IN ACTIVE RECREATION AND NATURAL ENVIRONMENT

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Abstract
In today's society, smartphone usage in active recreation (natural environment) is somewhat controversial because some believe that smartphones promote an access to resources; however, some believe that smartphones distract attention from environment; therefore, the present study aims at determining adolescents' smartphone usage in active recreation and natural environment. An instrument of survey (non-standardized) was carried out six months (January – June, 2022) through an intentional sampling of survey group size of 2108 (100%) adolescent boys and girls: (i) Urban adolescent boys and girls (42.50%, n = 896); (ii) Rural adolescent boys and girls (57.50%, n = 1212), aged 18.50 ± .40 years. Statistics (e.g., descriptive, inferential) was used to analyze and compare the data. When considering the adolescents' smartphone usage, on average, 45.00% (n = 949) of survey group spent 1 – 3 hours of using smartphones and about 38.32% (n = 808) of survey group spent time using smartphones in active recreation (natural environment). About 4.80% (n = 102) of survey group spent time using specific, recreation apps (e.g., Geocaching, GeoCaches). Increasing the physical activity is necessary; therefore, smartphone usage (recreation apps) may increase time spent in active recreation and influence physical activity levels of adolescents.

Key words: Adolescence, Nature, Physical Activity, Recreation, Smartphones.

Introduction

Active recreation includes active play (e.g., walking, hiking) undertaken outside, before, during, and after school (Arundel et al., 2022). Being outside (outdoors) and participating in active recreation provides an opportunity for learning about natural environments. Combination of active play and being outside is providing various benefits; in particular, health, social connections, interaction with nature and/ or cultural heritage. Being outside may improve mood and subjective well-being (Winter et al., 2020). Active recreation may overlap with competitive play (activity); in particular, orienteering, ski race and/ or combine with environmental education – educational trails (Juško et al., 2021).
Using smartphones (recreation apps) in facilitating active recreation is common among adolescent boys and girls and is somewhat controversial (Bolliger et al., 2020) because some believe that smartphones promote access to resources – educational apps (e.g., Treasure-Hit, Mobilogue) (Michalakis et al., 2020), and some believe that smartphones increase inattention because of false sense of security and discharge the development of outdoor navigations through much of relying on devices (Dickson, 2004). Many of us are using smartphones (apps) in active recreation (e.g., map, compass); therefore, recreation apps may serve in significant ways in outdoor adventures.
Because many gaps (information) remain in literature in terms of Slovak scale, the present study aims at determining adolescents' smartphone usage in active recreation and natural environment.

Material and methods

In terms of study aim (see Introduction), the target population consisted of 2108 (n) (100%) adolescent boys and girls; (i) Urban adolescent boys and girls (42.50 %, n = 896); (ii) Rural adolescent boys and girls (57.50%, n = 1212), aged 18.50 ± .40 years) and attending the secondary schools. Adolescent boys and girls (n = 2108) consisted of convenience sample (population density – urban vs. rural), recruited through the communication services (Internet) (e.g., Instagram, Meta – Facebook) (Darko et al., 2022). Self-report measure (survey) was carried out six months (January – June, 2022), aiming for intentional sampling, regarding age and place of residence (urban vs. rural). Data interpretation process (authentic) consisted of 2220 (100%) adolescent boys and girls; however, 5.05% (n = 112) were excluded (Table 1). Reasons for not meeting the inclusion criteria were as follows: (i) Not sick (ill); (ii) Owning the smartphone(s); (iii) Place of residence – area of ≥ 15000 – urban vs. ≤ 5000 – rural).

The present study was carried out in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments and/ or comparable ethical standards. All subjects provided written informed consent.

Tab. 1: Characteristics of survey group (2108 (n), 100%)

Place of residence	Adolescent boys	Adolescent girls	Boys + Girls
Urban (≥ 15000)	490 (54.68%)	406 (45.32%)	896 (42.50%)
Rural (≤ 5000)	546 (45.05%)	666 (54.95%)	1212 (57.50%)
Urban + rural	1036 (49.14%)	1072 (50.86%)	2108 (100%)

Self-report measure (comparative study) was carried out six months (January – June, 2022), in order to determine (analyze, compare) adolescents' smartphone
smartphone usage in active recreation and natural environment. Developing the instrument of survey (non-standardized) made it easier to analyze and compare the data, consisting of two sections: (i) Demographic information (e.g., place of residence, gender, age); (ii) Survey items, consisting of five questions (closed – 4 – 5 survey answers) (see Results). Instrument of survey was available online, collecting the data (January – June, 2022). Incentives were not given (voluntary participation); however, adolescent boys and girls (100%, n = 2108) received feedback about their personal results afterwards (Microsoft Forms, Office 365, Microsoft Corp., Redmond, WA, USA) (Andrade, 2020).
Available survey data, collected through the instrument of survey, was tabulated (Table 1) and figured (Figure 1 – 4) (see Results) in database design. Incidence of responses (each item; 1 – 5) of adolescent boys and girls (100%, n = 2108) was evaluated (e.g., analyze, compare) by using the Tap3 – Gamo (statistical software) (Banská Bystrica, Slovakia). After cleaning the data (adolescent boys and girls; 100%, n = 2108), descriptive statistics (e.g., measures of frequency, measures of central tendency) were used to analyze and compare the data. Chi -square test (χ^2) (inferential statistics) of which the significance level (α) was .01 and .05, evaluated the differences between 2108 (100%) adolescent boys and girls: (i) Urban adolescent boys and girls (42.50%, n = 896);(ii) Rural adolescent boys and girls (57.50%, n = 1212) (Turhan, 2020).

Results

In terms of study aim (see Introduction), Fig. 1 illustrates smartphone usage of adolescent boys and girls (100%, n = 2108). When considering the smartphone usage of adolescent boys and girls (100%, n = 2108) (i.e., "survey group"), 45% of survey group spent 1 – 3 hours of using smartphones; in particular, 41.28% (n = 370) of urban and 48.72% (n = 590) of rural survey group. 1.69% (n = 36) of survey group spent 0 hour(s) of using smartphones, compared to 11.28% (n = 238) of survey group who spent ≥ 5 hours of using smartphones. Out of 2108 (100%) adolescent boys and girls, 28.68% (n = 604) of survey group spent 3 – 5 hours of using smartphones, compared to 13.38% (n = 282) of survey group who spent ≤ 1 hour of using smartphones. Difference between 2108 adolescent boys and girls (100%) (urban vs. rural) was significant (statistically; $p < .01$) ($p = 1.18$ E-06; $\chi^2_{(3)} = 33.02$).

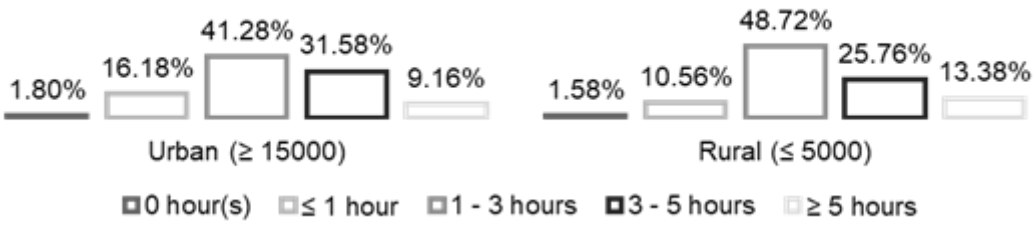

Fig. 1: Smartphone usage of adolescent boys and girls

Fig. 2 illustrates the smartphone activity of adolescent boys and girls (100%, n = 2108). When considering the smartphone activity of survey group, 64.12% (n = 1352) of survey group spent time on social networking service (e.g., Instagram, Meta – Facebook), compared to 2.80% (n = 58) of survey group who spent time in active recreation (natural environment). 540 adolescent boys and girls (25.62 %) out of 2108 (100%) spent time in artistic activity (e.g., listening to music and podcasts, recording videos), compared to 7.48% (n = 158) of survey group who spent time gaming smartphones. Difference between 2108 adolescent boys and girls (100%) (urban vs. rural) was significant (statistically; $p < .01$) ($p = .002$; $\chi^2_{(3)} = 33.02$).

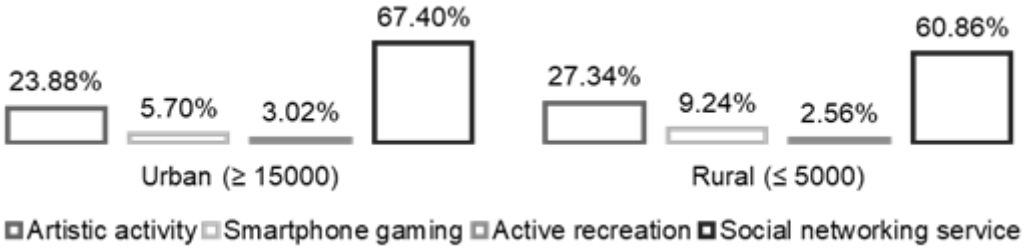

Fig. 2: Smartphone activity of adolescent boys and girls

Smartphone usage in active recreation of adolescent boys and girls (100%, n = 2108) illustrates Fig. 3. Out of 2108 (100%) adolescent boys and girls, 38.32% (n = 808) of survey group spent time using smartphones in active recreation; in particular, natural environment, compared to 14.02% (n = 296) of survey group who spent time using smartphones in sports environment. 395 adolescent boys and girls (18.75%) out of 2108 (100%) spent time using smartphones in both of environments, compared to 28.92% (n = 610) of survey group who spent time in different environments ("None"). Difference between 2108 adolescent boys and girls (100%) (urban vs. rural) was significant (statistically; $p < .01$) ($p = 8.08$ E-16; $\chi^2_{(3)} = 72.38$).

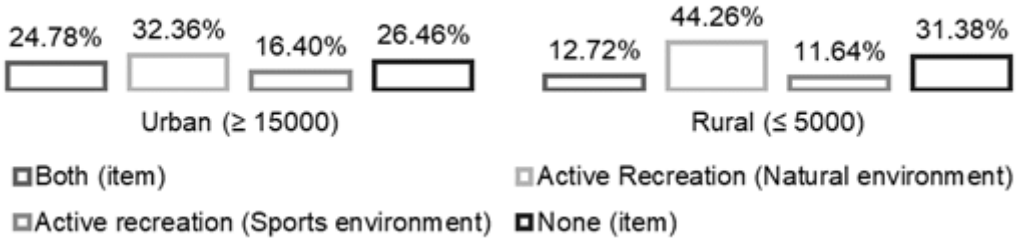

Fig. 3: Smartphone usage in active recreation of adolescent boys and girls

Smartphone usage of recreation apps of adolescent boys and girls (100%, n = 2108) illustrates Fig. 4. Out of 2108 (100%) adolescent boys and girls, 4.80% (n = 102) of survey group spent time using recreation apps (e.g., Geocaching, Geo Caches), compared to 23.65% (n = 498) of survey group who knew how to use recreation apps. 36.92% (n = 778) of survey group was not aware of recreation apps. 34.62% (n = 730) of survey group was aware of; however, was not using recreation apps (personal decision). Difference between 2108 adolescent boys and girls (100%) (urban vs. rural) was significant (statistically; $p < .01$) ($p = 5.45$ E-15; $\chi^2_{(3)} = 68.50$).

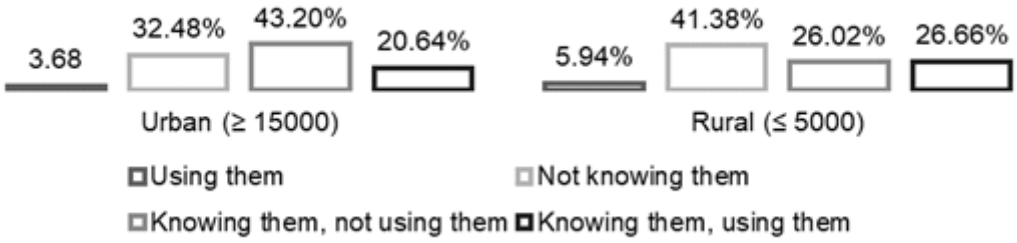

Fig. 4: Smartphone usage of recreation apps of adolescent boys and girls

Discussion

Research reviewing the smartphone usage (apps) for nature conservation and/ or active recreation provides influences (negative and positive) on adolescents' experience of nature, i.e., may create the spectacle out of nature; however, may harm the relationship with nature through the loss of practical quality (Adams, 2019). Consequences of adolescents' smartphone usage in active recreation is depending on category and/ or level of device use. 4.80% (n = 102) of survey group spent time using recreation apps (e.g., Geocaching, GeoCaches), which combines technology (smartphone apps) with outdoor adventure and explores locations near and far (Ihamaki, 2012). Most of literature; however, emphasizes the theory (discussion) of impact of smartphone usage, rather than experiences of being outside (outdoors) and participating in active recreation with device use (Arts et al., 2021). Technology

(e.g., traditional, new), whether maps, compass, trails (Juško et al., 2021), and/ or Geocaching (Schneider, Jadczaková, 2016) is crucial in shaping adolescents' active recreation in natural environments (Arts et a., 2021); therefore, in order to better understand the dynamics between nature and adolescents' smartphone usage, more research is necessary to understand the consequences of smartphone usage in active recreation and to ensure that current generation continues to receive variety of benefits from active recreation in natural environments.

Conclusion

Digital technology (e.g., smartphones, recreation apps) plays an important role in active recreation and adventure in natural environment; however, may hinder active recreation (outdoor). Recognizing the ways, smartphones (apps) change active recreation experiences, encourages the world, where everyone (user of smartphone) may profit from nature and digital technology. Smartphones (apps) have features (capability) that may enhance nature and active recreation, rather than degrade. Smartphones (apps) are an adequate education tool in improving the quality of life (well-being), in inspiring to explore the nature (outdoors) and in promoting the active recreation of adolescent boys and girls (100%, n = 2108). Recreation apps may serve in significant ways to help adolescent boys and girls to connect with natural environment in lasting ways.

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Conflict of interest

The author(s) have no conflicts of interest to declare. The author(s) declare that the research was conducted in the absence of any commercial and/ or financial relationships that could be construed as a potential conflict of interest.

Souhrn

V dnešní společnosti je používání chytrých telefonů při aktivním odpočinku (v přírodním prostředí) poněkud kontroverzní, protože někteří se domnívají, že chytré telefony podporují přístup ke zdrojům; někteří se však domnívají, že chytré telefony odvádějí pozornost od životního prostředí; proto je cílem této studie zjistit, jak dospívající používají chytré telefony při aktivním odpočinku a v přírodním prostředí. Nástroj průzkumu (nestandardizovaný) byl prováděn šest měsíců (leden - červen 2022)

prostřednictvím záměrného výběru vzorku velikosti průzkumné skupiny 2108 (100 %) dospívajících chlapců a dívek: (i) městští dospívající chlapci a dívky (42,50 %, n = 896); (ii) venkovští dospívající chlapci a dívky (57,50 %, n = 1212), ve věku 18,50 ± ,40 let. K analýze a porovnání dat byla použita statistika (např. deskriptivní, inferenční). Pokud jde o používání chytrých telefonů adolescenty, v průměru 45,00 % (n = 949) dotazované skupiny trávilo 1 - 3 hodiny používáním chytrých telefonů a přibližně 38,32 % (n = 808) dotazované skupiny trávilo čas používáním chytrých telefonů při aktivním odpočinku (v přírodním prostředí). Přibližně 4,80 % (n = 102) dotazované skupiny trávilo čas používáním specifických, rekreačních aplikací (např. Geocaching, GeoCaches). Zvýšení pohybové aktivity je nezbytné, proto používání chytrých telefonů (rekreačních aplikací) může zvýšit čas strávený aktivním odpočinkem a ovlivnit úroveň pohybové aktivity dospívajících.

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ASSESSMENT OF EXTREME LONG-TERM METEOROLOGICAL DROUGHT IN THE NORTHERN PART OF SERBIA

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Abstract

The need to quantify and assess the extreme precipitation deficit is increasing due to climate changing. Long-term precipitation deficits result in the spread of drought to other spheres: hydrosphere and lithosphere, and this leads to negative effects on biodiversity (fauna and flora) as well as human activities such as reduction of electricity production, prevention or elimination of recreational and tourism activities. This paper deals with the assessment of long-term meteorological drought in 5 synoptic stations in the northern part of Serbia. Standardized Precipitation Index was computed in 12-month time scales for identification of extreme meteorological drought for a reference period from 1946 to 2021. The main characteristics of the meteorological drought and relative drought frequency are calculated. The most serious extreme long-term meteorological drought was recorded mainly in 1948 and 2001. The average return period of extreme meteorological drought in the studied area is 11.8 years, but it is specific for each station separately.

Key words: Frequency analysis, Standardized Precipitation Index, extreme episode, meteorological drought, Serbia.

Introduction

Meteorological drought is a recurrent extreme climate event, that begins when deficiency of precipitation occurs over season or over a longer period. The most serious droughts are long-term meteorological drought, which case the occurrence of other types, e.g. agricultural, hydrological or socio-economical drought (Mishra and Singh, 2010). Drought indices are most often used to quantify meteorological drought. Some of mostly used drought indices are: Deciles, Rainfall Anomaly Index, Palmer Z index, Palmer Drought Severity Index, Standardized Precipitation Evapotranspiration Index (WMO and GWP, 2016).

One of the most applied drought indices is Standardized Precipitation Index (SPI). The SPI is a useful index for monitoring dynamics of precipitation and defining the lack of precipitation and its quantitative specification, which is universal for different territories in time and space (McKee et al., 1993; Blain, 2012). The SPI index has attained popularity in the analysis of meteorological drought, despite its weaknesses, which are nicely described by Sienz et al. (2012) and Blain (2012). The SPI is used worldwide to analyze meteorological drought or other physical types of drought.

In this study, the SPI in 12–month time scale is used to identify extreme precipitation deficit, as well as to assess the vulnerability of the northern part of Serbia to this phenomenon. The index is calculated by DrinC software during the years (1946 – 2021) at 5 synoptic stations.

Materials and methods

The case study considers 5 synoptic stations in the northern part of Serbia (Fig. 1), located on the territory of the Balkan Penisula. Values of monthly precipitation are provided by Republic Serbia Hydrometeorological Institute of Serbia for the reference period (1946-2021).

DrinC software (Tigkas et al., 2015) is applied to obtain SPI for 12-month time scale (SPI-12). DrinC software is created with the goal of offering a simple interface for calculating drought indices. The SPI is suitable for diagnosing, defining and monitoring meteorological drought. The risk of meteorological drought can be classified according to the SPI into seven classes. Each of the class has its own probability of occurrence that is shown in Table 1.

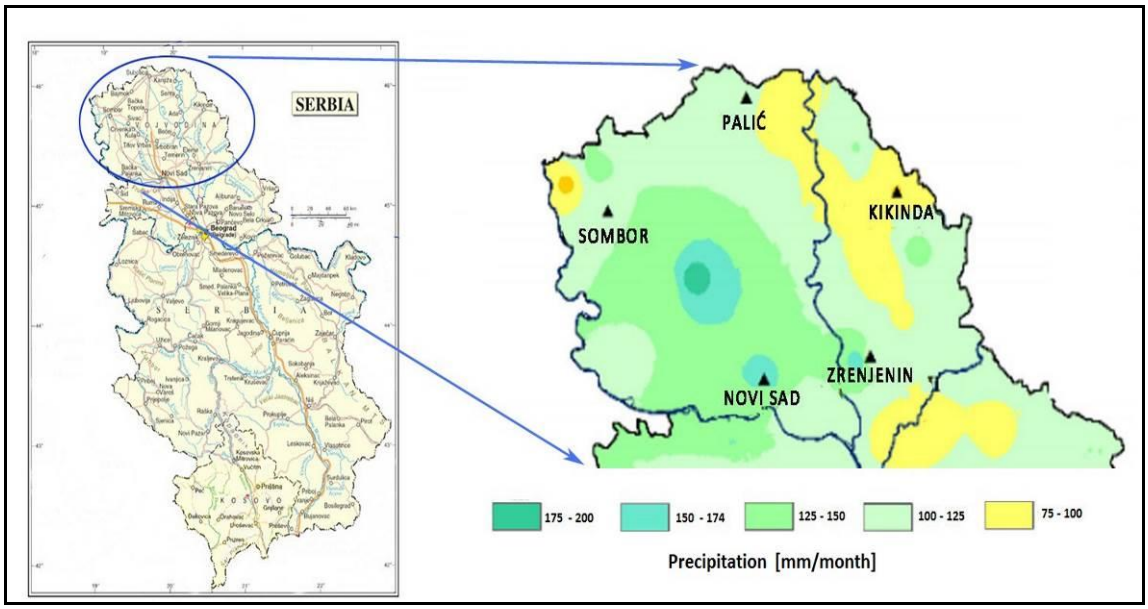


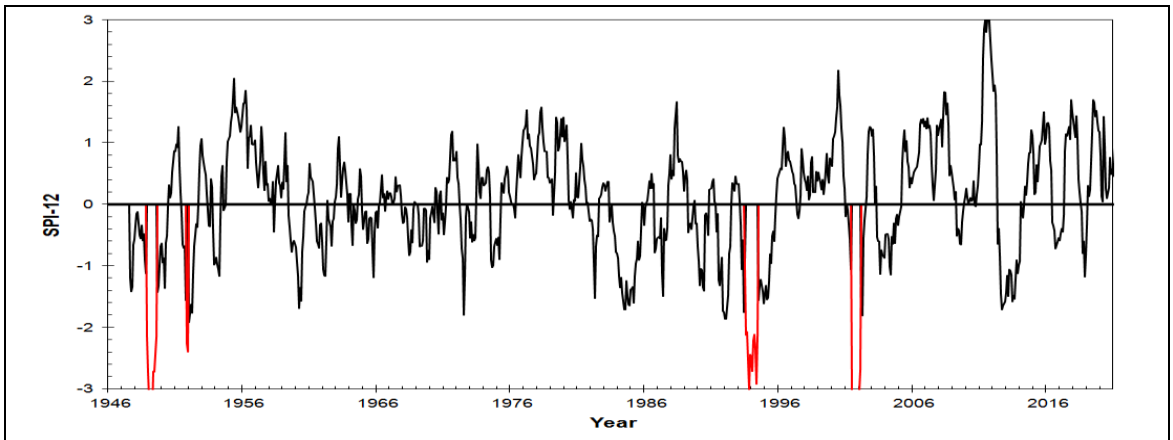
Fig. 1: Location map of the 5 synoptic stations in the northern part of Serbia

Tab. 1: Classes of meteorological drought (Sienz et al., 2012; Blain, 2012).

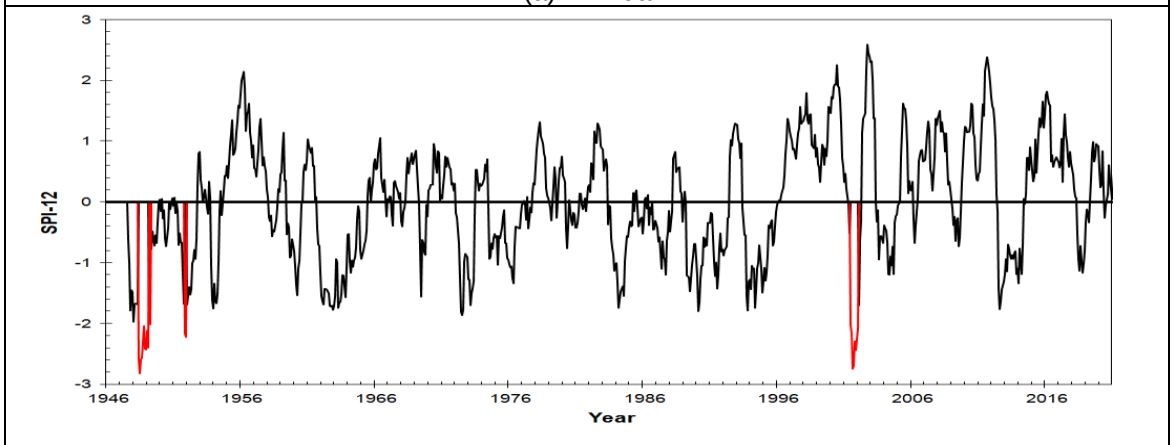
SPI intervals	SPI classes	Probability events
≥ 2	Extreme humidity	2.3%
1.5 to 1.99	High humidity	4.4%
1.0 to 1.49	Mild humidity	9.2%
0.99 to -0.99	Almost normal humidity	68.2%
-1.0 to -1.49	Moderate drought	9.2%
-1.5 to -1.99	Severe drought	4.4%
≤ -2	Extreme drought	2.3%

Results and discussion

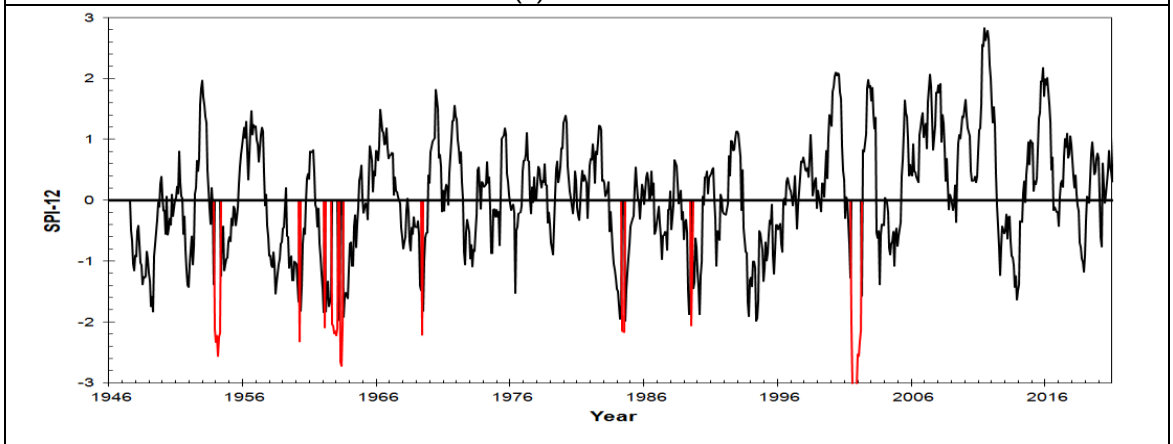
The results of the SPI for drought analysis is presented and evaluated. The results of SPI-12 for five selected stations are shown in Figures 2a to e. The figure presents the results of hydrological year starting from October to September for the period of interest 1946 to 2021. In SPI-12 histograms, extreme meteorological events are identified in red when the SPI value less than (-2). The results of SPI were used to identify duration, severity, intensity and average inter-arrival time for meteorological drought. The results at selected 5 stations are presented in Table 2 for extreme meteorological drought. The total extreme drought events recorded at 5 stations are 34, recorded mainly in 1948 and 2001, with total duration 139 months, cumulative severity of -345.8 and intensity -78.7.



(a) Kikinda



(b) Novi Sad



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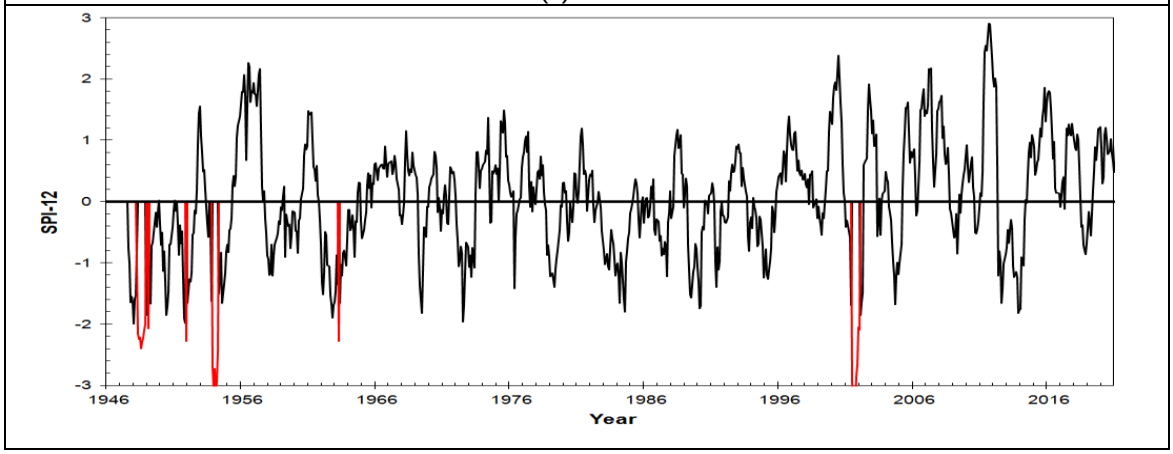
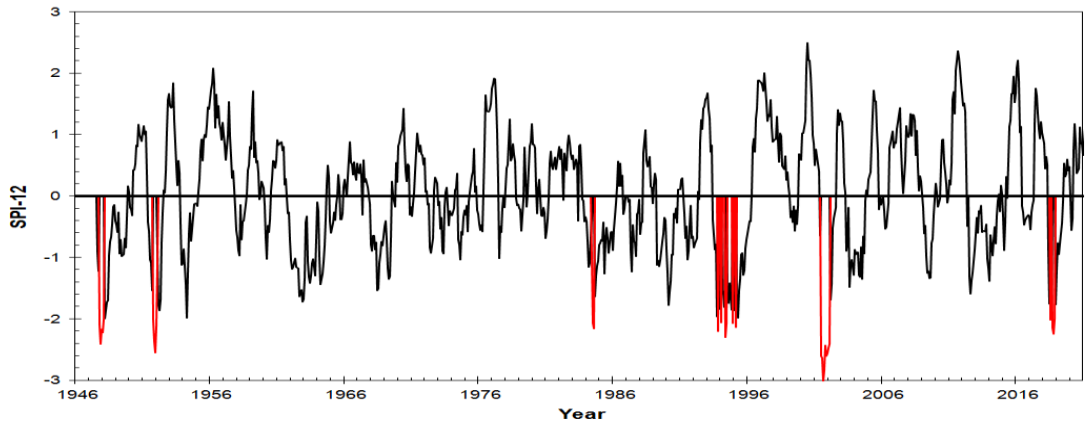


(d) Sombor



(e) Zrenjanin

Fig. 2: SPI-12 for the selected 5 stations in the northern part of Serbia for the period 1946-2021

Tab. 2: Extreme episodes of meteorological drought identified by SPI-12 for 5 selected stations

Station	Number of events	Duration	Cumulative severity	Cumulative intensity	Average Inter-arrival time	Years
Sombor	6	25	-63.5	-14.4	10.6	1948,1949 1952,1953 1954,1963 2001,2002
Kikinda	4	32	-89.4	-10.9	17.5	1948,1949 1951,1952 1993,1994 2001,2002
Novi Sad	4	21	-49.4	-8.9	17.7	1948,1949 1951,1952 2001,2002
Palic	9	31	-74.4	-20.5	5.9	1953,1954 1960,1962 1963,1969 1984,1989 2001,2002
Zrenjanin	11	30	-69.1	-24.0	7.1	1947,1948 1951,1952 1984,1993 1994,1995 2001,2002 2018

From Table 2, it is possible to see how the extreme meteorological drought often occurred during the years 1946-2021. An extreme precipitation deficit can be expected on average from 5.9 to 17.7 years. The driest years were mainly in 1948 and 2001.

The most frequent occurrence of extreme meteorological drought was recorded at the Kikinda station, and a slight occurrence of extreme dry episodes was recorded at the station Novi Sad. Table 3 summarizes the relative drought frequency for a 75-year time period and for each observed station.

Tab. 3: Relative drought frequency - RDF

Station	RDF
Kikinda	42.7%
Novi Sad	28%

Palic	41%
Sombor	33.3%
Zrenjanin	40%

Conclusion

Extreme meteorological drought is rarely occurring phenomenon whose rarity is changing to regularity as a result of climate changing. Understanding its manifestations in environment leads to proper drought risk management, which ensures mitigate negative impacts on fauna, fluora and human, as well as human activities for this purpose. The SPI-12 was utilized to asses the extreme historical meteorological drought episodes during the years from 1946 to 2021 in the northern part of Serbia. The most sensitive area to extreme meteorological drought is the Kikinda station, where this event is expected to occur more frequently. The two years 1948 and 2001 saw the most extreme long-term meteorological droughts ever documented. In the studied region, the average return period for extreme meteorological drought is 11.8 years, but it varies for each station individually. The results of the SPI analysis can serve as a basis of the proposal of operational measures in the given territory to minimize or eliminating the averse effects of risk of drought.

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Acknowledgement

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Souhrn

Potřeba kvantifikovat a vyhodnocovat extrémní srážkový deficit se v důsledku změny klimatu zvyšuje. Dlouhodobý deficit srážek vede k rozšíření sucha do dalších sfér: hydrosféry a litosféry, a to má negativní dopady na biologickou rozmanitost (faunu a flóru) i lidské aktivity, jako je snížení výroby elektřiny, zamezení nebo vyloučení rekreačních a turistických aktivit. Tento článek se zabývá hodnocením dlouhodobého meteorologického sucha na pěti synoptických stanicích v severní části Srbska. Pro identifikaci extrémního meteorologického sucha za referenční období 1946-2021 byl vypočten standardizovaný srážkový index ve 12měsíčním měřítku. Byly vypočteny hlavní charakteristiky meteorologického sucha a relativní četnost sucha. Nejzávažnější extrémní dlouhodobé meteorologické sucho bylo zaznamenáno především v letech 1948 a 2001. Průměrná doba návratu extrémního meteorologického sucha ve studované oblasti je 11,8 roku, je však specifická pro každou stanici zvlášť.

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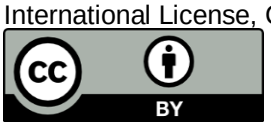

AWARENESS OF SLOVAK TOURISTS ON POSSIBILITIES TO VISIT GEOSITES

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Abstract
The paper presents results of survey on the knowledge of possibilities to visit geosites in Slovakia. Geosites can be considered as the primary element of geotourism development. In this process, potential visitors play a key role. Therefore, it is important to know tourists' knowledge about such locations. Results show that Slovak tourists are not aware of the term geosite and do not use to visit such places nor search for information about geosites. Only 35,79% respondents replied that they visit geosites. In terms of sustainable geotourism development, significant revision of approach within geosite promotion, interpretation and tourism use is required.

Key words: geosite, tourist, knowledge, Slovakia, survey

Introduction

Geosites as part of natural heritage are often a subject of interest of visitors due to their values. In this regard, for some tourism forms (e.g., geotourism), geosites are of primary importance. These sites are extremely interesting to understand Earth and its various processes not only from the experts‘ perspective but from non-specialized visitor too. Some geosites can represent evidence of climate change, tectonic development and related changes in the history of life that have shaped our planet. They are also important for observing recent and current processes and geological elements, as they allow analyzing the development of the territory and understanding the importance of surface processes and rocks in the development of the landscape.
Geosites may differ from each other in genesis, dimensions and their unique geological features, which determine their value for science, education and tourism. They do not have a specified minimum or maximum size, which can range from a few square meters to several square kilometers. Sometimes larger geosites can include smaller ones, they can occur as single objects or like larger systems (Reynard 2004, Ilies & Josan 2009).
As knowledge on specific locations can be considered for a key prerequisite for tourism development, the aim of the paper is to analyze awareness of Slovak tourists on geosites and possibilities to visit such places.

Material and methods

For the purpose of this study a method of online survey was adopted. Survey is considered to be of the most frequent methods in social research. It is defined as a research, development and evaluation tool that serves to quickly find out facts, preferences, information about knowledge, opinions, interests, attitudes, etc.
The anonymous questionnaire includes two major parts. The first part was focused on basic demographic respondents’ data, including age, gender, and education level. The second part was focused on the knowledge of respondents on geosites, including following questions:

- Did you ever hear term ‘geosite’?
- Do you know where geosites are located in Slovakia?
- Do you visit geosites?
- Which geosites do you visit most often?
- Approximately, how many geosites do you know?
- Do you look for information about geosites? (If yes, what is source of information?)
- Are you interested in geosites in more detail? (more than aesthetic value, e.g., geology, geomorphology, processes, etc.)
- Do you think that the availability of information on geosites is sufficient?
- Are geosites sufficiently promoted as tourist destinations?

Results and discussion

The total number of processed questionnaires was 366. 209 female respondents and 157 male respondents participated in the survey. Considering age, the largest group of respondents was aged 26-35 years, including 109 respondents. The majority of respondents has finished at least secondary school. Basic demographic data are summarized in Table 1.

Tab. 1: Demographic data of respondents

Demographic item		**Number**	**Percentage**
Gender	Woman	209	57%
	Man	157	43%
Age	less than 18	17	5%
	18-25	106	29%
	26-35	109	30%
	35-50	88	24%
	more than 50	46	13%
Education level	primary school	17	5%
	secondary school	181	49%
	university	168	46%

Out of the total number of 366 respondents, only 124 respondents answered ‘yes‘ to the question of whether they had already hear the term geosite. This term is known by both women and men term was mainly encountered by women. In terms of age category, persons older than 35 years are more familiar with this term. Moreover, respondents with university diploma are the major sub-group in this category. Only 45,08% of respondents (165) replied that they know where are geosites located in Slovakia. However, only 35,79% (131 respondents) replied they visit geosites repeatedly (Fig. 1). 145 (39,62%) respondents visited geosites but do not plan to visit such places repeatedly. 13,11% of respondents plan to visit some geosite in the future.

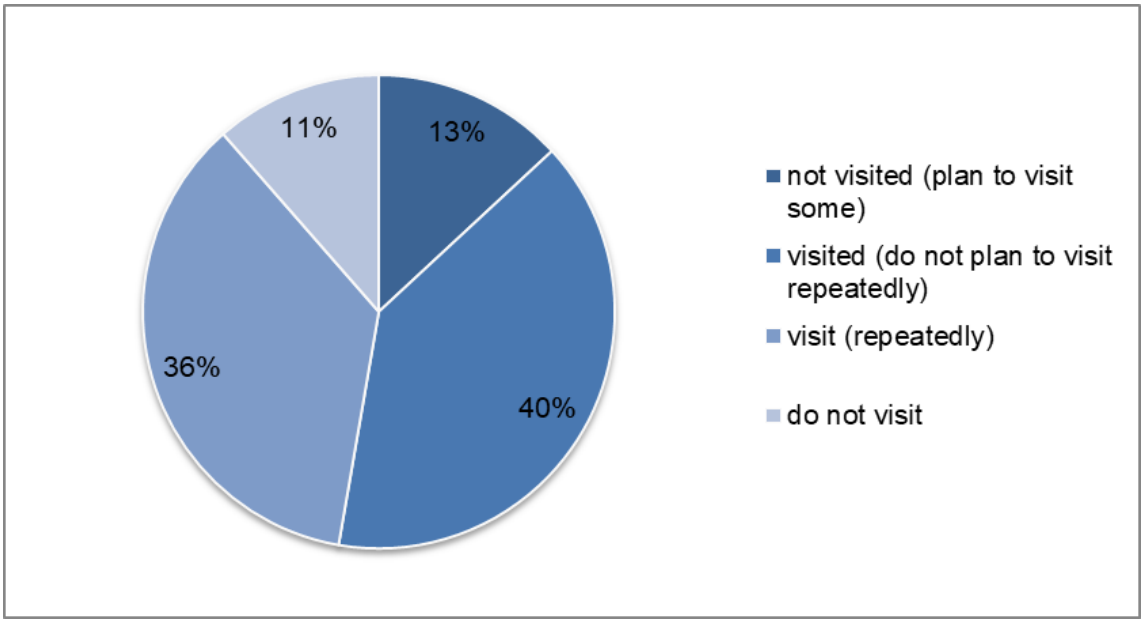

Fig. 1: Respondents’ replies on geosite visits

When visiting geosite, the most frequent visited geosites include caves (184), canyons (57) and waterfalls (53). This may be caused by the fact these places are among the most visited natural phenomena in general, visited by various groups of visitors. So, also people who do not plan visit such places in the future may have been here during, e.g., some school excursion. In total, 349 respondents replied that they know at least one geosite in Slovakia among which 185 respondents know more than 5 various Slovak geosites.

People visiting geosites, most often, look for some information on internet which is considered to be the most frequent information source in general. But this information, most frequently, do not include some detailed information about geosite, just the most general data – accessibility, entrance fee, etc. The majority of respondents (263) is not interested in geosites in more detail and, we suppose, therefore more than 65% of respondents replied that they do not know if the availability of information about geosites is sufficient. Considering geosites as potential tourist destinations, the majority of respondents (198; 54,1%) thinks that these places are not sufficiently promoted (Fig. 2).

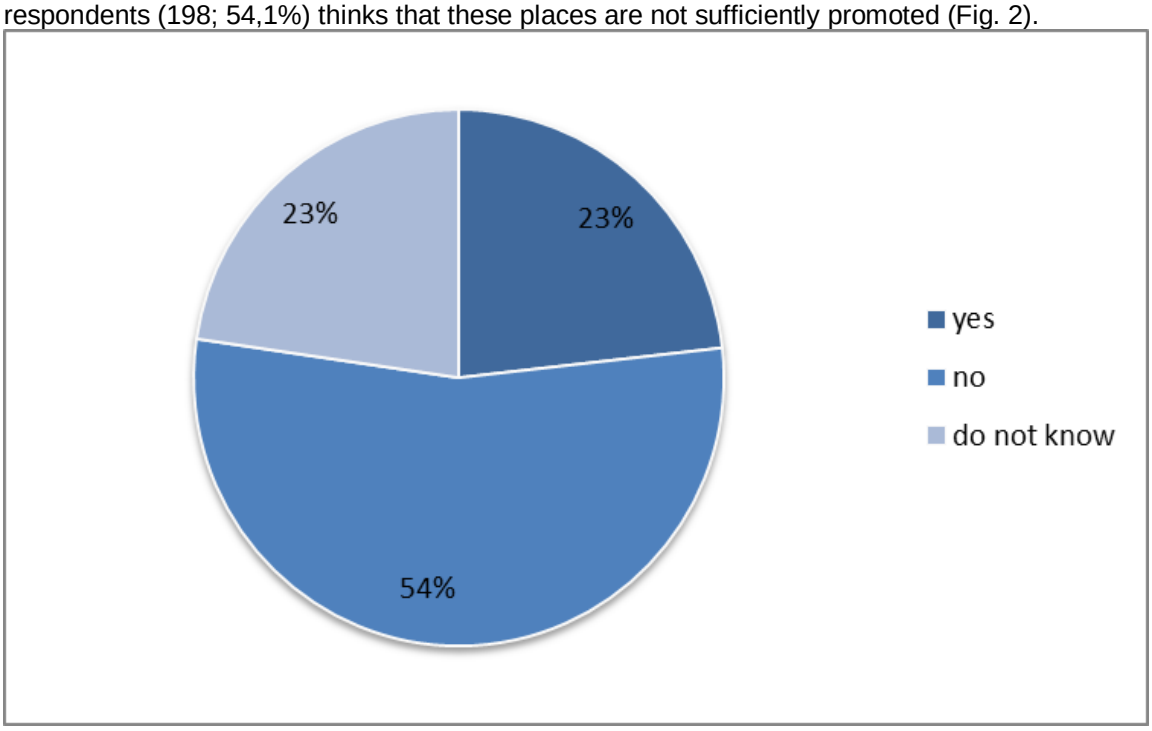

Fig. 2: Respondents replies on the question: Are geosites sufficiently promoted as tourist detinations?

Findings presented in this paper confirm the conclusion of Liščák and Antalík (2018) that there is a decreasing level of geological knowledge of Slovak people, which is manifested by a worsening perception of environmental importance of various components of the country.
Nature-based tourism has an undeniable potential of development in Slovakia. This importance has also been recognized by the various documents adopted by the Government of the Slovak Republic (e.g., Slobodníková 2022). However, for effective sustainable development, participation of people as potential visitors is crucial. This paper shows that, compared to previously published results (Štrba 2019), only a part of Slovak tourists visits geosites repeatedly. Survey results indicate that Slovak tourists do not recognize the importance of geosites in general what leads to decreasing interest in such locations. Without real interest in geosites, no geotourism (or any other nature-based tourism form) development is possible. Therefore, appropriate changes are required in terms of communication and interpretation of this natural phenomena at various levels, from schools (within the education process) to in-situ interpretations. Local stakeholders and DMOs should also be involved, especially in the process of geosite promotion and sustainable use management.

Conclusion

Nature-based tourism forms are generally recognized as sustainable tourism forms with special emphasis on specific natural phenomena. Geosites represent one of such categories having big potential to attract people and, in case of proper management, educate them various aspects of geosciences and related fields. This paper, based on the online survey, was aimed at the study of Slovak tourists' awareness on possibilities to visit geosite. Results of the survey shown that, despite the fact that people know some Slovak geosites in general, less than 36% visit geosites regularly and there is a considerable group of respondents which do not plan to re-visit geosites. This study did not cover reasons why people visit or not visit geosites in Slovakia what may bring more light into this topic. However, it can be concluded that, when considering geotourism development in Slovakia, much more attention and appropriate action is required towards general public when discussing geosites as potential (geo)tourist places in Slovakia.

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Souhrn
Geolokality jako součást přírodního dědictví jsou pro své hodnoty často předmětem zájmu návštěvníků. V tomto ohledu mají pro některé formy cestovního ruchu (např. geoturizmus) prvořadý význam. Cílem příspěvku je analyzovat informovanost slovenských turistů o geolokalitách a možnostech takové místa navštívit. Pro účely této studie byla využita metoda online průzkumu. Z celkového počtu 366 respondentů odpovědělo „ano“ pouze 124 respondentů na otázku, zda již pojem ‘geolokalita’ slyšeli. Pouze 45,08% respondentů (165) odpovědělo, že ví, kde na Slovensku se geolokality nacházejí. Pouze 35,79 % (131 respondentů) však odpovědělo, že navštěvují geolokality opakovaně. 145 (39,62 %) respondentů geolokality navštívilo, ale neplánuje taková místa navštěvovat opakovaně. Celkem 349 respondentů odpovědělo, že znají alespoň jednu geolokalitu na Slovensku, z toho 185 respondentů zná více než 5 různých slovenských geolokalit. Většina respondentů (263) se o geolokality blíže nezajímá a možno předpokládat, že proto více než 65 % respondentů odpovědělo, že neví, zda je dostupnost informací o geolokalitách dostatečná. Tato studie se nezabývala důvody, proč lidé navštěvují či nenavštěvují geolokality na Slovensku, což může vnést více světla do tohoto tématu. Lze však konstatovat, že při zvažování rozvoje geoturismu na Slovensku je potřeba mnohem více pozornosti a patřičných kroků směrem k široké veřejnosti v oblasti geolokalit a jejich využití jako (geo)turistických cílů na Slovensku.

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BANK STABILIZATION – NON-TRADITIONAL WAYS OF USING VEGETATION - INCREASING RECREATIONAL ATTRACTIVENESS

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Abstract
Bank damage caused by deflation has appeared in nearly all world reservoirs. However, bank stabilization is mostly seen as a solution and implemented only when bank damage occurs.
In this case, there is a unified scheme used - a stone bank toe is constructed and the (eroded) bank sloping is restored in place of the erosion wall.
However, this paper presents another solution - a solution using breakwaters. One of their basic types is presented together with the diagram and the 3D model. The article also includes a proposal for an unconventional way of stabilizing the shore.

Key words: Stabilization, river, dam, vegetation. recreation

Introduction

Bankside trees and shrubs are one of the building blocks of territorial systems of ecological stability (TSES). It is part of an ecologically balanced landscape, a form of spread green vegetation growing outside integrated forest complexes. It is created by tree species and herbs growing along streams. In relation to stream regulation, linear building along water streams etc., a lack of riparian and accompanying stands started to manifest negatively. We can say that only once it decreases, will we start to realise its indispensability in our landscape. The following paragraphs deal with the basic functions of bankside trees and shrubs.

Asic functions bankside trees and shrubs – effect on recreational use

Aesthetic Fuction - Recreational Function

Bankside trees and shrubs are a precondition for creating rest areas near streams in the vicinity of towns and cities; in the case of reservoirs used for recreation they are a pre-condition for its development; by supporting the good condition of fish in streams and reservoirs, it helps in the development of sports fishing, etc.
Bankside trees and shrubs are an important element in landscape enhancement. Within stream regulation, we should try to propose necessary interventions to the river profile and its closest surroundings with maximum respect for existing vegetation. Having carried out technical adjustments, it is necessary to propose, in liaison with competent specialists, and to provide for the implementation of new planting, or reconstruction of riparian and accompanying stands.
The planting of and the consequential care for bankside trees and shrubs should not be underestimated as unplanted areas within natural succession become overgrown with self-seeding species whose unsuitable location and species structure may impair the stability of slopes, flow ratios in the riverbed and, even in aesthetical terms, they do not have to necessarily make a good impression.
Fully-grown, maintained bankside trees and shrubs are a dominant element in flatlands and their impact on the overall character of the area is appreciable.

Anti-deflationary Function

Protection against silting up of a riverbed or a reservoir with material transported by wind from adjacent land is significant especially in intensively cultivated agricultural plains. Along with fine dust particles, organic residuals, plant seeds, excessive fertilisers, preservative agents etc. are also transported here.
A fully-grown, sufficiently involved accompanying stand (mostly trees) and riparian stand (mostly shrubs) acts as a "protective wall" and is able to intercept much of the transported material. According to the width and quality of bankside trees and shrubs, we can speak about a similar function as a semi-permeable windbreak. Its importance in the protection against the effects of side wind is also demonstrated in inland navigation, especially in the navigation of empty ships.

Protective Function

Protection against riverbed overgrowth and silting

A direct incidence of sunrays on the water surface causes intensive warming of water in riverbeds. Since the intensity of sunshine is highest in summer months when the water level is also very low, water flora grows more. Irrigation channels and shallow reservoirs are most endangered. The final effect of a fast growth of hydrophytes in warm water, well provided with nutrients from adjacent agricultural land, may be an increasing oxygen deficit with all its unfavourable consequences for fish in the reservoir (pond). In addition, it should be emphasised that an overgrown riverbed does not have to be capable of higher flow in case of rainstorms, thus causing a flood, albeit only a local one.

An increased occurrence of hydrophytes in the riverbed results in increased bottom roughness and a lower flow profile. The speed of running water reduces and, consequently, more particles are deposited. Especially smaller streams with a minor bottom slope are endangered. By means of hydrophytes, such deposits are stabilised and the flow profile gradually reduces, increasing the risk of overflows.

Appropriate bankside trees and shrubs, especially with smaller streams, prevent excessive access of direct light, partially shading the

surface and very effectively preventing conditions suitable for the rapid growth of weed hydrophytes.

Water Quality Function

Impact on self-cleanability of water streams

The pre-condition for self-cleanability to develop is a sufficiently aerated water stream and the presence of organisms in the water. Organisms colonising uneven places on the bottom, roots penetrating into the stream, parts of plants etc. participate, to the maximum extent, in the removal of organic pollution in the stream (its natural transformation into inorganic substances). It is riparian vegetation, its surface and underground parts that have a considerable share in the enhancement of self-cleanability of water streams. However, it should be pointed out that full shading of the surface is undesirable. The more the surface is shaded, the more its self-cleanability is reduced.

Conclusion

Within stream regulation, great attention is also paid to programs in the area of landscape ecology and environmental engineering, aroused by efforts not to irreversibly disturb (through proposed construction complexes) the ecological balance of the system. (Ecological balance is a dynamic condition of the ecosystem and is the main feature of ecological stability of the system. Ecological stability is then the ability of the ecosystem to endure the effect of stressors and, after they subside, to return to the initial condition.)

Within hydraulic engineering, revitalisation and eco-biological constructions (but only here), it is vital to initially become acquainted with the current situation of the locality which will be more or less affected by proposed modifications or building interventions.

Possible recreational use is also an important part. Quality, vital trees and shrubs are the foundation.

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Souhrn
Vegetační doprovod vodního toku či nádrže je nedílnou součástí úpravy toku a jeho začlenění do krajiny. Řeka včetně kvalitního vegetačního doprovodu se stává především v nížinné krajině dominantním prvkem. Určuje krajinný ráz, je vodícím prvkem při budování sítě pěšin pro turistiku cest pro cyklistiku míst pro nerušený rybolov apod.
V příspěvku si všímáme funkcí vegetačního doprovodu zajišťujících právě možnost nerušeného a kvalitního rekreačního využití okolí vodního toku. Jsou to především funkce krajinotvorná, funkce hygienická, rekreační, estetická, důležitá je také podpora procesů samočištění aj.

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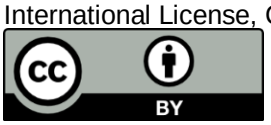

BIOCULTURAL DIVERSITY: SACRAL MONUMENTS AS HABITATS FOR BIRDS

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Abstract
Biocultural Diversity is considered as a new emerging scientific concept under assessment both historical and natural heritage in European cultural landscapes. This study provides an insight into the Biocultural Diversity concept in the practice. Results of the long-term research (2016-2018) on bird species nesting in unusual types of habitats – sacral monuments such as chapels and churches - indicated high importance of the Biocultural Diversity concept in holistic understanding to joining of historical value of sacral monuments with its significance for natural heritage maintaining in cultural landscapes of the study area Olomouc Archdiocese (Czech Republic).

Key words: Bird diversity, Cultural Landscape, Sacral monuments

Introduction

Sacral buildings belong among the significant dominant architectural features of former settlements across various cultures. With regard to their spaciousness, segmentation, and dominant height, they often serve, apart from their clerical and cultural mission, as a refuge for a certain group of synanthropic animal species (Bezděčka et al. 2019). The habitation of sacral buildings by animals has had its own historical course and development. The first dated findings about the habitation of sacral buildings by barn owls in the Czech Republic come from the second half of the 19th century, and partial sporadic information is known from the first half of the 20th century. However, the majority of databases were collected during the course of the second half of the 20th century up till the present (Poprach 2010). The significance of sacral buildings functioning as refuges for synanthropic animal species has been gradually growing in the course of the 20th and 21st centuries, most probably in relation to extensive changes in the agricultural landscape of the country. The Czech Republic saw negative changes in the landscape of the agricultural countryside in the sense of the utilization of the landscape in the course of the 1950s and 1960s (merging blocks of arable land, the shrinkage of meadows, and scattered and attached greener in the countryside). These changes were reflected in village and farm architecture in the forms of tending and utilizing related buildings. After 1990, agricultural production was restructured and gradually intensified and further changes were made to the agricultural countryside. In connection with the intense application of chemical preparations, the agricultural landscape has become homogenous, with a significant decrease in its biodiversity (Reif & Vermouzek 2018). The alterations to the agricultural landscape might have had an impact on the successive synanthropization of some animal species and their tendency to utilize sacral buildings for their purposes. Species richness, abundance, and phylogenetic diversity were all higher in churches than farmsteads (Skórka et al. 2018). In this study, we analyse the results of the monitoring of sacral buildings in the Olomouc Archdiocese, Czech Republic. The data acquired, depicting the utilization of sacral buildings by endangered and protected animal species, plays a key role in providing them with protection and ensuring their survival.

Materials and methods

The monitoring of sacral buildings which was carried out on a part of the territory of the Czech Republic between 2016 and 2018 was targeted on the occurrence of all types of animals living in these buildings. Monitoring was conducted on the territory of the Olomouc Archdiocese (10 018 km^2), where altogether 1275 sacral buildings (churches and chapels) are located in 418 parishes. A large part of the Olomouc Archdiocese lies in lowland areas (200–250 m a.s.l.), while the south-east part is covered by the uplands of the Vsetínské vrchy hills and White Carpathians and the northern part rises into the Nízký Jeseník uplands and Hrubý Jeseník Mountains (1491 m a.s.l.). The vast majority of local settlement systems house a sacral building of some type. What we conducted was the monitoring of the entire territory of the Olomouc Archdiocese, i.e., in regions with differing altitudes above sea level. When checking the sacral buildings, we monitored the occurrence of all species of vertebrates and traces of their habitation (used nests, droppings, vomit, etc.). The towers and attic areas of sacral buildings were always examined in detail, as was the occurrence of vertebrates in the exterior of the building (in embrasures, behind sculptures, etc.). We also recorded the occurrence of access openings leading to the towers and attic areas for individual animal species. In the course of

the monitoring, we checked a total number of 278 sacral buildings. Within the scope of this paper, we have evaluated the data that was acquired on the occurrence of all bird species in these sacral buildings.

Results

In the period between 2016 and 2018, we recorded the occurrence of the nesting of bird species in a total of 133 sacral buildings (47.8% of the buildings that were monitored) within the Olomouc Archdiocese. On a larger number of sacral buildings, only one nesting bird species was detected (n = 105); less often, two nesting species were detected (n = 22) and, exceptionally, three nesting species (n = 6). Altogether, 145 sacral buildings (52.2%) remained uninhabited by bird species.

We recorded the nesting of nine bird species (n = 167 cases of occurrence) in these sacral buildings. The most common and, at the same time, the most numerous bird species was the domestic pigeon, *Columba domestica* (n = 49). In most cases, the pigeons nested in the exteriors of sacral buildings (n = 33), especially in buildings where the interior was protected against the entrance of birds. In accessible parts of sacral buildings (towers, attic areas), pigeons nested both in the interiors (n = 12) and in both the interiors and exteriors of these buildings (n = 4). Domestic pigeons are, as far as their nesting conditions are concerned, highly adaptable. Another regularly nesting species that was detected was the common kestrel *Falco tinnunculus* (n = 44), which builds its nests in the top parts of towers, and in sporadic cases also in the attic areas of churches. In most of the sacral buildings, common kestrels nested on the exteriors of towers (n = 37), individual pairs also in interiors (n = 7) per pair, and only in three buildings were there two pairs. Another regularly occurring species is the common swift, *Apus apus* (n = 22), nesting in the interiors of roof areas, with very small openings being sufficient for them to gain access into the interior. Less commonly, the house sparrow, *Passer domesticus* (n = 16), and black redstart, *Phoenicurus ochruros* (n = 14), were recorded, nesting in the interiors as well as the exteriors of buildings. We also registered the common house martin, *Delichon urbica* (n = 13), nesting exclusively on exteriors, on the walls of the sacral buildings. In the interiors of the buildings, we also discovered the nesting of the western jackdaw, *Corvus monedula* (n = 6), white wagtail *Motacilla alba* (n = 2), and barn swallow, *Hirundo rustica* (n = 1); see Table No. 1. We did not detect nesting of the barn owl, *Tyto alba*, or traces of its habitation (fresh as well as older vomit, wooden drill dust under the nests) during our monitoring of the sacral buildings. In spite of that, barn owls used to nest in 63 sacral buildings in the past (around 20 years and more). Out of 130 sacral buildings with fly-in openings sufficient for a barn owl, 36 buildings (27.7 %) were accessible and suitable for this bird species but not inhabited by the owl.

Tab. 1: List of recorded bird species and frequency of their nesting occurrence in sacral buildings within the Olomouc Archdiocese region (Czech Republic) in the period 2016 – 2018

Bird species	Amount of detected nesting sites in sacral monuments (n)	%
Columba domestica	49	29,3
Falco tinnunculus	44	26,3
Apus apus	22	13,2
Passer domesticus	16	9,6
Phoenicurus ochruros	14	8,4
Delichon urbica	13	7,8
Corvus monedula	6	3,6
Motacilla alba	2	1,2
Hirundo rustica	1	0,6
Total	167	100,0

Discussion

From the results that were gained it follows those sacral buildings, or rather the tower and attic areas of such buildings, represent a significant refuge for synanthropic bird species, including specially protected species. In and on the sacral buildings, we recorded the nesting of nine bird species altogether. The most common and numerous species was the domestic pigeon. This species ranks, at the same time, among the most problematic species inhabiting sacral buildings, because of the extensive contamination of the buildings' interiors as well as exteriors with droppings and veterinary risks. Because of these aspects, the owners and administrators of sacral buildings tend to close

access points into the interiors of sacral buildings and protect them against pigeons, which, however, results in other nesting species not being able to enter these buildings either. The occurrence of domestic pigeons in historical and sacral buildings is a world-wide problem. In Europe, pigeon populations have colonized smaller and large towns and cities, even including some villages. It is estimated that on the territory of the capital, Prague, the pigeon population numbers over 100,000 birds. For some cities, however, pigeon populations are typical and supported (they are regularly fed by people) – such as Venice, Rome, London, Krakow, and others. Between 1985 and 1989, the number of wild domestic pigeons in the Czech Republic was estimated at from 800,000 up to 1,600,000 pairs. The European nesting population numbers over 9.3 million pairs (Šťastný et al. 2006). Such numerous populations of the domestic pigeon have a negative impact on the utilization of sacral buildings and their accessibility for other bird species. Larger openings into the interiors of sacral buildings are also required, on the basis of our findings, by the barn owl, western jackdaw, and common kestrel. On the contrary, small roof openings are sufficient for the common swift, just as they are for other songbirds that were recorded during our monitoring. Together with the above-mentioned research, we also focused on searching the sacral buildings for representatives of the Chiroptera family. We detected the occurrence of a total of ten species of the Vespertilionidae family and one species of the Rhinolophidae family. Minuscule openings in the roof construction, which can easily be overlooked visually, are sufficient for bats and horseshoe bats to enter the interiors of sacral buildings.
It follows from our data that 27.7% of the sacral buildings were, in the period that was monitored between 2016 and 2018, accessible and suitable for barn owls, but, in spite of this, barn owls did not occupy any of them as no fresh traces of their habitation were visible. At present, in the Czech Republic the barn owl nests mostly on the premises of farms (Poprach 2010). The most significant factor that could have caused the transfer of the barn owl from sacral to agricultural buildings might be strong predatory pressure by, especially, the beech marten, *Martes foina*, which has synanthropized in the Czech Republic. Schönfeld and Girbig (1975) state that the beech marten occurred in 13% of the churches monitored by them. They also indicate that the barn owl returned and started nesting in church towers which the beech marten ceased to visit. The reason why the barn owl selects its nests in the top parts of church towers (the belfry) might be the fact that these places are difficult to access for their predators and thus offer them sufficient safety for nesting (Kopij 1990). In the past, sacral buildings made up a significant part of nesting places for the barn owl on the broader territory of Europe. In France, monitoring of sacral buildings was carried out 1970-1995 (Baudvin & Jouaire 2001), revealed 18.5% of the 951 investigated churches (n = 176) were not accessible for barn owls. Out of the total number of 775 accessible churches, barn owls nested regularly in 34.7% (n = 269), 20.8% of the churches (n = 161) were used as a daily location, in 12.1% of the churches (n = 94) old traces of habitation by barn owls were found, and in 32.4% of the churches (n = 251) no traces of habitation were detected. Out of the nests found in churches, 81% were located in the church towers and 19% in the attic areas.
An alternative protective measure for the barn owl is the installation of nesting boxes into towers of sacral buildings. The problem is, however, that even these nesting boxes might be inhabited by domestic pigeons and might later be closed by the owner of the sacral building. Extensive changes to the agricultural landscape might gradually influence the synanthropization of some animal species and, at the same time, the utilization of sacral buildings by these species. As shown in the results of the monitoring of 101 churches and the same number of sacral buildings in Poland, the species composition differed between types of buildings, but functional diversity was similar in both types of buildings. The richness and abundance of the bird species correlated with the age of the church age. Churches may be important for the conservation of local bird diversity (Skórka et al. 2018).

Conclusion

Results of this study provide an insight into the Biocultural Diversity concept in the practice. Applying of this emerging scientific concept to the management practice in cultural landscape is based on long-term field monitoring of bird species nesting in unusual types of habitats – sacral monuments such as chapels and churches. Results of the research indicated high importance of the Biocultural Diversity concept in holistic understanding to joining of historical value of sacral monuments with its significance for natural heritage maintaining in European cultural landscapes.

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Souhrn
Práce prezentuje hlavní výsledky studie významu sakrálních objektů (kostelů, kaplí) v historickém regionu Olomoucké arcidiecéze jako biotopů pro ohrožené druhy ptáků. Monitoring sakrálních objektů v letech 2016–2018 prokázal že 167 sakrálních objektů má kromě svého primárního religiózního účelu i význam jako hnízdní biotop pro ohrožené ptačí druhy kulturní krajiny. Toto zjištění dokládá význam nově vznikajícího konceptu „Biokulturní diverzity“ v praxi pro propojení oborů památkové péče i ochrany přírody. Sakrální objekty (kostely, kaple) v kulturní krajině tvoří velmi často historické dominanty, jejichž význam však v holistickém pojetí není pouze kulturně-historický, ale přesahuje i do zájmů na udržení některých prvků přírodního dědictví evropských kulturních krajin.

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CAMPING AND TRAMPING VERSUS CAMPING AND NATURE CONSERVATION

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Abstract
Staying in a protected nature area in one place associated with stay features, such as pitching tents and shelters, preparing food, sleeping overnight, building fires and the associated waste production, can have a negative impact on the objects of nature conservation. In the Czech Republic, we are seeing an unprecedented increase in travelling with caravans and overnight stays in them outside official campsites in parking areas originally intended for day parking only, often without respecting the rules of nature conservation. Wild West-inspired camping, known as tramping , which has a long history in the Czech Republic, even contravenes the Czech Republic's nature protection legislation when it comes to staying in protected nature, and its future is in great doubt.

Key words: Laws, education, respect, fire, influence

Introduction

At the beginning it is necessary to say what is meant by camping. There is no legal definition of this term. Most of us understand camping as staying in the countryside in one place, usually overnight, using a shelter or tent, preparing food and making a fire. It is therefore a set of activities, and it is also understood as a set of activities by the Agency for Nature and Landscape Conservation of the Czech Republic. In detail, I list the activities characteristic of camping as follows: sleeping, preparing food, eating, washing dishes and washing people, toileting, littering and discharging waste water, building and using seating (tables, chairs, chairs, etc.), in particular evening seating, possibly with the aid of recorded music or music production, the erection of shelters and tents, may be supplemented by the lighting of fires and the driving of cars off roads, local roads and designated car parks. It is not necessary to comply with all of these features, but only with some of them. The assessment of the concept of camping is a matter for each individual ranger or conservation officer in relation to the negative impact or risk of negative impact or direct damage to nature. It is not the purpose of this paper to specify the interpretation of the terms tent, shelter and fire making.

Caravanning

During the covid epidemic, many people found that spending their leisure time and especially their holidays in a caravan was very attractive. Moving around in a motorhome or caravan allows a huge amount of flexibility in the choice of where to stay and especially where to stay overnight. Many people choose to spend the night in a car outside of caravan parks in secluded car parks where they are surrounded by nature. The purchase of caravans and the conversion of small vans into campervans and the proliferation of caravan and motorhome hire companies has taken off with covid, which has continued on an upward trend even after the end of the covid epidemic. Even now in April 2023, rental and dealership owners are reporting on the evening TV news an unrelenting interest in motorhomes ahead of the 2023 summer season. Before covid, caravanning was more or less kept to official caravan parks. With and after covid, it is expanding more and more into the open countryside, with motorhome travellers craving solitude, romance and proximity to nature.
In a narrower sense, we understand caravanning as camping hidden in a vehicle, i.e. in a caravan or motorhome. In a broader sense, it is camping or sleeping in any vehicle or trailer, but always inside. However, where activities typical of camping are concealed in a vehicle and there is no contact with the external natural environment and there is no or minimal risk of impact on it, the Nature Conservancy does not currently consider these activities to be camping within the meaning of the Nature Conservation Act.
Therefore, if a traveller spends the night or stays in a vehicle and does not carry out activities outside the vehicle that are typical of camping, then they are not camping for nature conservation purposes. It is true that caravanning is not camping.
The problem arises especially in specially protected areas, if the traveller in the caravan does not respect the nature protection rules for the area. For example, the car park at Skalní mlýn in the Moravian Karst Protected Landscape Area is surrounded by a national nature reserve, where visitors are not allowed to enter outside the marked paths. Some travellers from caravans park at the edge of

the car park and use the toilet in the NNR, and an unprecedented case is entering the NNR on the bank of the Punkva River and spilling the contents of a chemical toilet into the Punkva. In one instance in this parking lot, the RVs formed a square with a courtyard in the middle where travelers had tables and chairs and ate their meals, creating an image not unlike a car camp.
If several vehicles are parked night after night in a car park in the countryside, then there may be both noise and light disturbance to the site. To give an example of the occupancy of the two main car parks in the Moravian Karst Protected Landscape Area: in the interval 12-31 August 2022 (20 days), a total of 36 vehicles spent the night at the car park Skalní mlýn near Kateřinská jeskyně and only 4 of these nights were not spent at the car park; in the interval 10-31 August 2022 (22 days), a total of 60 vehicles spent the night at the car park near the Macocha abyss and only 5 of these nights were not spent at the car park. It is still the case that if motorhomes are only overnighting, i.e. spending the night in the car park with no other activities outside the car, then from a conservation perspective they are not camping and cannot be penalised and banned.
In the Moravian Karst we would like to prevent the problem of disturbance or damage to nature associated with overnight stays in car parks. Restricting or completely banning overnight parking is currently only possible through the operating regulations of car parks by their operators or through municipalities and their public ordinances.
Education seems to be essential. Travellers who spend the night in their cars outside official car parks need to be informed about the conservation rules both on the internet through entries on specialised websites and directly at the car parks concerned. The rule that caravanning is not camping and that simply sleeping or camping in a vehicle must not turn into camping outside the vehicle must be visibly emphasised.
Even so, it will be up to the Nature Conservancy to consider all the risks associated with caravanning in the open countryside on a site-by-site basis and find a way to regulate or eliminate caravanning as appropriate for the Nature Conservancy.

Tramping
is a movement that is unparalleled in the world apart from the Czech Republic and Slovakia. It is beyond the scope of this paper to deal with its characteristics and history, but the roots of Czech tramping go back to the beginning of the 20th century. It has a close inspirational link to scouting, generally outdoor activities inspired by the American Wild West, and also to tramping from the time of the Austro-Hungarian Empire, and is simply a free and unorganised leisure time in nature, or camping almost always associated with making a fire. Although the tramp movement declined after November 1989, it did not disappear and still lives on in its traditional places to a lesser extent.
Many natural areas have long been associated with tramping and have a rich history in it. Often these are valleys or rocky areas with meadows decorated with totem poles for gathering and for tents, with rock overhangs for sleeping, and with tramp cabins and huts. It should be noted that tramping areas have retained their unique natural values despite many years of tramping and some have been designated as protected under the category of Specially Protected Areas for these values. As tramping is associated with being outdoors, including sleeping in the countryside and making fires, these activities are increasingly coming into conflict with nature conservation.
The Czech legal system does not give tramping any special status, it is probably not perceived by the majority of the public as a historical tradition and therefore its historical existence in a given protected locality cannot be used to justify any exceptions to the law for camping and fire lighting, although many would certainly like it and although there may be some understanding for it.
Even tramping must respond to the demands of modern times and recognise that the flame of a fire blackens rock, that the heat of flames can damage rock, that smoke from a fire can disturb animals, that ash can affect soil chemistry, that the light of a fire and the sound of speech and song in the depths of the woods disturbs animals. Furthermore, in the context of drought climate change and the bark beetle calamity with last year's fire in the Bohemian Switzerland National Park, fire in nature is also a major fire risk.
Tramping has its bases in big cities and its typical areas for Prague are, for example, the Bohemian Karst, Brdy, Kokořínsko and others, now protected as protected landscape areas. The Moravian Karst is surprisingly not a tramp area near Brno, where the position of the tramps has been replaced to some extent by cavers and the interesting figure of the karst hermit. The Brno tramps occupied small valleys to the west and north-west of Brno in the Bohemian-Moravian Highlands, typical of which are the valleys of the Oslava and Chvojnice rivers, now protected as national nature reserves and nature reserves.
Currently, the situation in the Kokořínsko Protected Landscape Area (CHKO Kokořínsko) has escalated, where we can observe very conflicting discussions on the Internet about the relationship

between nature protection and tramping. There is talk of illegal tramping cabins in this MPA, over 100 unauthorised campsites with fireplaces often under rock overhangs, blackened sandstone cliffs and destroyed archaeological sites in the sediments under sandstone overhangs. It is alleged that the tramp movement has been completely displaced from the Bohemian Switzerland National Park by the functioning park guard service, which has caused an increase in the number of tramps in Kokořínsko. It is not the aim of this paper to assess this, but it is quite clear that a functioning guard service is an important and effective factor in the enforcement of nature protection law.

Conclusion

Finding a compromise between tramping (camping and making fires in areas with a historical tradition of tramping) and nature protection is very difficult and in fact impossible. The nature conservation authorities are bound by the Administrative Code and the principle of equality of persons and the Act on Nature and Landscape Protection of the Czech Republic and must always justify their decisions. Why allow a hut for hikers and not for the father of a family of four. Why allow a tramp to camp and build a fire and not a school class on a trip.

Speleologists in the Moravian Karst are not allowed new huts in the countryside and the old ones are left to live out their lives as temporary structures in exclusive connection with the permission of speleological research as a working base. It is difficult to imagine a similar justification for a tramp cabin, although on rare occasions a tramp group may have legal personality and may work for nature conservation in a protected area. Thus the log cabin could be a work base. However, this will not apply across the board, but exceptionally.

A special case is the valley of the Oslava River below Náměští to Vlčí hill west of Brno. A long tramp history. Few tramp cabins. Few campsites with totems on the river bank in the forest, not under rock overhangs, which are not present in the valley. One tramp settlement with legal personality publishing a tramp magazine Oslavské boudy with overlap from the region to the country. Meadow leased by this tramp settlement as the largest regional occasional campsite. The settlement regularly organizes various events for the tramp movement, including the annual cleaning of the banks of the Oslava River and its valley slopes, which no one else does here. There is a plan to build a dam in the valley, which the entire local tramp community opposed with their friends and supporters, including musical groups as one man, and their power and voice was heard far and wide. The area had been protected as a nature reserve since 1974, allowing the tramps to move freely. Territory re-designated as a National Nature Reserve (NNR) in 2019, which brought a major change in that only marked paths could be used in the NNR. In doing so, tramps could have fought against the NNR designation as actively as they did against the dam, but instead they cooperated with the Nature Conservancy in preparing the NNR designation documents. Is it now appropriate to eliminate tramping in the valley in the NNR? Is it even possible to find a legal way to preserve the status of tramping in this valley, with permits for trail entrances, with permits for fireplaces, and with temporary permits for log cabins to gradually catch up? Of course, it all depends on the assessment of any requests for exceptions to the law and the justification for them.

In the Kokořín region, the situation with log cabins and campsites was unbearable and the nature protection there proceeded to the gradual destruction of log cabins and campsites. Tramping with its bonfires and log cabins in specially protected areas current legislation aims to eliminate, but the authorities' course of action remains open. This paper could not cover all aspects of the issue, such as the perception of tramping in neighbouring villages or by landowners, which tends to be tolerant, its extent, which is different in each area, its danger to fires and the degree of its risks to disturb or damage nature, which in turn will be different in each area. Even in the case of tramping, there will be no single template for the authorities' decision-making.

It will be up to the Nature Conservancy to consider all the risks associated with tramping in the open countryside in each specific location and find a way to regulate or remove tramping as appropriate to the needs of the Nature Conservancy.

Souhrn

Táboření je souhrn činností jako je např. stavba stanů a přístřešků, příprava stravy, nocleh, rozdělání ohně a s tím vším spojená produkce odpadů. Pokud nejsou dodržovaná pravidla ochrany přírody, může mít táboření negativní vliv na předměty ochrany přírody. Ve zvláště chráněných územích České republiky je táboření omezeno zákonem o ochraně přírody a krajiny (dále jen „zákon“). Caravaning chápeme jako táboření zkryté ve vozidle a v takovém případě nedochází ke kontaktu s vnějším přírodním prostředím a riziko jeho ovlivnění není nebo je minimální. Pak ochrana přírody caravaning v současné době za táboření ve smyslu zákona nepovažuje. Pokud však dojde k projevům táboření mimo vozidlo, půjde o táboření, které mimo autokempinky může být v rozporu se zákonem. Tramping

je táboření inspirované Divokým západem a skautingem a jedná se zjednodušeně o volný a neorganizovaný volnočasový pobyt v přírodě téměř vždy spojený s rozděláváním ohně. V případě pobytu v chráněné přírodě obvykle je v rozporu se zákonem. Bude na ochraně přírody, aby posoudila a zvážila všechna rizika spojená s caravaningem nebo trampingem ve volné krajině na každém konkrétním místě a podle potřeby ochrany přírody v souladu se zákony našla cestu k ponechání, k regulaci nebo k odstranění caravaningu nebo trampingu.

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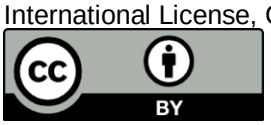

CAUSES OF OVERCOMING OVERTOURISM FAILURE IN CZECHIA

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Abstract
Overtourism is a phenomenon affecting destinations that are so popular that the sheer number of visitors to a destination causes problems. Several strategies have been used to mitigate the impact of overtourism, addressing both its manifestations and the root of the problem: too many tourists. However, when evaluating the effectiveness of these strategies, we find that while strategies that aim to mitigate the effects of overtourism tend to be successful, strategies that try to reverse the trend of increasing numbers of tourists tend to be unsuccessful. Therefore, the paper examines why this is the case and compares the experience abroad with the situation in Czechia.
The results show that one of the main reasons for the failure of the strategies is the different perceptions of the two main types of actors in the fight against overtourism: nature conservation authorities on the one hand and municipalities and destination agencies on the other. In some cases, the conflicting interests of these actors lead to inaction on overtourism, as one side usually blocks the other's solutions. It is only when the situation is genuinely untenable that they find agreement. However, the most effective approach is to take action on the stage to prevent the emergence of overtourism.

Key words: Sustainable tourism, attitude-behavior gap, development actors, fear of missing out (FOMO), tourism carrying capacity.

Introduction

The phenomenon of overtourism, defined as an excessive number of tourists in a destination that negatively impacts the environment, culture, and quality of life for locals (Koens, Postma & Papp, 2018), has become a pressing issue in many popular tourist destinations worldwide (Dodds & Butler, 2019). In response, various strategies have been implemented to mitigate the effects of overtourism. While these strategies have shown some success, efforts to reverse the trend of increasing tourist numbers have generally been less successful (Gowreesunkar & Seraphin, 2019).
Strategies to mitigate the adverse effects of overtourism, such as limiting the number of visitors or promoting responsible tourism practices, often fail due to complex and interrelated factors. These factors include inadequate planning and management, conflicting interests among stakeholders, lack of political will and resources, and the complexity of the tourism industry (Butler & Dodds, 2022). Many destinations need more data, expertise and help to develop and implement effective tourism management plans. This can result in a reactive approach to tourism, with destinations needing help to keep up with the rapid growth of tourist numbers and failing to anticipate and address the negative impacts of overtourism (Seraphin et al., 2019).
Another factor contributing to the failure of mitigation strategies is the conflicting interests among stakeholders. The tourism industry involves a range of actors, including government bodies, tourism operators, residents, and tourists. These actors often have competing interests and values, making it difficult to reach a consensus on managing and regulating tourism (Koh & Fakfare, 2020). For example, tourism operators may prioritize profit over sustainable tourism practices, while residents may prioritize their quality of life over the economic benefits of tourism (Boháč & Drápela 2022). Moreover, many destinations lack the necessary political support and financial resources to implement effective policies and regulations to manage tourism (Benner 2020).
Since choosing the right mitigation strategies is essential to destination management, this article analyzes the results of the strategies used in Czechia (outside of Prague) in recent years. Applications of different solutions to the problem of overtourism are presented at selected locations, and their effect is commented on. The article focuses on understanding the role of local stakeholders in preventing and overcoming overtourism.

Materials and Methods

To analyze how the selected destinations in the Czech Republic have implemented measures to mitigate the negative impacts of overtourism, it was first necessary to determine them. In total, 63 such sites were analyzed. Still, due to the limited scope of the paper, the results are presented here

only for three selected destinations, namely Adršpach, Hrubá Skála, and Bedřichov. In these destinations, interviews were conducted with key actors of local development (mayors, local entrepreneurs, nature conservation authorities, representatives of local destination agencies, etc.) and field observations of the current state of tourist infrastructure and its utilization during the primary summer tourist season. Subsequently, an evaluation of the presence of three factors that influence the presence of overtourism was carried out, namely fear-of-missing-out (FOMO), not-in-my-backyard (NIMBY) effect, and (non-)cooperation between stakeholders. The resulting synthesis is then presented in the following chapter.

Results

The first destination analyzed is Adršpach, where overtourism was manifested by queues on hiking trails in the local rock town, traffic and congestion on access roads, and a lack of parking spaces. The municipality of Adršpach, which collects entrance and parking fees in the rock town, benefited from many visitors. Therefore, for a long time, it resisted any regulation of tourism, and the situation in the destination steadily worsened. However, the problem was relatively successfully resolved after local stakeholders (especially the municipality and nature conservation authorities) agreed and introduced a reservation system for rock town entry and parking spaces (see Figure 1). This measure regulates the number of incoming visitors to a tolerable limit and prevents overtourism at the destination.

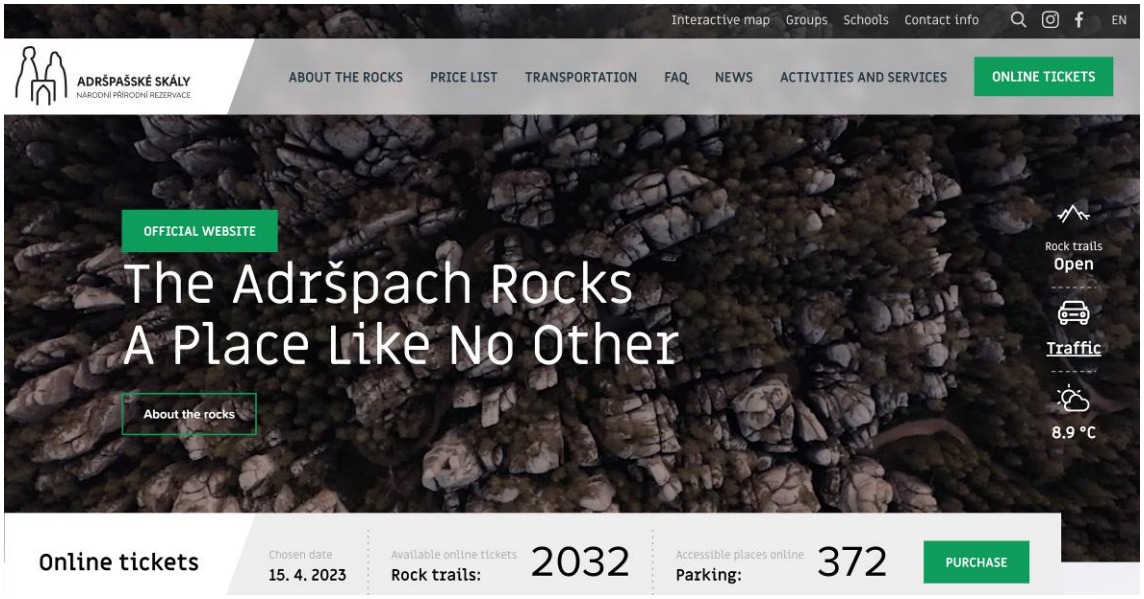

Fig. 1: The Adršpach Rocks website with a booking system for tickets and parking spaces. Source: https://www.adrspasskeskaly.cz/

The second destination analyzed is Hrubá Skála. It is a very similar locality to Adršpach; the main tourist attraction is the rock town. Overtourism is manifested here mainly by traffic problems associated with a lack of parking spaces. Due to the lack of parking capacity, traffic jams occur on the access roads, and various local businesses entice visitors to park in these jams on their property. However, this sometimes arouses resentment among the residents who have tourists park near their houses. In this destination, however, there has been no agreement on a solution to this problem among local actors, with each pushing for a different solution, which is why the overtourism situation continues.

Another destination studied was Bedřichov in the Jizera Mountains, a popular destination, especially in winter, when cross-country skiers leave for trips to the surrounding area. Problems with overtourism are manifested on access roads and parking, even though the municipality of Bedřichov has several large parking lots built on its territory, and the street navigation system shows their current occupancy. Unfortunately, this destination is a victim of the inactivity of the surrounding municipalities in the region. It is one of the few places where comfortable and spacious parking lots can be found in the Jizera Mountains. That is why an unbearably large number of visitors are heading here, which the municipality's territory cannot absorb. The construction of tourist parking lots in other places in the region is prevented either by the lack of interest of the surrounding municipalities or by nature conservation authorities, who are afraid of the influx of tourists to the core areas of the mountains.

As can be seen from the previous description of the selected destinations, although each has a slightly different character, the reasons for the emergence of overtourism in them are pretty similar: the attractive natural environment gradually attracted large numbers of visitors, which began to cause the collapse of the transport and tourist infrastructure during the high season. All three destinations did not address this situation proactively but let it escalate to overtourism before reacting. After that, however, their approach differs.

Tab. 1: Comparison of the analyzed destinations in the presence of critical factors influencing overtourism

	Adršpach	Hrubá Skála	Bedřichov
fear-of-missing-out	yes	yes	no
not-in-my-backyard effect	no	yes	no
cooperation between stakeholders	yes	no	yes in destination /no in region
mitigation strategy successful	yes	no	no

Table 1 provides an overview of the three main factors influencing the emergence of overtourism. The first is fear-of-missing-out (FOMO), i.e., the feeling that if I am in a given region, I will miss out on something important by not visiting the destination. This psychological phenomenon is typical for tourist highlights (i.e., also for Adršpach and Hrubá Skála) but not for starting points to them (e.g., Bedřichov). The second factor is the not-in-my-backyard (NIMBY) effect, which applies mainly to large public infrastructure projects, but in recent decades also to tourism infrastructure. Although almost everyone likes to travel and have comfort in their travels, if, for example, a tourist parking lot were to be built next to their house, they would try to block this project. Of the sites analyzed, this is happening in Hrubá Skála. The third factor is the cooperation between stakeholders, which has already been described above in the text.

Discussion and Conclusion

When analyzing the success of destinations in overcoming overtourism, smart technology-based solutions such as online booking systems have proven to work relatively well. These are some of the few possible solutions that can reduce the number of arrivals and thus regulate the number of visitors. Studies from abroad confirm their success (e.g., Fontanari & Traskevich, 2023).

However, in rural areas with valuable natural environments, in addition to congestion of local transport and tourism infrastructure, a significant negative impact of overtourism is damage to nature, such as damage to sandstone cliffs or disruption of valuable ecosystems (Drápela, 2021). In such cases, the interests of nature conservation must also be considered. Still, these may conflict with the interests of municipalities and tourism entrepreneurs who would welcome tourism growth in the destination. These contradictions may then be why no measures are ultimately implemented, as in the case of Hrubá Skála. However, these contradictions are not always between the nature conservation authorities and the entities benefiting from tourism; in the case of Bedřichov, it is instead the municipalities in the surrounding area that are worsening the situation in Bedřichov by their persistent resistance to strengthening the tourist infrastructure on their territory, as it is almost the only way for visitors to get to this part of the Jizera Mountains.

This short article does not aim to provide a comprehensive explanation of the reasons leading to overtourism in the Czech Republic. After all, there are already several other studies on this topic - the author can recommend Drápela et al. (2021), which discusses this issue in more detail. However, the purpose of this text was to point out a factor that significantly influences the success of the application of measures aimed at overcoming overtourism in a destination, namely the (non-)cooperation of local stakeholders.

Rural overtourism is mainly caused by exceeding the carrying capacity of a destination, which is a problem that can be addressed. However, if local stakeholders disagree on a standard course of action, the situation is blocked for a long time, and the problem of overtourism is continuously worsening.

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Souhrn
Overturismus je fenomén postihující destinace, které jsou natolik oblíbené, že pouhý počet návštěvníků v destinaci způsobuje problémy. Pro zmírňování dopadů overturismu se využívá několik druhů strategií, které se zaměřují jak na jeho projevy, tak i na samotné jádro problému: příliš vysoký počet turistů. Při evaluaci efektivity těchto strategií však zjišťujeme, že zatímco strategie cílící na zmírnění projevů overturismu bývají úspěšné, tak strategie, které se snaží změnit trend rostoucího počtu turistů, naopak neúspěšné. Článek se proto zabývá důvody, proč tomu tak je, a porovnává zkušenosti ze zahraničí se situací v Česku.
Z výsledků plyne, že jedním z hlavních důvodů neúspěšnosti strategií je odlišné pojetí boje s overturismem u dvou hlavních druhů aktérů: orgánů ochrany přírody na jedné straně a obcí a destinačních agentur na straně druhé. Protichůdné zájmy těchto aktérů v některých případech vedou k neaktivitě v oblasti overturismu, neboť jedna strana obvykle blokuje řešení strany druhé. Shodu pak nalézají až případě, kdy je situace opravdu neúnosná. Přitom nejefektivnějším přístupem je konat už ve fázi prevence vzniku overturismu.

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ECOTOURISM IN AMAZONIAN ECUADOR – BOSQUE MEDICINAL PROJECT

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Abstract
Bosque Medicinal was established in Ecuador to protect the rainforest. Its founder, Roman Kollar, who lives in Ecuador, set it up in 2018 and has since been raising money to save the tropical forests there. His organisation and its Czech partners, Forest Ink, buy up former farms with remnants of rainforest. The aim is to turn the pastureland back into a high-quality forest, and to protect forests that have not yet been damaged by cattle ranching. Although the organisation has an international focus, most of the volunteers who come to help are from the Czech Republic. Their holidays mean buying tickets to Ecuador and working for free on the farms they buy, restoring forest to the slopes of the Ecuadorian Amazon. In 2019, the UNIDA Consortium was formed, bringing together universities and associations in Europe and Latin America to to share knowledge about the Amazon and contribute to the conservation of the region's nature and traditions. Mendel University is a founding member, and the first group of students travelled to the Amazon in 2021 with the aim of collecting the basic data needed for the reforestation of farmland.

Key words: land trust, Bosque Medicinal, biodiversity, deforestation, UNIDA

Introduction
Ecuador is a country in tropical Latin America. The eastern part slopes down from the Andes into the Amazon basin and is still covered by vast and diverse forest ecosystems. Part of these tropical forests are protected in a system of protected areas managed by the Ministry of Environment, Water and Ecological Transition (Ministerio del Ambiente, Agua y Transición Ecológica), in 67 areas with different categories of protection (MAE, 2022). According to the IUCN (2023), these areas account for 23% of Ecuador. Our area of interest is located near the town of Gualaquiza in the eastern part of Ecuador. The regional government has designated several regional protected areas here, including the El Paraiso Reserve, which is part of the larger Área de Conservación Municipal Runahurco (GAD minicipal de Galaquiza, 2014).
This area is in the Amazon region, but on the slopes of Andes, originally covered by montane tropical rainforest. Here, the Bosque Medicinal Land Trust started to buy former farms to reforest them. Decades ago farmers from the lowlands began to convert forest into pasture for cows. The rapid deforestation of the area is a problem not only for biodiversity, which is very high here, but also for the climate, as the carbon trapped in the trees is released into the atmosphere. For local farmers, logging used to get legal ownership of the land, as local governments had a strategy of certifying their property if farming took place over a long enough period.

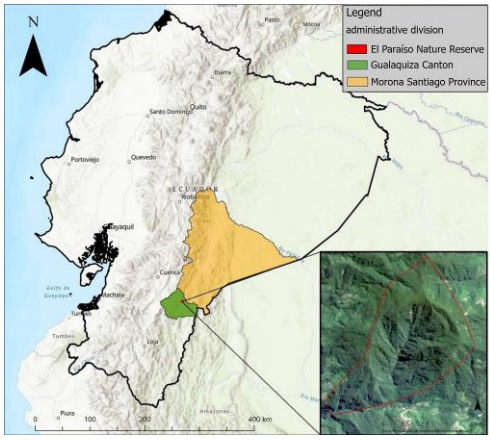

Fig. 1: Region of study area (INEC, 2019)

The diversity of the forest is still very high and has not been sufficiently studied so scientists from the international community are invited to conduct research here. Bosque Medicinal, an Ecuadorian

foundation, started its activity here in 2018. Several groups of volunteers from many countries but mainly from the Czech Republic come here every year to plant forest in the newly-purchased land as well as to build the field station for further research. Bosque Medicinal, together with its partner association Forest Ink from the Czech Republic, raised money to buy former farms. Later in the UNIDA (United for the Development of the Amazon) project was launched as a consortium of universities, NGOs and private companies from the Amazon countries and the Czech Republic with the aim of working together to protect the Amazon. The first group of students from Mendel University travelled to Gualaquiza in September 2021 to begin the basic biological research necessary for the reforestation of former farms there.

Materials and methods

The El Paraiso Nature Reserve (Figure 1) is part of a diverse system of protected areas in Ecuador - specifically it is a regional protected area. It has about 500 ha and is located 20 km north of Gualaquiza at an elevation of 1300–2157 m covered by diverse mountain rainforest. The area is in the eastern part of Ecuador, in the province of Morona Santiago Province and the canton of Gualaquiza (INEC, 2019). Part of the nature reserve is privately owned by farmers who also own the land around the reserve (Nugra et al., 2011).

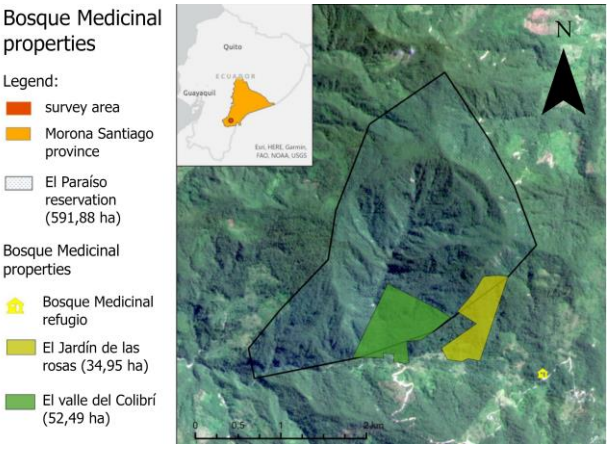

Fig. 2: Study area location with Bosque Medicinal Land Trust

The nature reserve consists of three ecosystems (Nugra et al., 2011; MAE, 2013), which are shown in Figure 2. The lower part of the reserve forms low mountain rainforest with the Lauraceae family (up to 1400 m above sea level). The higher part (1400–1800 m) is formed by low mountain rainforest with Ocotea and Podocarpus species (up to 1400 m above sea level). The highest part of the reserve is Mountain rainforest with Miconia species.

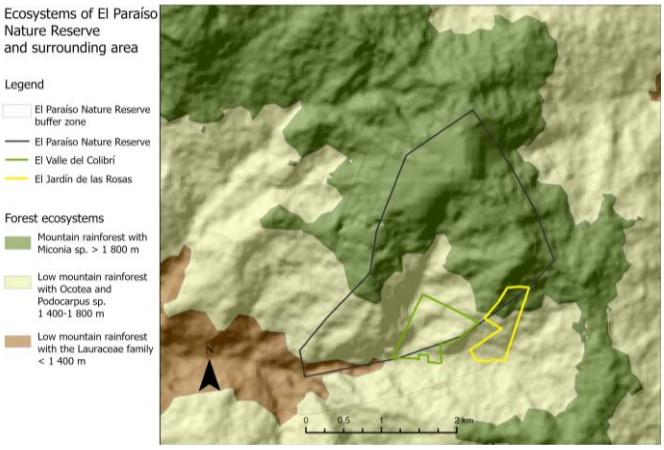

Fig. 3: Ecosystems of the El Paraiso Nature Reserve and the surrounding area

Research on tree species of the Bosque Medicinal Land Trust on deforested pastures was carried out in September 2021 by the team from Mendel University, the Czech Republic, with a local expert from

Azuay University. The team also used the knowledge of farmers and guides from the Shuar minority. The tree atlas of Minga et al. (2019) was used for basic tree identification. Translation from local languages was carried out with the help of R. Kollar, director of the Bosque Medicinal Land Trust.
The task of identifying species and ways to reforest the former pastures led us to decide if there were enough natural tree regeneration in the area and what species of adult trees were left on the pastures. All trees taller than 15 metres were measured and identified. Long telescopic scissors (1.5 to 11.5 m) were used to cut off tree branches, preferably with flowers or fruits. GPS data and mobile phone photos were archived and ArcGIS was used to create images of tree distribution.
Another task was to consider the abundance of tree seedlings. For this purpose a network of 50 x 50 m was inserted into the mobile phone application and12 research plots of 2 x 2 m were established. Each seedling was described and at least the family name was identified.

The results
First of all, a digital map of properties of the Bosque Medicinal was made as shown in Figure 4. Two farms were acquired in the southern part of the El Paraiso Nature Reserve, later named “El Jardin de las Rosas” and “El valle del Colibri” (Figure 4). As the reserve El Paraiso has 591 hectares, the new land trust of Bosque Medicinal is much smaller, El Jardin de las Rosas has 35 ha and El valle de Colibri 52 ha. Both were paid for by international donors, mainly from the Czech Republic. Volunteer camps, which are held four times a year, pay for their stay to cover food and basic accommodation, so international donations flow into the land trust for new land purchase projects. At the field station called El Refugio (see Figure 4), there is a basic camp for their activities as well as being offered for research and education. This area of about one hectare is much smaller and was purchased earlier.

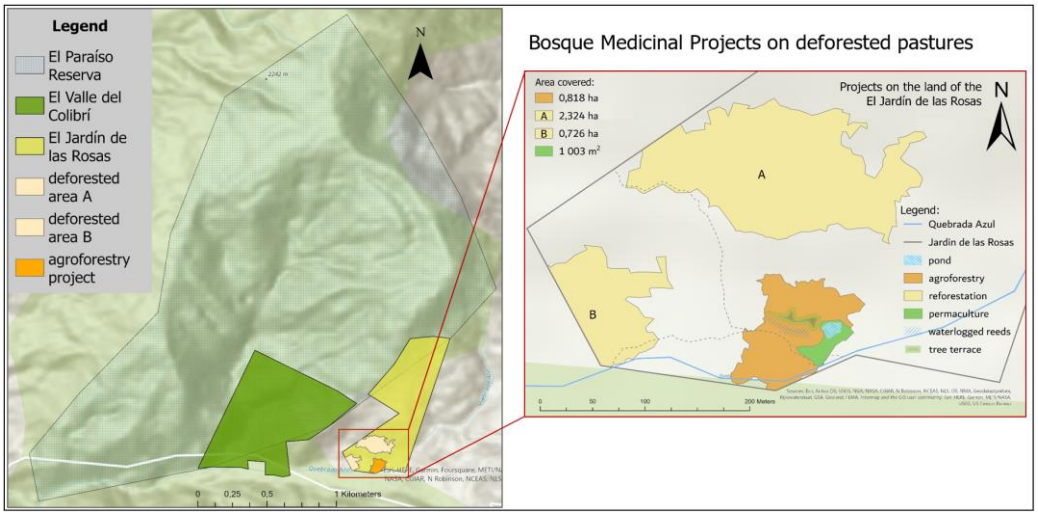

Fig. 4: Plan for agroforestry and gardens on the deforested pastures of Bosque Medicinal

El Jardin de la Rosas has several hectares of pasture used by former farmers for grazing cattle and is partly formed from forest slightly damaged by logging by the farmer. The presence of solitary natural and planted trees was studied as well as the presence of seedlings. The pastures were mapped using GPS data. Four parts of nearly four hectares were defined (Figures 5 and 6). Dots on the map mean trees either from the original rainforest and some planted fruit or ornamental trees in the southern part (všude změnit odkazy na mapu!!). Yellow parts A and B are meant for reforestation, where natural forest will be supported. The orange part of 0.8 ha was chosen for agroforestry, for products needed for the volunteer kitchen and local environmental school education, while the green part of 0.1 ha is for a future permaculture garden. This area has the highest number of planted trees as it was the most intensive part of the former farm, with fruit trees, rose bushes and even some building ruins.
In plots A and B, 74 trees were found that were over 15 metres tall. The trees belong to 13 families (mainly the Lauraceae, Meliaceae, Arecaceae and Fabaceae families). Here 25 tree species were identified. All the native trees will be used for the reforestation of the area. In the southern agroforestry plots, most of the native trees will be used as shade-giving trees forming an agroforestry culture.
Another task was to identify right tree species and number of trees to have in the reforested area. Figure 6 shows network of 12 plots of detailed research into seedlings from natural regeneration. Calculating the plots of 4 square metres (2 x 2 m each) for each hectare, 11 879 seedlings per hectare

in area A were obtained and 3 750 seedlings per hectare in area B, which is sufficient for natural regeneration.

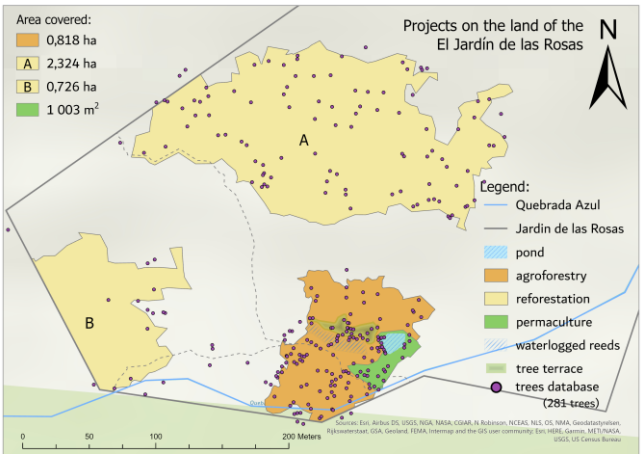

Fig. 5: Trees of natural or planted origin on the pastures of the Bosque Medicinal Land Trust

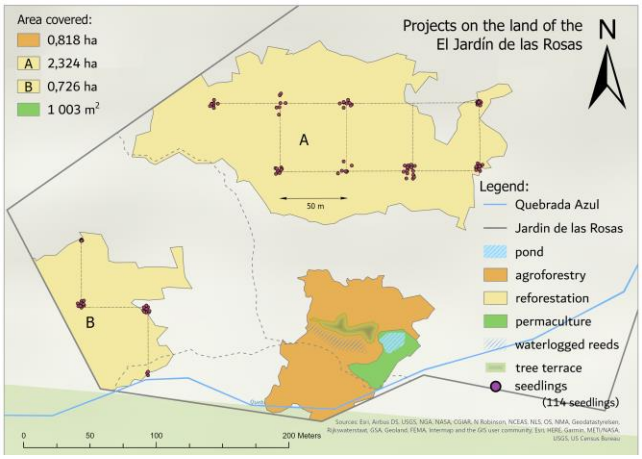

Fig. 6: Natural regeneration on research plots on Bosque Medicinal Land Trust *pastures*

This could be supported by planting native tree species in gaps, but good protection from cows from surrounding farms must be assured.

Discussion

The question for our research is that of what methods to choose for restoring montane rainforest. In acquired areas there are still montane rainforest trees, for example *Cedrela* from the *Melicaceae* family or species from *Lauraceae* such as the *Ocotea* or *Endlicheria* genus which can form umbrella for other species from natural regeneration in the future. Leaving the land to natural regeneration is also supported by our research in Valle de Colibri (eastern plot on Figure 4), which was abandoned by cows about 15 years ago. A density of 425 trees over 10 cm in DBH per hectare was found here after the former farmer abandoned the pasture. Although not all plants in the 400 m^2 study area were identified here, we counted 10 tree species from 7 families in this small plot and the site will need more detailed research in the future.

Further research could also answer the question of how much overseas ecotourism is affecting local diversity. About 60 volunteers a year come to the Bosque Medicinal field station willing to help. Their ecological footprint is largely made up by air travel to and from Ecuador, since the life in the field station is simple and environmentally friendly (Forest Ink, 2022). On the one hand, there is a clear support for nature's return to newly-acquired land, formerly grazed pastures. Bosque Medicinal Land Trust has purchased about 100 hectares of agricultural land to convert into a close-to-natural forest and expand the existing El Paraiso reserve. According to Hora, Marchant, Borsdorf (2018), there are hundreds of private protected areas in South and Central America, up to 5% in Costa Rica. In Ecuador private and community owned protected areas make up 0.78% of the country´s territory (MAE, 2018).

The Bosque Medicinal organisation also hopes to influence some of the farmers and residents of the nearby valley town of Gualaquiza, from where high school and university students have recently been starting to come. Education is provided by teachers from the Universidad de Azuay, as well as lectures in the natural environment, in the El Paraiso reserve, which are organised by Bosque Medicinal and guided by indigenous Shuar people. Another aim is to influence some farming families by establishing and running agroforestry land and permaculture gardens. We were able to see the impact on the farmers during our stay - the neighbouring farm owner not only guided us and named the trees around the farm for our research, but he also no longer wants to cut down the natural forest. There are more and more such owners here, so while deforestation is happening in one part of the province, the opposite process is also happening, with some nature returning to the damaged farms.

Conclusion

The research carried out in the El Paraiso area of the Morona Santiago province, Gualaquiza canton, Ecuador, was aimed at determining methods for reforestation of the land purchased by Bosque Medicinal. A team from Mendel University, within the framework of the UNIDA project, collected the basic biological data needed to return good forest to the deforested pastures that have been bought. Bosque Medicinal buys deforested land from farmers who usually keep cows there. Groups of volunteers who spend their holidays here are willing to plant trees and help the restore the natural forest. Our research has shown that due to the proximity of the El Paraiso reserve with high-quality montane rainforest, hundreds of seedlings of forest trees are appearing in the pasture, not to mention the solitary native forest trees that the farmers have left standing for various reasons. In total, the inventoried areas contain 25 tree species from 13 families, providing a solid foundation for a diverse natural forest in the future, mostly without planting. In areas where natural regeneration is lacking, only trees of local origin will be planted.

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Souhrn
Organizace Bosque Medicinal vznikla v Ekvádoru kvůli ochraně pralesa. Její zakladatel Roman Kollar, který v Ekvádoru žije, ji založil v roce 2018 a od té doby zde shání peníze na záchranu tropických lesů. Jeho organizace i čeští partneři z Forest Ink vykupují zbytky původního pralesa i pastviny od farmářů. Cílem je z pastviny opět učinit kvalitní les a lesy, které dosud nebyly poničeny, před pastvou ochránit. I když má organizace mezinárodní zaměření, většina dobrovolníků, kteří sem jezdí pomáhat, jsou z České republiky. Jejich dovolená znamená zakoupit si lístky do Ekvádoru a zdarma pracovat na vykoupených farmách, vrací zpět les na svahy ekvádorské Amazonie. Rovněž většina peněz na výkup pozemků plyne z České republiky. U nás se podobným organizacím říká pozemkové spolky a jejich hlavním cílem je ochrana přírody a kulturních památek. V roce 2019 vzniklo konsorcium UNIDA, které sdružuje univerzity a sdružení v Evropě a Latinské Americe, jehož cílem je spolupráce na výměně znalostí o Amazonii a přispění k ochraně přírody i tradic v oblasti. Zakládajícím členem je i Mendelova univerzita a první skupina studentů do Amazonie vyjela v roce 2021 s cílem vytvořit přírodovědné podklady pro další skupiny studentů a dobrovolníků.

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ERGONOMIC APPROACH IN TOURISM FOR VISITORS WITH SPECIAL NEEDS

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Abstract
The number of people with disabilities has been increasing as a result of ageing population, chronic health diseases and environmental factors such as accidents, natural disasters or conflicts. Disabled people make valuable part of community and their integration into society reflects the level of human development and public awareness.
Social responsibility and human rights legislations support the improvement of tourism conditions for visitors with special needs resulting in hotel industry in accessible tourism policies including transport, accommodation, destinations and attractions appropriately meeting their needs. Ergonomic design should be preventive design. Sustainability is assured by ergonomic premises which are safe, pollution free, hygienic and nonhazardous. In ergonomics applications, functional efficiency privails and individuals are able to live in environment which is safe, convenient and healthy. The cooperation of builders, architects and ergonomics designers is essential.
This paper presents results of research in hotel sector in Kusadasi, Turkey. The aim was to determine if the hotel facilities are provided to the disabled people, the perceptions of general guests about the disability and their accommodation in disabled rooms. Semi-structured interviews with hotel's department managers were conducted in 9 hotels ranked as 4 and 5 star.

Key words: Ergonomy of space, environment, disabled clients, accessible tourism, hotel sector

Introduction

According to World Health Organization, around 1.3 billion people have disability which is about 15% of total world population (WHO, 2022). Majority of these people are living in developing countries and the number is increasing due to ageing population, chronic health diseases and environmental factors (accidents, natural disasters, conflicts or war). This includes also the quality of holiday destinations among which the most popular are seaside resorts or areas with healthy nature – natural parks, forests etc. Forest ecosystems are also suffering by climate change which is motivating many researchers to develop new tools how to deal with current situations (Souček et al., 2016).
Disabled people should be integrated into normal life conditions and social exclusion should be avoided. Governments, social state and businesses are responsible for accessible environments (Wazzan, 2015). In the tourism context, human rights legislations support the improving the conditions of tourism for disabled people as most of the developed countries settled their legislations for the disabled people to join tourism movements. Accessible tourism policies are introduced which includes transport, accommodation, destinations and attractions appropriately meeting the needs of disabled people. (Buhalis and Darcy, 2011). There are many practical and social issues that prevent the full participation in life of people with disabilities and those traveling with them (Yau et al., 2004). Many changes are made in hotel rooms to provide comfort to disabled individuals, but these rooms, which are sometimes sold to non-disabled people, are having negative reactions. Disabled people and those with limited accessibility tend to come back to accommodation designed for the disabled. In addition, people who are obliged to travel with disabled individuals positively affect their repurchase attitude. (Pehlivanoğlu, 2012).
Room ergonomy for disabled prople can provide them with special need for living environment which is safe, convenient and healthy. The basic condition is to make the space according to fixture and fittings. In general, ergonomic improvements should be done before the equipment of space. The construction phase is critical to designing structure of living space, both inside and outside. For this reason, the cooperation of builders, architects and ergonomics designers is essential. They can evaluate and plan all factors related to safe, healthy and hygienic environment. It was stated many times that with ergonomically furnished home we can achieve maximum benefit. Having clients with special needs, we need to analyse their individual needs and know individual characteristics such as anthropometric dimension or clients' choices and preferences.

Ergonomic improvements can help people with restricted mobility and communication in performing their daily living activities. The basic principle of an ergonomic space for people with disabilities is a barrier-free living environment, a sustainable construction, adaptable and comfortable. People with limited mobility and communication can live comfortably in an ergonomic house or flat. One of the most important concerns is the promotion of health, hygiene and safety (Haigh, 1993; Smith, 1990). For functional requirements and clients' satisfaction, it is recommended to maintain ergonomics checklists and special guidelines (International Labour Organisation, 1996). The role of specific facilities is promoted by Ahasan et al.(2000) to match the home environment or perform general household activities (Czaja and Nair, 1992). For instance, the loss of balance and its circumstances are under focus. Ergonomic configuration and dimension can be usefull with focus on basic requirements of the user (Kumar, 1992).

Ergonomic design in the ideal case should be preventive design rather remedial one. Sustainability is assured by ergonomic premises which are safe, pollution free, hygienic and nonhazardous. In ergonomics applications, functional efficiency privails and individuals are able to live safely for example with arthritis (Philippen, 1994). Engineering approach with ergonomic approaches (Ahasan and Tanya,1999) can benefit also elderly reflecting bending posture and postural pain when reaching up for objects. High or low shelves may contribute to a loss of balance or fall injuries (Tinetti et al. 1988). Ergonomics application must be maintained in constructions with special regulations that fit all types of disabilities and ageing as well as outskirts, gardens, courtyards, car parking, or recreational parks. Free and easy access should be provided to community areas, corridors, traffic paths or stairs for disabled or elderly people. An ergonomic space is reflecting the actual needs of disabled or older people in all the circumstances (Ahasan R, Campbell D, Salmoni A, Lewko J., 2001).

Empirical evidence shows that the hotel managers don't want hotel rooms to look "medicalized" because it puts non-disabled people off. In addition, hotel managers have been seen to excuse the high costs of converting rooms into disabled rooms. English experience showed after the paralympic London Olympic games in 2012 which have been promoted as the most accessible and inclusive Olympics ever, that hotel industry revealed an unwanted conclusion about disabled rooms which could not be sold to non-disabled people because these rooms are too ugly and medicalized and people did not want them to book. (Design for Independence, Baruch, 2017).

Another case from Australia reveals that disabled rooms may be allocated by non-disabled guest often as a result of a shortage of the rooms and happen on a "last minute" basis. Managers reported that this can cause problems as the last minute sold disabled rooms have an image of inferior standards from the point of view of non-disabled guests. Many disabled room bathrooms are seen by non-disabled people as unpleasant because of their rudimentary and "clinical" design. Managers reported that there is an unexplained fear or aversion when proposed disabled room to non-disabled people. This attitude is explained by the stigma and aversion of people who want to avoid contact with others of difference. The word of disabled is still carrying a negative connotation. (Darcy and Pegg,2011).

Material and methods

This study determines the hotel facilities provided to the disabled people and the experience of non-disabled people. Semi-structured interviews with hotel's department managers (front office managers) have been conducted. Combination of descriptive and perceptional questions have been used. The research was done at the seaside location Kuşadası in Turkey which offers 9 five stars´ and 23 four stars´ hotels. The sample consists of 9 hotels which participated in the research, data collection, analysis and interpretation by content analysis. The main research question of the research was: Is there any negative reactions to stay in disabled room of non-disabled people?

Results

Hotel operators in Turkey are obliged to have 1% of the number of total rooms for the disabled and these are supervised by the Ministry of Culture and Tourism. According to the statements of the respondents, the hotel enterprises had disabled rooms due to legal requirements in proportion to the number of rooms and they designed their enterprises according to the general disability regulation of the hotel operators.

All respondents had enough information about the features of the disabled rooms. Accordingly, the managers of hotel enterprises stated that in the disabled rooms, there are details such as the width of the door entrances, large areas for the maneuvering of the disabled chair, furniture with rounded corners, bathroom in the form of a shower without a bathtub, sliding door for the shower, handles in the shower and toilets or doors without thresholds. Only one of the interviewed hotel establishments (H5) stated that they had standard land and sea view rooms for the disabled rooms, while the disabled room type in the other hotels was standard and land view. (See Table 1)

It was seen that the number of disabled guests hosted by hotel enterprises was quite low except for a hotel and the occupancy rates generally varied between 2% and 3%. It was observed that the occupancy rate of a hotel business was 0.8% since it was in the holiday village concept and was not suitable for disabled guests, and a hotel reached to 52% occupancy rate due to its small size and sold to non-disabled guests. Some of the other hotels did not declare the disabled rooms occupancy and sales rates. All hotel managers have stated that they have opened their disabled rooms to non-disabled people for sale due to the need for additional rooms in high season and that they have observed that most of the non-disabled guests in general do not want to stay in disabled rooms and are feeling uncomfortable with this situation.

It was stated that in the hotel businesses, as additional services for the disabled, services such as in-hotel shuttle service, wheelchair service and special area on the beach and disabled ramp and holder for sea access, private area in the restaurant or free room services are provided. Two hotel businesses have declared that they do not provide any additional services. None of the hotel businesses stated that they applied any additional and different price policy. It was seen that all the managers interviewed were empathetic and stated that disabled guests also have the right to vacation and that it is necessary to provide better service to this disadvantaged group.

Tab: 1: Participant hotels

Hotel	**Stars**	**Number of Rooms**	**Number of Disabled Rooms**	**Number of Disabled Rooms sold /per night (2022)**	**Occupancy rate (in disabled rooms)/yearly**	**Unsold nights**
H1	5	650	6	18	0,008	2172
H2	4	338	5	45	0,025	1780
H3	5	87	1	191*	0,52	174
H4	5	333	3	36	0,03	1059
H5	5	263	3	23	0,021	1072
H6	5	436	4	52	0,035	1408
H7	5	443	6	NA	NA	NA
H8	5	272	5	NA	0,02	NA
H9	4	86	1	3	NA	362

*****Sold to nondisabled guest mostly (101 nights sold to disabled guests)

** It is assumed that hotel businesses are open all year round and serving with full capacity

Discussion

Collected data from respondents show that managers have adequate knowledge about the disabled people needs and minimum hotel facilities are provided by hotels which is regulated by law. All managers were very well informed about the legal regulations required for the disabled. Furthermore, hotel managers have a very positive perspective towards disabled guests as 3 hotel businesses had more rooms than the number of disabled rooms required by law, while the others met the legal requirements. They stated that in order to increase the room occupancy rates of hotel businesses, they opened to sell disabled rooms to non-disabled guests especially in high seasons.

In general, it has been determined that the room occupancy rate on the basis of disabled rooms except one hotel (which is in the city center, in operation all year and has less rooms than others) remains quite low. It has been observed that the annual occupancy rates of disabled rooms generally varies between 2% and 3% and they are used quite little compared to other rooms throughout the year. Therefore, according to the comments of the hotel managers, it is stated that these rooms remained relatively new compared to the other rooms because they are used less. While it is known that disabled rooms are generally on the ground floors and poorest vistas in hotel businesses (Darcy and Taylor, 2009), it is realized that they are located on different floors (except for the top floors) of the hotel businesses participating in the study and that they meet the accessibility with elevators.

Although the occupancy rates of the disabled rooms are very low, the hotel managers do not see these rooms as idle rooms and they describe them as rooms that hotel enterprises should have. In general, it was stated that the size of the disabled rooms was larger than the other rooms, while only two hotel managers stated that they were the same as the standard rooms.

Respondents stated that many hotel businesses provide additional services such as in-hotel shuttle service, wheelchair supply, ramps and stairs for sea access, disabled parking, special toilets and special areas on the beach, private areas in restaurants to facilitate the holiday of the disabled. Hotel managers also stated that they do not charge any additional accommodation fees to disabled guests and that they try to fulfill the requests of disabled guests staying in hotel businesses. When their attitudes towards disabled guests are examined, it is stated that holiday is the right of disabled guests as well as non-disabled guests, that every individual in the society is a candidate for disability and that hotel operators should offer more opportunities to facilitate the holidays of disabled guests

Conclusion

The most crucial finding in this research is that, due to the full use of capacity in high season, unfortunately, many guests do not want to stay in disabled rooms within the scope of the sale of disabled rooms to non-disabled guests. According to the observations of the hotel managers, when disabled rooms were offered to the non-disabled guests, they did not want to stay mostly or that they wanted to stay temporarily for one or two days. It has been observed that some guests do not care much about this, but in general they feel uncomfortable staying in disabled rooms. That finding confirms the previous UK and the Australian cases mentioned above in Introduction.

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Souhrn
Počet osob se zdravotním postižením se zvyšuje v důsledku stárnutí populace, chronických zdravotních onemocnění a environmentálních faktorů, jako jsou nehody, přírodní katastrofy nebo konflikty. Osoby se zdravotním postižením jsou cennou součástí společnosti a jejich integrace do společnosti odráží úroveň lidského rozvoje a povědomí veřejnosti.
Sociální odpovědnost a legislativa v oblasti lidských práv podporují zlepšování podmínek cestovního ruchu pro návštěvníky se zvláštními potřebami, což vede k tomu, že hotelový průmysl v rámci politik přístupného cestovního ruchu, včetně dopravy, ubytování, destinací a atrakcí, vhodně vyhovuje jejich potřebám. Ergonomický design by měl být preventivním designem. Udržitelnost zajišťují ergonomické prostory, které jsou bezpečné, neznečišťují životní prostředí, jsou hygienické a neohrožují zdraví. V ergonomických aplikacích se privatizuje funkční efektivita a jednotlivci mohou žít v prostředí, které je bezpečné, pohodlné a zdravé. Spolupráce stavitelů, architektů a ergonomických projektantů je nezbytná.
Tento článek představuje výsledky výzkumu v hotelovém sektoru v tureckém Kusadasi. Cílem bylo zjistit, zda je hotelové vybavení poskytováno osobám se zdravotním postižením, jak vnímají běžní hosté zdravotní postižení a jejich ubytování v bezbariérových pokojích. Polostrukturované rozhovory s manažery hotelových oddělení byly provedeny v 9 hotelech zařazených do kategorie 4 a 5 hvězdiček.

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METHODOLOGICAL OPTIONS FOR EVALUATING OF THE LANDSCAPE RECREATIONAL POTENTIAL

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Abstract
The proposed methodology for evaluating of the landscape potential for recreation is grounded on the basic values of the territory, which make the area more attractive for visit in leisure time. For the purposes of the methodology, the landscape potential for recreation is the system of natural and cultural-historical elements of the area and its aesthetic values, which together create a harmonious complex, and can fulfill the ability of the landscape to provide opportunities for recreation. The proposed method of evaluating the potential for recreation was tested by the GIS on two chosen areas (the surrounding of the town Mladá Vožice in South Bohemia region and the surrounding of the town Mikulov in South Moravian region) and subsequently subjected to a critical assessment.

Key words: landscape values, landscape character, recreation, GIS

Introduction

The topic of recreation in the landscape is a very comprehensive multidisciplinary topic, which significantly affects basic natural, humanitarian and social fields, but also interdisciplinary (so called multidisciplinary) topics, such as landscape ecology, social psychology, and also, for example, economics and business. The position of the landscape architecture field within the evaluation of the potential of recreation and tourism of the landscape is very important. Landscape evaluation, which contains its description, classification, analysis and subsequent synthesis presented as results formulation based on primary, secondary and tertiary structure, appears as a complete part of the components of subsequent process plans in the landscape. As stated by Sklenička (2003): „the landscape evaluation is a decisive factor for choosing the most suitable approach to the development of a certain territory, it enables a better understanding of the relationships between individual landscape components or elements that create a characteristic feature of the landscape."

Material and methods

For the presented methodology purposes, the potential of the landscape for recreation is considered as a set of natural and cultural-historical elements (or components) of the territory and its esthetic values, which create a harmonious unit and are able to fulfill the ability of the landscape to provide opportunities for recreation.
The proposed evaluation methology of the landscape recreational potential is divided into 4 levels (categories) of evaluation.

1) Natural subsystem of landscape potential for recreation
2) Nature subsystem protection mode
3) Cultural-historical subsystem
   - Spot analysis
   - Area analysis
4) Landscape subsystem

A detailed description is given in Table No. 1

The natural subsystem of landscape potential for recreation is based on Míchal and Nosková´s assessment of natural conditions for recreation (1970, in Kolář et al., 1981), which has been modified on the basis of a critical evaluation. The resulting value of the natural landscape subsystem potential for recreation is calculated using the formula below:

$$\mathbf{r} = \frac{(\boldsymbol{A} + \boldsymbol{B} + \boldsymbol{C} + \boldsymbol{D})}{\boldsymbol{S}} * \boldsymbol{K}$$

r – the value of the natural subsystem of the landscape potential for recreation
S – area of the territorial administration unit (e.g. municipal territory, cadastral territory and others)
A, B, C, D – values as per the table below

K (climate factor) is determined as the total annual value by summing the number of summer days with a temperature above 10°C (L) and the number of days with guaranteed snow cover for skiing (Z) and dividing them according to the formula: K = (L + Z) / 100

The resulting value of the level of protection regimes of the natural subsystem is calculated for the territorial administrative unit according to the formula below

$r_2 = (S_{BR}*5 + S_{NP}*5 + S_{CHKO}*4 + S_{PPam}*1 + S_{NPP}*3 + S_{PR}*2 + S_{NNR}*3 + S_{PPark}*3) / S$

r_2 – the value of the natural subsystem of the landscape potential for recreation

S – area of the territorial administration unit (e.g. municipal territory, cadastral territory and others

S_x – area representation of individual protection regimes within the territory of the municipality

The resulting value of the cultural-historical subsystem is equal to the sum of spot and area analysis:

$r_3 = r_{3a} + r_{3b}$

The spot analysis (r_{3a}) is calculated according to the formula:

$r_{3a} = (X_{NKP}*2 + X_{KP}*1 + X_{EP}*0,5) / S$

X_x – the number of elements in each category

S – area of the territorial administration unit (e.g. municipal territory, cadastral territory and others)

The area analysis (r_{3b}) is calculated according to the formula:

$r_{3b} = (S_U*5 + S_{KPZ}*4 + S_{PR}*3 + S_{PZ}*2 + S_{NKP}*2 + S_{KP}*1 + S_{EP}*0,5) / S$

S_x – area of declared cultural-historical value or the protection regime of the NPÚ

S – area of the territorial administration unit (e.g. municipal territory, cadastral territory and others)

The analysis of the landscape character subsystem is based on the definition of the so-called places of landscape character, which are either taken from the territorial analytical documents for the addressed area or defined on the basis of field research and more detailed study of the primary, secondary and tertiary structure. Individual landscape character areas are assigned an importance, i.e. a weighting coefficient. The weighting coefficients are chosen based on the uniqueness of the image of the place, which is influenced by the set of natural and cultural values of the area. The evaluation criteria for the designation of landscape character areas are as follows:

1. Places with average aesthetic value (meaning 1): localities differ from the surrounding matrix in terms of their vegetation cover structure and therefore their ecological value, which increases the aesthetic perception of visitors. These are, for example, forest complexes, watercourse valleys, a system of scattered greenery, vineyards, etc.
2. Places with medium aesthetic value (meaning 2): localities with a different structure of vegetation cover or different land use in relation to the surrounding landscape, which have been influenced by the historical context during their development (whether by historical event or e.g. specific land use) or by the creation of architecturally valuable buildings and urban structures, thus giving rise to harmonious relationships and the scale of the landscape.
3. Places with significant aesthetic value (meaning 3): localities with a different structure of vegetation cover or different land use in relation to the surrounding landscape, with specific natural conditions (relief, water areas), which have been co-created during the historical development by significant human activity of a predominantly profane nature.
4. Places with high aesthetic value (meaning 4): localities with specific natural conditions (geomorphological structure, water areas and streams), often in great contrast to the relief or use of the area from the surrounding landscape; historically influenced by significant human activity of a profane and sacred nature.
5. Places with above-average aesthetic value (meaning 5): Very specific localities with their natural conditions and historical development, where human activity has co-created the structure of the landscape, often in a spiritual context or in profane composite units. These sites are also protected for their aesthetic values by conservation regimes such as landscape conservation zones or UNESCO sites.

The total value of the landscape character subsystem was calculated according to the following formula:

$r_4 = (A_1 * 1 + A_2 * 2 + A_3 * 3 + A_4 * 4 + A_5 * 5) / S$

r_4 – value of the area analysis of the landscape character subsystem of the landscape potential for recreation

A_x – area of the landscape character area

S – area of the territorial administration unit (e.g. municipal territory, cadastral territory and others)

The final landscape potential for recreation result is equal to the sum of the four partial evaluation results, which can be written mathematically as

$r = r_1 + r_2 + r_3 + r_4$

In conclusion, eight classification classes of landscape potential for recreation were defined (see Table no. 2).

Tab. 1: Input factors of the landscape evaluation of the potential for recreation (Smetanová, 2023)

Category	Subcategory	Selected indicators	Indicator label or its abbreviation	significance of indicators [1]
Natural subsystem of landscape potential for recreation	A / Length of the forest edges	Length of the forest edges (km)		1
	B / Length of the water body margins	Length of the water body margins (km)		1,5
		Lenght of the watercouses (km)		1,25
	C / Geomorphology	Relief and elevation gain (height range) (hm)		1
	D / Territorial use	Built-up areas (km^2)	ZU	0
		Arabe land (km^2)	OP	0,1
		Permanent grassland (km^2)	TTP	0,3
		Gardens, orchards (km^2)	ZS	0,5
		Vineyards, respectively hopyards (km^2)	VI	0,6
		Forest community (including scattered green areas) (km^2)	LS	0,7
		Water area (km^2)	VP	1
	K / Climate	Climatic factor (coefficient of the number of days of stay)	K	
Protection regimes of the natural subsystem	UNESCO	Biospheric reserve	BR	5
	Large-scale	National park	NP	5
		Protected landscape area	CHKO	4
	Small-scale	National nature reservation	NNR	3
		National natural monument	NPP	3
		Nature reserve	PR	2
		Natural monument	PPam	1
	Protection of the landscape character	Natural Park	PPark	3
Cultural-historical subsystem	Spot analysis	National cultural monument	NKP	2
		Cultural monument	KP	1
		Expert assessment	EP	0,5
	Area analysis	World Heritage	UNESCO	5
		Landscape conservation zone	KPZ	4
		Monument reservation	PR	3
		Monument zone	PZ	2
		Nsaional cultural monument	NKP	2
		Cultural monument	KP	1
		Expert assessment	EP	0,5
Landscape subsystem	Places of landscape character	Places with above average aesthetic value		5
		Places with high aesthetic value		4
		Places with significant aesthetic value		3
		Places with medium aesthetic value		2
		Places with average aesthetic value		1

[1] The importance of monitored phenomena is classified into weight categories based on expert evaluation using the so-called scoring method. Individual weight categories are determined based on the context of individual topics. However, for the numerical evaluation of the significance of the monitored phenomena, it is common that the smaller the number, the lower the significance. This is due to mathematical calculations by multiplying the monitored phenomena by selected coefficients.

Tab. 1: Classification classes of landscape potential for recreation (Smetanová, 2023)

Category	Class	Characteristics	Point potential range (r)
Above average	I.	Areas with the best natural conditions, which together with the cultural and historical values of the area have a great influence on the formation of a specific landscape image with international significance for recreation.	40 and above
	II.	Areas with the best natural conditions, which together with the cultural and historical values of the area have a great influence on the formation of a specific landscape image with national importance for recreation.	35 – 40
Optimal	III.	Areas with high-quality natural conditions and rich historical development, which is reflected in a large concentration of cultural-historical monuments and in the formation of a unique image of the place. Large- and small-scale conservation regimes with national overlap.	30 – 35
	IV.	Areas of regional to national importance for recreation, with quality natural conditions, diverse historical development, which is reflected in the cultural-historical values of the area. They often fall under large-scale nature and landscape protection regimes, including a higher concentration of small-scale protection regimes (including cultural and historical).	25 – 30
Average	V.	Areas with quality natural conditions, contrasting relief, often with scattered vegetation elements, which together with valuable cultural and historical elements create a unique and specific image of the place. Protection regimes mainly in the form of small areas, or natural park or monument protection.	20 – 25
	VI.	An area with better natural conditions or with the presence of a lower concentration of attractive elements in terms of the cultural-historical subsystem for recreation, which create interesting places of landscape character.	15 – 20
Neutral	VII.	An area with a predominantly agricultural function, with less suitable natural conditions for the development of recreation. The concentration of cultural and historical elements of local importance is lower. Small-scale conservation schemes or sites of enhanced landscape character value may be recorded in the area.	10 – 15
	VIII.	An area with the least suitable natural conditions, often with a predominantly agricultural function and a low concentration of cultural and historical values, with only local significance. There are no significant conservation regimes recorded in the area.	0 – 10

Results

The proposed method of assessing the potential for recreation was tested in the GIS environment on two selected areas (Mladovozicko in the South Bohemian Region and Mikulovsko in the South Moravian Region). See Figure 1 and Figure 2.

Discussion

The final value of the landscape potential for recreation is the sum of the partial results. During the design of the methodology, the input data and their weighting coefficients (meanings) were adjusted several times so that the total scores in the final evaluation corresponded to the representation of the meanings of the individual subsections. The highest scores are evident in the natural subsystem. This is because the natural conditions determine the use and historical development of the area and are therefore the basis for the perception of the habitability of the landscape. The conservation regimes of the natural subsystem, the cultural-historical subsystem, and the landscape subsystem are linked systems whose contribution to the overall score is comparable to each other but generally lower than that of the natural subsystem.

Due to the recalculation of the resulting value of the landscape potential for recreation per administrative unit, in the case of large areas of municipalities (e.g. Mikulov or Mladá Vožice) this value is also dispersed even to places with a lower value. A variant of the solution could be the evaluation of the territory within a regular geometric network with possible subsequent conversion into administrative units.

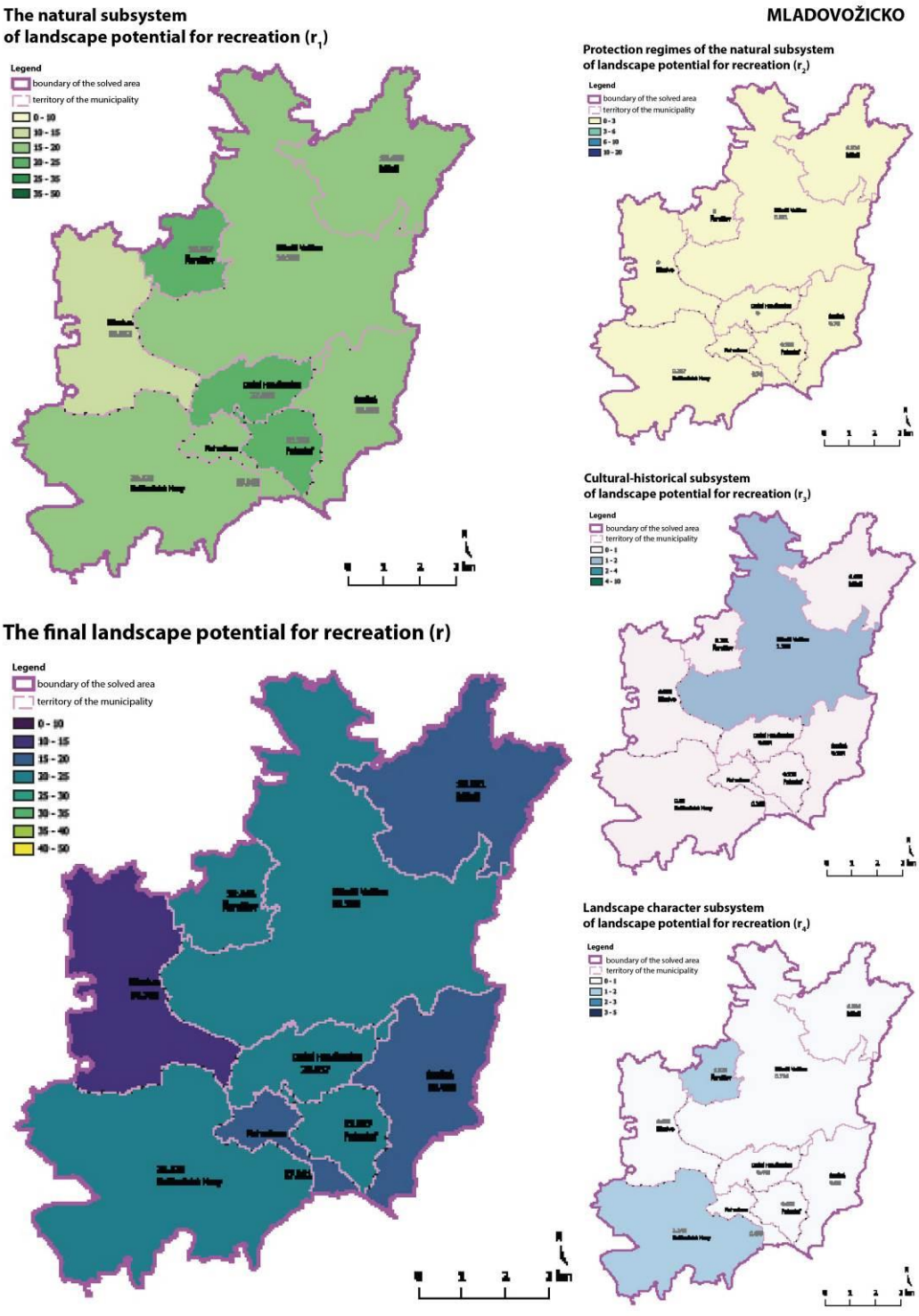

Fig. 1: The evaluation of landscape potential for recreation, Mladovožicko (Smetanová, 2023)

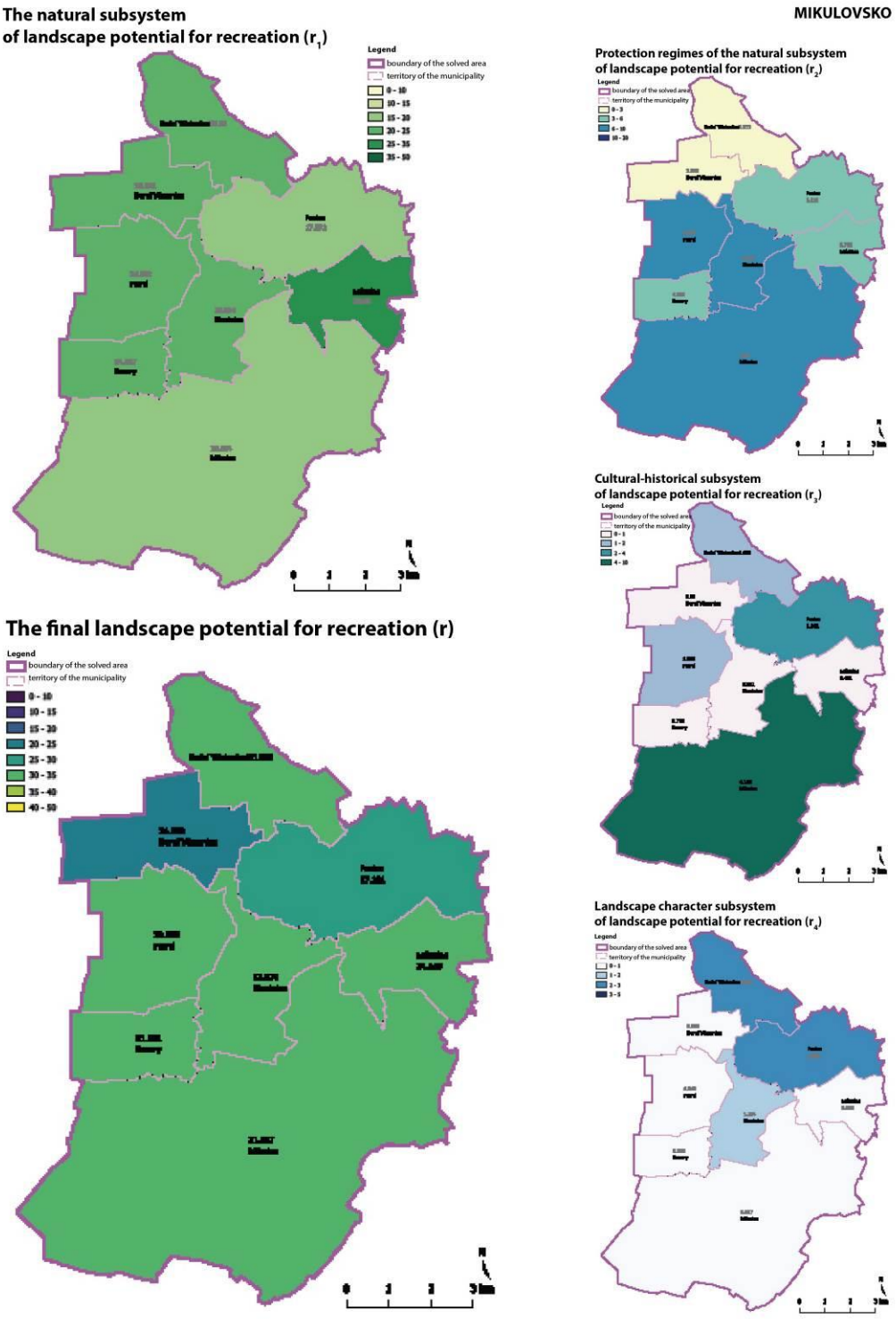

Fig. 2: The evaluation of landscape potential for recreation, Mikulovsko (Smetanová, 2023)

Conclusion

The evaluation of the landscape using the proposed methodology can serve as a basis for subsequent planning processes enshrined in Act 183/2006 Coll. on spatial planning and building regulations and subsequent management and marketing of areas from the perspective of tourism on a local and regional scale. In the joint methodological guideline of the Ministry of Regional Development and the Ministry of the Environment for the commissioning of the landscape study, the analysis and framework definition of landscape potentials (including recreational potentials) is part of the requirements for the landscape study.

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Souhrn

Předkládaný článek je velmi stručným shrnutím výsledků disertační práce na téma Metodické možnosti hodnocení rekreačního potenciálu krajiny, ve které byly v části věnované literatuře popsány různé přístupy a metodiky hodnocení krajiny z hlediska rekreace a cestovního ruchu. Na základě jejich kritického zhodnocení a testování vybraných z nich na dvou vybraných modelových územích byla vypracována vlastní metodika hodnocení rekreačního potenciálu krajiny na základě primární, sekundární a terciární struktury.

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EXPLORING THE RECREATIONAL POTENTIAL OF URBAN GAPS

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Abstract
In the process of continuous urbanization, planning errors sometimes appear. Urban structures are loosened, and places are created that do not have a clearly defined function. Empty spaces between two elements have several definitions and terms. One of them is vacant lot. Vacant lot, if they are not built up in a short period of time, they become "lost places" that are out of control and out of order and consequently create green chaos in the city. This brings a new diversity to the urban structure and the possibility of recreation near residential buildings. Vacant lots have become part of the city for many decades and many undeveloped plots of land create an oasis
of greenery within the urban environment. People have started to visit such places spontaneously and use them for daily recreation. Often it is no longer possible
to bring them back into the city system because people have become accustomed
to the greenery in their surroundings and do not always want to exchange it for a new building or a parking lot. A gap full of greenery provides a lot of freedom for visitors
to recreate, unlike a city park which is strictly regulated. In such places, animals
and plants are beginning to appear in addition to people. Many plants and animals have a presence and a safe territory in the space until the gap is of interest to urban planners or developers. At that point, the chaos becomes an asset and conservation becomes a priority for its visitors. In city centres, there is an emergence
of recreational potential that needs to be explored and redesigned through low-cost interventions in the urban environment. This reduces the costs of maintenance,
and transport for recreation.

Key words: recreation, urban voids, terrain vague, gap-sites, vacant lot

Introduction

Cities are ever-changing and dynamic, and one of their defining features is the existence of empty plots of land known as vacant lots. These parcels of land lack a clearly defined function and can often remain unutilized for prolonged periods. In urban settings, these lots may transform into abandoned spaces that are unregulated and disorganized, leading to an overgrowth of vegetation. However, they can also serve as green oases in densely populated areas, introducing new diversity into the built environment and providing opportunities for recreation in close proximity to residential structures. Public spaces have a great aesthetic role and can complement and beautify the city (Carr et al., 1992). Urban avoid are undiscovered places, which have the potential to significantly improve the opportunities for recreation in urban areas. As a result, people have begun to frequent these spaces spontaneously and utilize them for leisure activities. The purpose of this article is to examine the phenomenon of vacant lots and their potential for recreational purposes (HALUZÍK (ed.) a kol., 2020). Urban avoids, which are commonly found in urban areas, can be a result of various reasons such as property abandonment, demolition, or redevelopment. In some cases, these lots may become unsightly areas and create an unpleasant atmosphere for residents (Picon, 2000). They may also attract unwanted activities such as illegal dumping and criminal activity, which can have a negative impact on the surrounding community or citizens. We are also facing the problem that these urban voids are being used as landfills. Even though an increasing amount of waste is reused, recycled or energetically valorised. The degradation of wastes in this place results in the production of leachate and gases. These emissions are potential threats to human health and to the quality of the environment (Marišová, Fandel, 2021). Through the revitalization of these areas, we can eliminate this problem. Currently, in Slovakia, residents lack knowledge on how to manage waste. Sometimes, they use lost places or urban voids as garbage dumps, even directly within cities downtown. In general, municipal waste recycling and proper waste management rates are among the lowest in the EU in Slovakia. Landfilling is still the main strategy for handling this kind of waste. The landfill has negative economic effects in the form of resource losses and land occupation in addition to negative effects on human health and the environment (Mariš, Marišová, 2021). However, vacant lots can also provide a range of benefits, particularly when transformed into green spaces. One significant benefit of vacant

lots transformed into green spaces is that they can enhance the visual appeal of the community. By introducing trees, plants, and flowers, these lots can add colour and life to the surrounding environment, transforming otherwise dull and uninviting spaces into vibrant and lively places. Additionally, green spaces can contribute to the overall well-being of the community by reducing stress and promoting relaxation. We know exposure to greenery can improve mental health, leading to reduced levels of anxiety and depression (Haluzík (ed.) et. al., 2020). Another advantage of green spaces created from vacant lots is that they can provide opportunities for physical exercise and recreation. Residents may use these spaces for activities. These green spaces can also promote social interaction, bringing people together from different backgrounds and creating a sense of community (Clément, 2016). Moreover, green spaces created from vacant lots can have an ecological benefit by providing habitat for wildlife, reducing the heat island effect, and improving air quality (Lososová et. al., 2011). Some animal species, such as birds, move easily and can easily discover and settle in new places in the countryside. The fauna has found a natural way to colonize lost places, from the smallest insects to the largest birds. Species living in these places are not directly tied to specific environments. However, when we look at the rich diversity of vegetation in such places, we cannot expect these places to remain uninhabited (Lososová, 2011). Such places are much safer for animals than agriculturally managed fields. Plants and trees can absorb pollutants and release oxygen, leading to a cleaner and healthier environment. In addition, these spaces can help regulate the urban climate by reducing temperatures through the shading effect of trees and plants, thus mitigating the heat island effect (Vitková, 2015).

Materials and methods

The purpose of this contribution is to identify urban voids within a selected area of the city and recommend their optimal utilization. To achieve this objective, a range of map materials, spatial planning materials, a country atlas, as well as field surveys and our own photo documentation of the cadastral territory of Nitra and its immediate surroundings were necessary. We created a method for site evaluation, which we applied to the city of Nitra.

The sample area we chose is the oldest and most inhabited part of the city, characterized by architectural diversity and a high number of urban voids. This area encompasses the historic city center, block constructions, multifunctional buildings, modern urbanism, parks, and alleys. Urban voids come in various forms and sizes, ranging from small, neglected remnants of land left unmanaged to large, abandoned ruins in city centers. Methodologically, we employed methods such as the "Methods of evaluating public spaces 2015" (Vitková, 2015), supplemented by the "Pixel method" (Žolobaničová, 2022) and the "Methodology of green and blue infrastructure applications" (Haluzíková, 2021).

Results

Case study of exemplary urban void in Nitra Mostná numbers 62 and 66. The current state of the selected location can be described as an abandoned space near in the centre of the urban system. These places have peculiar non-urban characteristics, even though they are not full-fledged public spaces. They are characterized by chaos, disorder, mixed vegetation, unattractiveness, and abandonment. It is not uncommon to find litter there. They have no dominant architecture or vegetation. The proposal is to modify these places into a basic aesthetic form - by introducing organization, order, and offering them to citizens for recreation.

We categorized the possibilities of application and described them methodically - these are applications that have a favourable impact on the environment and are the first point of improvement in the selected locality. Based on the placement of these applications, the space can be further categorized and elements characteristic of closer requirements can be placed in it during interventions or landscape-architectural design. In organized passageways or inner courtyards, it is important to find a function again and make the places accessible or available.

The pixel analysis shows us that the space needs to be integrated into the urban system with permeable surfaces, retention beds, a more resilient herbaceous layer, and the planting of trees that are more suitable for the urban environment, as well as cultural vegetation. It is a very attractive place that is currently unused and empty. In a detailed design, the space will be complemented with flower beds, permeable surfaces, a tree-lined avenue, furniture, and a visual kinetic-optical element.

We found that urban avoid provide a habitat for a diverse range of plants and animals, contributing to the urban biodiversity. These spaces can serve as breeding grounds for native species, including birds and insects, and provide a haven for animals that are displaced by urban development. However, vacant lots of face challenges associated with their management and maintenance. The lack of ownership and control over these spaces often leads to neglect and illegal dumping, contributing to the creation of green chaos in the city. Moreover, vacant lots can become a safety hazard if left

unattended for an extended period, leading to criminal activities and vandalism. To overcome these challenges, the study recommends the implementation of low-cost interventions in the urban environment that promote the sustainable use of vacant lots. These interventions include the establishment of community gardens, the creation of temporary public spaces, and the installation of lighting and other safety measures. To change and update something means having the ability to understand the dynamic and living nature of our settlements. The balance between open spaces and structures, private and public spaces, and individualism and socialization can change over time. We are now moving into a new era where planning should focus on human beings and our health, as well as the health of the planet (Back Prochnow, Čibik, 2022).

In conclusion, the paper highlights the importance of urban avoids as an essential component of urban green spaces. The sustainable use of these spaces can contribute to the creation of a more liveable, sustainable, and resilient city.

Fig. 1: Typical urban urban avoid. Nitra ulica Ďurková 3. For many years, an urban gap near the city center in a lucrative location, where it already lives its own green life behind the fence

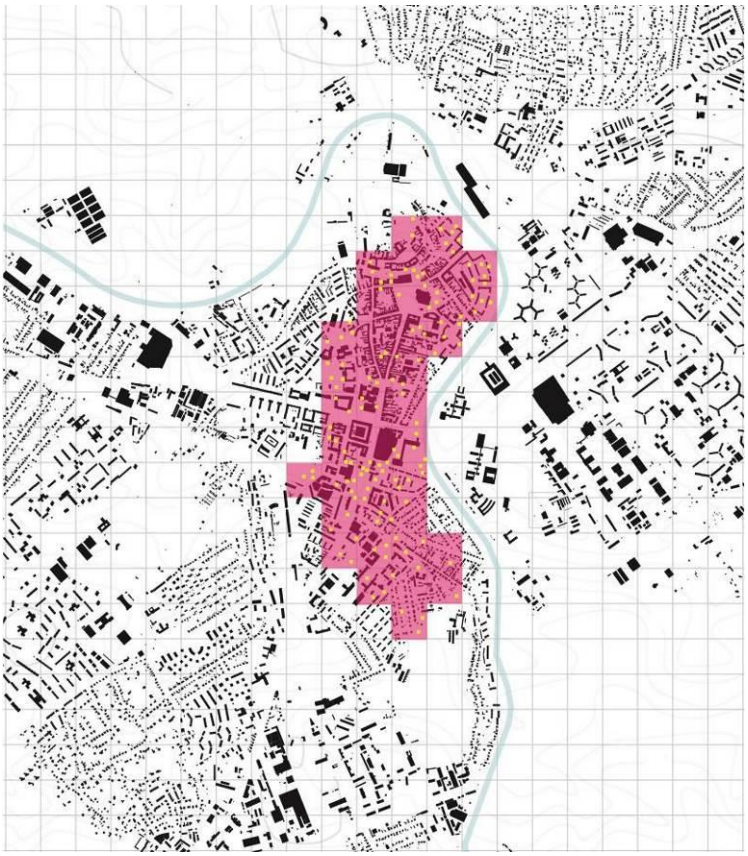

Fig. 2: Pixel analysis of the city of Nitra was conducted, with the selected location being the city center. A grid of 100x100m squares was used, with a total of 38 squares analyzed. Within the selected area, 125 lost places were identified.

Fig. 3: The selected sample area for analyzing the location is the range of addresses 62-66 on Mostná Street. On the left side is the original state, and on the right side is an example of a short-term intervention.

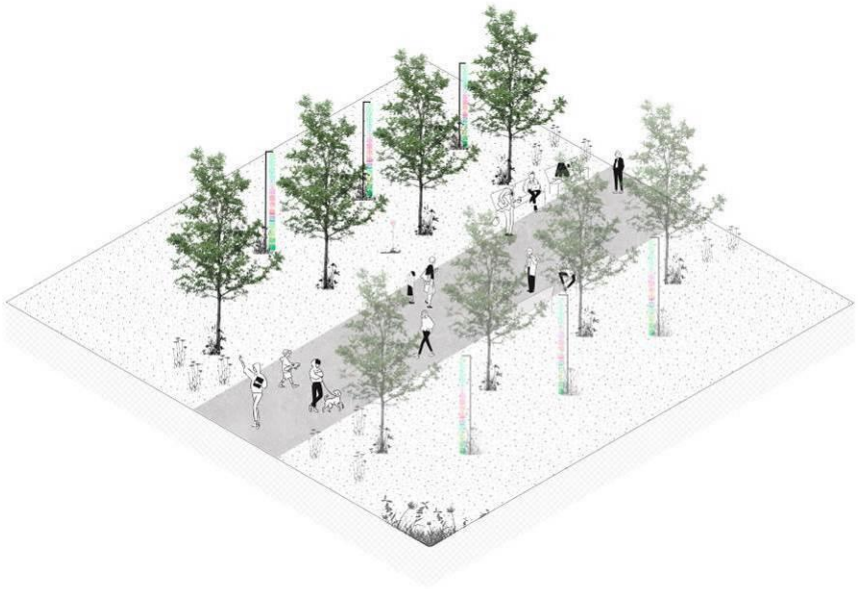

Fig. 4: Urban avoid revitalization proposal that provides residents with short-term recreation near the city center

Discussion

The city is not always homogeneous; it is composed of multiple places, and each city has its own secrets, waiting to reveal its potential. Italo Calvino believed that every city is made up of invisible places that form its character. Urban identity is not based on just one place, but on the entire society (Calvino, 1997). Currently, society focuses mainly on public spaces, parks, urban and suburban landscapes. However, lost places escape our attention, providing opportunities for development (Witting, 2004). Urban gaps bring wilderness into the hearts of cities.The phenomenon of vacant space, lost places, and urban avoidance is related to urbanism. These places are an integral product of urbanism, although an unintentional expression, and therefore, inevitable (Haluzík (ed.) et. al., 2020). Architect Michal Fisher, who, after completing his studies, was left with remnants of the Berlin Wall, commented on these places as areas where traditional urban planning rules do not apply, where plants grow, and the city's inhabitants visit, even where decay should prevail, and development should not occur (Haluzík (ed.) et. al., 2020). In cities, various accessible corners, incomplete spaces, or brownfields remain where abandoned walls of pure concrete or metal panels decay, as if life has vanished from these places, and they seem to belong to no one. However, when the community focuses on them, they can bring them to life, attracting new visitors (EZOP 257, 2016). Biologist Jiří Sádlo says that "the center represents order, and the periphery represents chaos," but order arises

from chaos, and the center always tries to maintain decorum. In contrast, peripheries have their own order in chaos, having civilized themselves in their own way without the need for architects. Thus, a subnatural landscape opens up to us, which we only need to visit (Sádlo, 2019). Various experts speak of the recreational potential of these places urban gaps, but in practice, we see that we have not yet dared to discover it. It is a different, wild world, but it works and brings a new dimension to the city's society.

Conclusion

In conclusion, through our research we have discovered the potential for underutilized spaces to provide new opportunities for urban recreation. By identifying and transforming these areas through green and blue infrastructure, cities can offer greater diversity and leisure opportunities for their residents. Integrating these spaces into the urban fabric and creating modular solutions to urbanize them provides a unique opportunity to efficiently enhance public spaces and collaborate with the surrounding environment. Urban avoids can also attract various species of plants and animals to inhabit these areas. Lost spaces, vague terrains and urban avoids have become a second world within the city, a different, wilder world that bring a new dimension of urban recreation.

Some places in masterplan are meant to be "empty" to allow the entire urban landscape to breathe (Back Prochnow, Čibik, 2022). But when they are empty for too long, they begin to go crazy and become unruly within the city system, and we cannot use them. Urban avoids full of nature provide us with new spaces to communicate with greenery. As active participants in urban life, we are not passive recipients of the surrounding events. We actively participate in the events and processes that take place in these urban avoids. The principle of returning function to urban avoids offers us recreational spaces in the centers of cities.

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Souhrn
Při zkoumání této problematiky jsme objevili potenciál prieluk pro rekreaci. Metodicky tato místa umíme identifikovat díky pixelové analýze a také proměňovat díky prvkům zelené a modré infrastruktury. Dlouhodobé nebo krátkodobé intervence na těchto mezerách jsou důležité pro města, protože poskytují novou rozmanitost v zastavěném městském systému a možnosti rekreace pro obyvatele v blízkosti jejich domovů. Začlenění těchto měst více do městského organismu a vytvořit pro ně modulární řešení, která by je dokázala o trochu více urbanizovat a poskytnout obyvatelům k rekreaci je velká příležitost. Do doby, dokud se jim nenaskytne jiná – lepší příležitost v městském urbanismu. Je to příležitost, která dokáže efektivně doplnit veřejná prostranství a lépe spolupracovat s okolím. Vandalismu je v našich podmínkách běžný, ale tato místa nepotřebují přímou ochranu. Dokážou to samé. Proto jsou méně nákladná než klasická veřejná prostranství. Díky aplikacím zelené a modré infrastruktury mohou mít i tato místa rovnocenné zastoupení a kolemjdoucí je nemusí obcházet. Zeleň v těchto místech přiláká i různé rostliny a živočichy kterým bylo místo z důvodu výstavy předtím sebráno a oni mohou osídlovat to co už člověk předtím opustil.
Ztracená místa, vágní terén, bílá místa, městské mezery, proluky se staly městem ve městě, druhým světem, městem naruby. Je to jiný, divoký svět ale funguje a když podpoříme jeho potenciál přinese společnosti novou dimenzi městské rekreace.

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EXPLORING WHITE SPACES ON URBAN MENTAL MAPS

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Abstract
There are several definitions for the term “white spaces“, and none of them can be fully identified as explicit. This collocation is accompanied by multi-conceptuality, where the group of concepts can include terms such as urban voids, terrain vague, inner periphery, places between places or even weird places. Some of the definitions are closer linked to urban planning - undeveloped places situated in a standing continuous urbanism, which are intended for future development, where is the tendency to supplement the original building so the meaningful structure would be created again. This includes places of local memory loss such abandoned blocks, gap-sites, vacant lot, mid-blocks, inner-blocks, micro spaces, courtyards, terraces, or gaps. White spaces can include specific, physical, and substantial urban places hidden under the layer of new structures. They often arise under unclear circumstances, where the cause is a poor-quality spatial planning process, or the forced, regulated, or random abolition of forgotten elements. Presented research will map such seemingly ordinary everyday spaces and review, examine, and confront diverse lost places in the city. Through several mapping methods and specific examples, the presented contribution will reveal how these places were created historically, how they are designed today, who they belong to, what functions they create in the city, or could have created, and what will happen to them in the future.

Key words:tourism, urban voids, terrain vague, inner periphery, places between places

Introduction

Lost places or white spaces without a function began to appear on the mental urban maps of Central and Eastern European cities mainly in the 1950s and 1960s. In this period, within the countries of the former Soviet Union, the cause of their origin is the onset of the socialist regime and the brutalist architecture associated with it. This mainly consisted of the demolition of old burgher’s houses and the construction of modern architecture without any sophisticated urban planning concepts. Another reason for the beginning of the creation of white spaces was the privatisation of companies and their subsequent closure, which resulted in the decay of industrial areas (brownfields) and their facilities (Hajduková & Sopirová, 2021). Lost places arise not only in the process of urban development, political or economic downfalls, but also as a result of natural disasters (Haluzíková, 2020). In Slovakia, the World War II, especially the bombing by the liberating Red Army at the end of it, contributed significantly to the creation of urban gaps and disruption of the urban structure. White spaces fulfil a predominantly eco-stabilising function in the city. Many perceive them negatively or not at all (Prochnow & Čibik, 2022). From the perspective of urban development, they are quite logically considered a problem. Although they are intended for reconstruction, many times this is not possible, or the process takes an infinite amount of time (Fornal-Pienak & Bihuňová, 2022). The reason is unsettled land, regional planning regulations, or the size of the space (Šinka et al., 2019). Nevertheless, they have a huge potential for their restoration and further development (Hajduková & Sopirová, 2021).

Materials

Lost places have different forms and size parameters - from small, neglected remnants of land left uncultivated, to large, abandoned areas (Haluzík et al., 2021). For the needs of initial mapping methods in the framework of long-term multi-level research focused on white spaces, it is necessary to define which spaces in terms of size and character can be included in the working database.
In the beginning of the contribution, places like urban voids, terrain vague, inner periphery, places between places or even weird places are mentioned. Research works primarily with definitions of spaces that can be classified according to typology. This includes places such abandoned blocks, gap-sites, vacant lot, mid-blocks, inner-blocks, micro spaces, courtyards, terraces, or gaps.

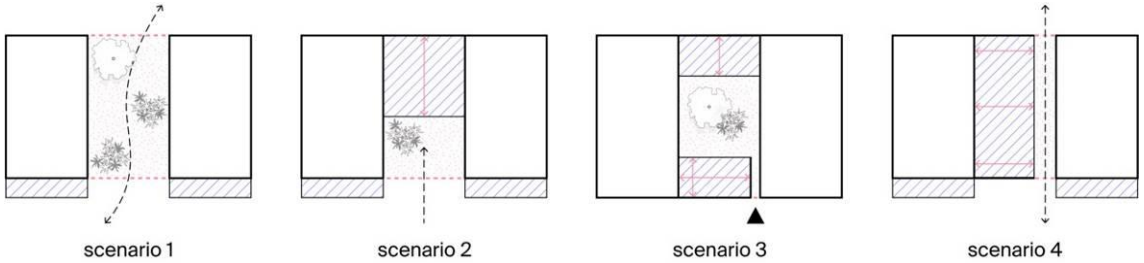

Fig. 1: Different scenarios of possible white spaces in terms of space typology

According to Haluzík et al. (2021), white spaces are divided into gaps in time (temporary vague spaces) and gaps in space (permanent vague spaces). For the purposes of this work and a simpler overview and categorisation of white spaces from the point of view of space typology, four different scenarios (Fig. 1) were developed as part of the research through graphically interpreted schemes. Scenario number one presents a typical example of a gap, where the space between two building elements is passable and open from both sides. There are cases where one of the sides remains closed by a wall with the original facade to preserve the street line. However, the space behind the remaining wall remains empty and again passable. Scenario number two presents a space where one of the buildings is set back from the street, creating a micro-space that cannot be built on. The depth of the micro-space varies depending on the surrounding buildings. Scenario number three describes an example of a hidden inner-block behind a gap between facades creating an intimate forgotten place reserved from the surrounding city life. The width of the entrance part as well as the area of the inner-block varies depending on the surrounding buildings. Scenario number four presents a typical gap between two building elements, where the space is passable and open from both sides, creating a micro-space that cannot be built. The width of the gap varies depending on the surrounding buildings. All presented scenarios are the most representative examples of the origin of white spaces in an urbanised environment stylised into simple graphic schemes for easier readability and understanding of the essence. Their morphology is of course variable.

Methods

White spaces research is a complex project that consists of four parallel activities:

a. Mapping
b. Analysing
c. Concept
d. Design

Mapping takes place in the field through direct observation methods. The basic basis for mapping is a set of well-processed historical analyses and related map materials. Archival research of historical sources and freely available documents characterising the historical development of the city's urban structure is also ongoing to clarify the progress of the urban development, historical connections, and regional planning procedures (Čibik et al., 2019). Subsequently, the research presents the basic contours of the strategic process that can be observed around the concept of white spaces at the level of the surrounding European countries and deals more closely with specific examples (Čibik et al., 2022). Through the methods of qualitative research, the white spaces that were included in the working database in the preparatory phase are studied and compared. The relations between the forgotten place and the city are also analysed in terms of physical, social, and economic dimensions in order to find out what role such space plays in the city and how it can function as its full-featured public space. Property relations are being investigated.

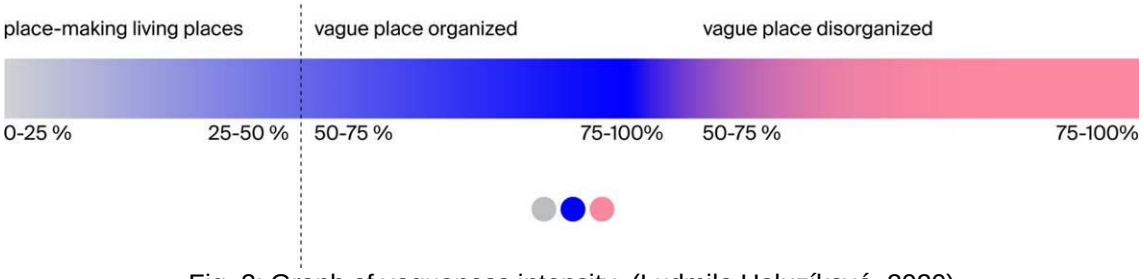

Fig. 2: Graph of vagueness intensity. (Ludmila Haluzíková, 2020)

The intensity of vagueness according to Haluzíková (2020) is one of the methods that research deals within its process. Thinking about the function and not only the type of space is essential in identifying its future use. Haluzíková divides white spaces into organized vague spaces and unorganized vague spaces. Along with the place-making living places, it is possible to evaluate and compare all the places included in the working database and to perceive their immediate surroundings through the methods of comparative research (Fig. 2).
Organized vague spaces: They represent a set of certain rules. For the place, they are tolerated in surroundings, but not frequented. In general, these are spaces, unpaved areas, which are filled with overgrown greenery, and therefore fulfil at least an eco-stabilising and aesthetic function. Alternatively, these are parking lots, paved areas in private ownership, but development intention is excluded. Such places fulfil a certain function, but if they are located in the city centre, it is appropriate to think about a new, more meaningful function.
Unorganized vague spaces: They have no function in the urban structure. Empty, chaotic places left to their own fate, waiting to be restored to at least a temporary function. Life here goes at its own pace. Place-making living places are all other space-creating places that fulfil the function of a full-featured urban public space.

Results and discussion
The research will interpret the possibilities of future use of such spaces in an innovative form, especially by graphic outputs, through various case studies applied to the specific areas, which will significantly simplify the process of restoring function as a result. The professional aim of the research is to create a typology of the territories included in the working database and the phasing of their potential temporary, short-term, or long-term use regarding financial and spatial possibilities. In duration of the research, these spaces will be gradually "occupied" through participatory processes - Research by Design, in the form of one-shot community events or short-term invasive interventions.

Fig. 3: Map of the location of the bomb impact (left). The resulting white spaces (green) after the forced liquidation of buildings and urban structures (right)

A partial output of the presented research is the result of mapping white spaces in the regional city of Nitra. In the 20th century, the city underwent a fundamental modification, which was influenced by two world wars, the regulation of the Nitra River and the period after the World War II, when the city experienced a significant urban development. However, Nitra was most marked by the raids of Soviet bombers at the end of the World War II in 1945, which completely changed the structure of the city with its streets, blocks, and squares. 53 buildings were destroyed and 301 were severely damaged (Košovan, 2012). This event, together with the removal of urban blocks after the new regime took place, resulted in the creation of several white spaces in the city centre. The map on the left (Fig. 3) shows the location of the impact of the bombs. On the right are the localities shown in green, within which the urban structure has not been supplemented since the bombing. Most of these places have the character of white spaces. The research will deal with them in more detail in its next phases.

Conclusion

Research focused on white spaces is an effort to positively recognise the potential and a constructive approach in the search for a new temporary use of these spaces. It is the opposite of ignoring the problem or perceiving only obstacles to potential solutions. In all areas mapped so far, research uncovers hidden potential. They are places that could provide a background for meaningful activities. The goal is to work with a suitable solution for the temporary as well as long-term use of these underutilised urban spaces, which have potential with several benefits applicable in social, economic, and ecological interrelated areas. By including them in the living structure of the city, it is possible to significantly support place-making functions, but also to reflect today's current ecological functions with regard to urban tourism.

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Souhrn

Bílá místa jsou prostory představující lokální výpadky paměti města a místa s obrovským skrytým potenciálem. Masivní suburbanizace je na ústupu a v době nepřetržité a intenzivní vnitřní urbanizace města, se stávají "díry" lukrativními součástmi kompaktní městské struktury zvané urbanita. Předkládaný článek popisuje úvodní metody dlouhodobého víceúrovňového výzkumu zaměřeného na právě taková místa. Sleduje postupy ověřené v praxi a přináší vlastní způsoby nahlížení na danou problematiku. V závěru odkrývá, rozeznává jejich skrytý potenciál a hledá možnosti dočasného využití a navrácení jim funkce.

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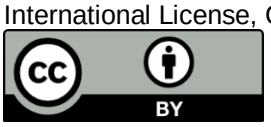

FOREST EDUCATION AS THE BASIS FOR CONSCIOUS USE OF ALL FOREST FUNCTIONS BY SOCIETY IN THE CELESTYNÓW FOREST DISTRICT

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Abstract
The Celestynów Forest District covers areas located southwest of the Warsaw agglomeration. The forests in this area are a place for recreation, hiking and cycling for local residents, a habitat for biodiversity, as well as a workplace for many people and a source of eco-friendly raw material - wood. The forests of the Celestynów Forest District serve ecological, social, and economic functions, and the task of foresters is to reconcile all of them, ensuring their sustainability for future generations. To achieve this goal, the employees of the Celestynów Forest District conduct forest education, one of the main tasks of which is to increase awareness among society about sustainable forest use. Most of the educational activities conducted by foresters are focused at the Forest Education Center in Celestynów. The center offers natural science lessons, workshops, lectures, and educational events for children, youth, and adults about nature, forests, and forestry. Forest education, combined with play and direct experience of natural phenomena, facilitates learning and understanding of processes occurring in nature, and builds responsibility for the natural environment.
A comprehensive approach, taking into account all ecosystem aspects and various social groups, allows for the effective promotion of sustainable use of all forest functions.

Key words: ecological awareness, State Forests

Introduction

Forests in Poland serve diverse functions - ecological (protective), economic, and social (Polityka ekologiczna państwa 2030, 2019). From an ecological perspective, forests shape the climate, regulate the water cycle in nature and provide habitats for many species. Forests also have significant economic importance - they provide employment opportunities and a source of renewable raw material - wood. Forests are also a place for cultural and scientific development, tourism, and recreation.

Urban forests and forests within the reach of cities are particularly important for society. These forests allow local residents to appreciate the richness of nature, have a positive effect on human psychology and improve aesthetic impressions. Urban forests also have protective functions - they protect against wind, noise and pollution as well as preserve drinking water and soil resources. Forests managed by State Forests, growing close to city borders, are mainly perceived by society as a place for rest and recreation (Jaszczak 2008).

The growing interest in forests is a challenge for modern nature and forest education. Actions to increase public awareness of rational and responsible forest use are becoming increasingly important (Płoskonka 2018). Forest education is an essential element of State Forests' activities. Its goal is to provide society with knowledge about multifunctional and sustainable forest management and to shape appropriate attitudes towards the forest environment (Będkowska 1999). Educational activities are particularly carried out by Forest Promotion Complexes - functional areas of ecological, educational and social significance, established in accordance with the Forest Act.

An example of innovative activities that increase public awareness of the benefits of sustainable forest management, nature conservation, and responsible nature interaction is the educational activity of the Celestynów Forest District (Brytan et al. 2019).

The aim of the study was to analyze the educational activity of the Celestynów Forest District and to present the issues addressed within forest education for society.

Material and methods

The study utilized internal data documenting the educational activities carried out in the area of the Celestynów Forest District. Information about the object comes from the Forest Education Program for the years 2019-2028 of the Celestynów Forest District.

Results

Celestynów Forest District covers the forest areas located southeast of Warsaw, along with the neighboring Forest Districts of Drewnica, Jabłonna, Chojnów and the Warsaw City Forests making up

the "Warsaw Forests" Promotion Complex. These forests are popular among local residents who enjoy sports, recreation and gaining knowledge as well as use of the tourist infrastructure created by the Celestynów Forest District. In response to societal expectations, the foresters have also prepared a rich educational offer. The main educational activities of the Celestynów Forest District are focused in the Forest Education Center (CEL) (Fot.1), which was opened in 2009. The center is located in Celestynów, surrounded by picturesque oak forest. The staff of the Forest Education Team conducts classes, lectures, workshops and various educational events. The center's offer is addressed to educational institutions and private individuals.

Fig. 1: Forest Education Centre (R. Brytan)

Forest education should combine theoretical knowledge with practical activities (Sobczyk 2000). The Forest Education Center has an extensive infrastructure (lecture and exhibition halls) and a rich collection of educational equipment and materials (such as field microscopes, binoculars, magnifying glasses, preparation equipment, forestry tools and wooden outdoor games), allowing for interesting classes to be organized both indoors and outdoors. Guests of the Forest Education Center can visit a sound-equipped exhibition hall presenting animals and plants inhabiting Polish forests, providing information about the environment that surrounds them. The tourist infrastructure around the main building of the center (a shelter with a campfire place, a camping site, a playground, a flower meadow) allows learning and relaxing in the company of nature.

During field classes, participants absorb knowledge with all their senses - they get to know the sounds and smells of nature, create artistic works using forest materials and taste the gifts of the forest in the form of forest fruits. Survival workshops, presenting the principles of outdoor ethics "Leave No Trace" are attractive activities for children, youth and adults visiting the center. During these lessons participants learn to light fires in controlled conditions, hang hammocks, get to know wild edible plants and also learn how to practice forest tourism without harming nature.

Every year the Forest Education Team organizes a series of open events "Do CELu po wiedzę!" (eng. "To CEL for knowledge!"), aimed at encouraging society to spend time in nature with respecting the natural environment. The events take place on selected weekends and take the form of picnics. The

lecturers are specialists from various fields who discuss selected topics including biology, nature conservation, and tourism. Additional points of these events are educational games and activities that facilitate knowledge acquisition.
In forest education it is also important to address the issue of using and managing natural resources. Participants in educational activities should be allowed to have doubts and resolve them independently, based on the interpretation of facts provided by educators (Naturski, Stępińska 2018). Lectures and discussions on topics related to forest management and protection of forest ecosystems are organized at the Forest Education Center. Participants in such activities have the opportunity to participate in debates, for example on the validity of tree felling.
Data from the educational activities reports of the Celestynów Forest District indicate that from 2009 to 2022 a total of 218,683 visitors took advantage of the Forest Education Center's offerings (Fig. 2).

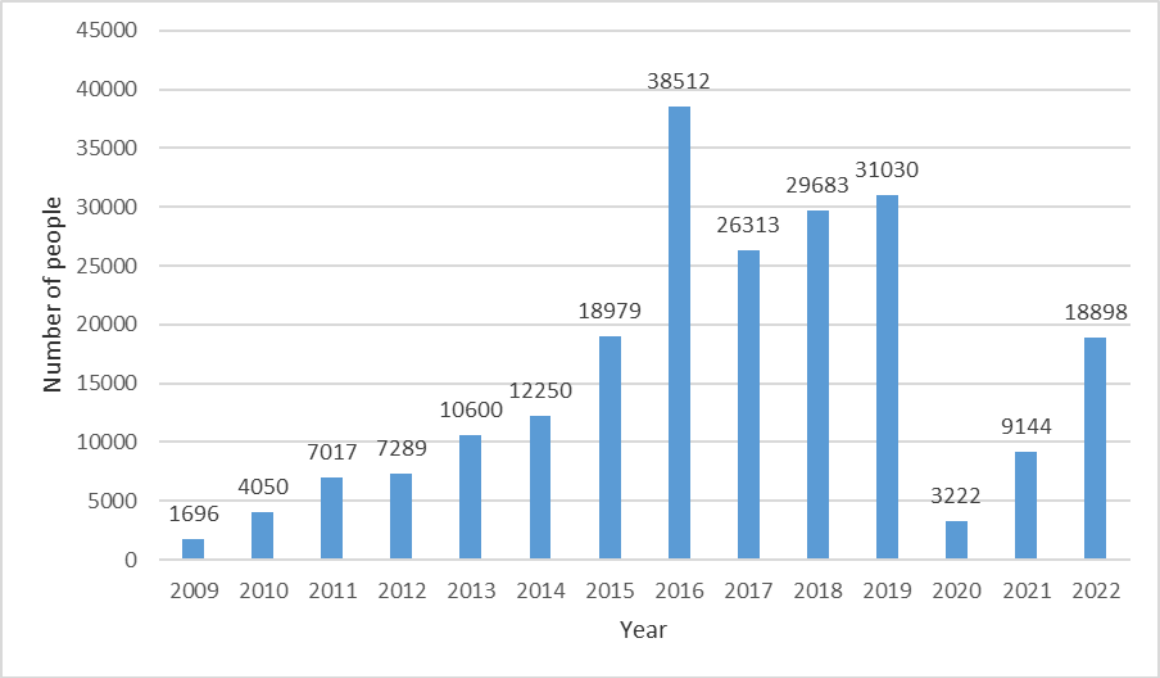

Fig. 2: Number of people using the educational offerings of the Celestynów Forest District from 2009-2022.

The sudden increase in the number of education recipients in 2016 was due to the expansion of the Forest Education Team, an increase in the number of available lesson slots, and a wider promotion of the center's activities, which enabled a larger number of interested individuals to take advantage of the educational offer. The continuous expansion of the center's educational offer with new lesson scenarios and events led to further growth in the number of forest education recipients. However, from 2020 to 2021, a visible decline in attendance at the Forest Education Center was observed on the graph due to the restrictions on the center's operations related to the Covid-19 pandemic, including the temporary suspension of lesson delivery and events, and the closure of exhibition halls for visits. After some restrictions were lifted in mid-2022, a sudden increase in public interest in participating in activities at the Forest Education Center was observed again. According to reports from the Celestynów Forestry, the main recipients of education during this period were children from primary schools and preschools (Celestynów Forestry 2022).

Conclusion

The forests of the Celestynów Forest District and the Forest Education Center are often visited by local residents, and the educational offer prepared by forestry workers is very popular. The diverse range of topics covered in the Forest Education Center's activities allows forest education recipients to learn about many aspects of the functioning of the forest environment and enables an understanding of the principles of sustainable forest management. Reaching an increasingly larger audience with forest education can contribute to raising awareness among the local community about responsible use of all the forest's functions.

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Souhrn
Lesy v Polsku plní mnoho funkcí, přičemž městské a příměstské lesy mají pro lidi zvláštní význam. Zájem o lesy roste, což představuje výzvu pro současné přírodovědné a lesnické vzdělávání. Proto je důležité úsilí o zvýšení povědomí veřejnosti o racionálním a odpovědném využívání lesů. Státní lesy provádějí vzdělávací aktivity zaměřené na zprostředkování znalostí veřejnosti o multifunkčním a trvale udržitelném lesním hospodářství a na formování správných postojů k lesnímu prostředí.
Inovativní vzdělávací aktivity v lesích v okolí Varšavy, které jsou intenzivně využívány veřejností, provádí Lesní správa Celestýnów. Hlavní činnost probíhá ve Středisku lesní pedagogiky, kde se pořádají kurzy, přednášky a různé akce. Vzdělávací nabídku připravenou lesníky využívá mnoho lidí z okolních měst a obcí. Lesní pedagogika vedená atraktivní formou přispívá ke zvyšování ekologického povědomí a znalostí o trvale udržitelném využívání všech funkcí lesa ve společnosti.

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GREEN AREAS AND NATURAL POTENTIAL OF THE POLISH CITY OF CIESZYN IN THE OPINION OF RESIDENTS

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Abstract
Cieszyn is located in the Silesian Voivodeship. It is a border town, divided into the Czech part on the west and the Polish part on the east bank of the Olza River. Cieszyn is characterized by specific physiographic features resulting from its location in an upland and hilly area, characterized by a strongly undulating platform at the foot of the Beskids, crossed by numerous ravines and watercourses in narrow valleys, which are tributaries of the Olza River. Although the city's forest cover is only 7%, and green areas cover 3% of the city's area, open areas, communal fields and meadows (45%) have great natural potential here.
Natural areas, including protected areas and green areas of Cieszyn, were assessed. Opinions of residents about the nature of Cieszyn were surveyed. You included the results of scientific research and research for the valorization of greenery, and then you used and used it to develop the natural system and indications for the management of green areas of the city

Key words: city green of Cieszyn, anthropropression to nature protection areas, the the valorization of greenery, green ifrastructure.

Introduction

The spatial structure of Cieszyn is determined by the varied topography and hydrographic system. About ¾ of the city's area is raised land. Surface waters cover 1.96% of the city's area. The city has an area of 2,861 ha, of which built-up areas account for 39.65%, and agricultural land and wasteland as much as 45.82% (GUS data, 2022).
In the natural structure of the commune, the most important role is played by the Olza valley and the Bobrówka river together with its tributaries, forming a hydrographic network connecting areas of valuable nature. A threat to the functioning of ecological corridors are ecological barriers in the form of buildings, roads and railway lines. A small share of forests (7%), woodlots (2.55%) and landscaped green areas (0.79%) causes the risk of over-exploitation and, consequently, degradation of environmentally valuable areas. This problem also applies to protected areas, including forest reserves: Lasek nad Olza, Lasek nad Puńcówką and Kopce.
One of the basic conditions for the sustainable development of a modern city is the presence of a developed and efficiently functioning system of green infrastructure (Borowski J. et. al,. 2018). Sustainable management of green infrastructure, reconciling the well-being of the inhabitants with nature protection and adaptation to climate change, is an important task for the commune (Rosłon-Szeryńska E., 2022).
Many studies prove the degradation of environmentally valuable areas as a result of anthropopressure (Rosłon-Szeryńska E., Korbik M. 2022). Existing plants, including trees, shrubs and herbaceous plants, are destroyed. Native species are displaced by expansive and invasive plants (Sikorski P., et al. 2014).
Social participation is a prerequisite for the effectiveness of public authority activities and the basis for creating an effective system for meeting social needs. The aim of the article is to assess the existing green areas and the potential of Cieszyn's natural system in the opinion of its inhabitants. The results of the survey, in conjunction with the valorization of the city's greenery, will allow the development of indications for shaping, maintaining and protecting the natural system of Cieszyn.

Material and methods

The study is based on field research carried out in 2022, where data on green areas and trees in the estates of Cieszyn city were collected. The condition of green areas was assessed using a valuation scale 1-5 points, where 1- means bad, 3- average, and 5- good conservation of the greenery. Factors such as plant condition, species composition, and the presence of invasive plants were taken into account.
Spatial analyzes of green areas were also carried out on the basis of indirect data. Strategic documents of the city and acts of local law were used to prepare the document.

The data compiled by the Central Statistical Office was used to compare the state of preservation of greenery in Cieszyn and the way of managing trees over a period of 10 years (2012-2021).
Public opinion polls on the greenery of Cieszyn were carried out. The survey questionnaire consists of 3 sections: the respondent's profile, questions about the assessment of existing green areas and the assessment of Cieszyn's natural system. Questions were sent to 166 people via the Internet. This article presents a synthesis of the most important results of the survey.

Results

Cieszyn's natural system

The natural system of the city is based on valleys of rivers and streams as well as forested and meadow areas of slopes. The area of the Cieszyn Foothills, due to fertile soils and relatively small hills, quickly began to be used for agriculture, and the vegetation was completely transformed. Semi-natural communities have been preserved in a small area and they are forests that cover about 206 ha, which is only 7% of the city's area. There are 17 types of forest habitats in Cieszyn. The largest share has: subcontinental oak-hornbeam forest (*Tilio-Carpinetum*) with common hornbeam and small-leaved linden, Norway maple and common hazel in the stand, fertile Carpathian beech forest (*Dentario glandulosae-Fagetum*) with the main share of common beech and an admixture of fir, spruce, sycamore and rowan in sapling layer. Riverside stands have special natural values, including: riparian ash and alder (*Circaeo-Alnetum*) with common ash and black alder and riparian elm and ash (*Ficario-Ulmetum campestris*) with ash, field elm and wild cherry.
A characteristic element of the vegetation of the Cieszyn Foothills are also thermophilic mid-field thickets, xerothermic grasslands and foothill hay meadows (*Gladiolo-Agrostietum*). Combined with the diversified relief, these areas increase the landscape values of the city. In built-up areas, segetal and ruderal communities as well as arranged greenery predominate (SUiKZP, 2016).

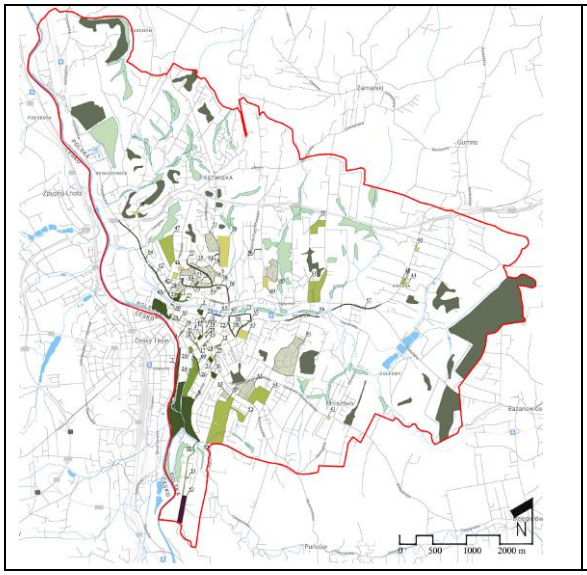

Fig. 1: The structure of green areas in Cieszyn (aut. Justyna Jastrzębska)

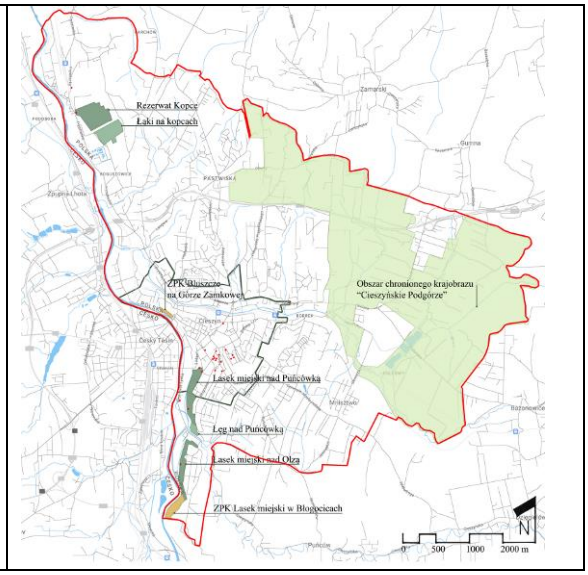

Fig. 2: Forms of nature protection in Cieszyn (aut. Justyna Jastrzębska)

The most valuable natural areas in the city are under legal protection in the form of nature reserves (26.6 ha), ecological lands (16.3 ha), nature and landscape complexes (4.5 ha), documentation sites (0.1 ha) and protected landscape area (830.8 ha). It is worth noting that these areas are made available to residents for educational and recreational purposes. There is a relatively small share of expansive and invasive trees, i.e. black locust, ash maple, red oak, bird cherry or plum. In the reserve areas in the coastal zone, invasive herbaceous vegetation and expansive species of ornamental plants can be noticed, including mainly Japanese redwood, Impatiens glandular and Virginia Cress.

Public green areas of Cieszyn

According to the Local Data Bank of the Central Statistical Office, the balance of green areas in the city is as follows (Central Statistical Office data, 2021). They occupy an area of 133.93 ha, including parks - 41.2 ha, green areas - 13.6 ha, street greenery - 4.0 ha, housing estate greenery - 49.2 ha, cemeteries - 13.8 ha, forests – 22.6 hectares. In total, this gives an indicator of only 9.8 ha/1000

inhabitants (for the county it is 166 ha, for the voivodeship 89 ha). According to the commune list, green areas and other areas maintained as green, owned by the Cieszyn Commune as of October 25, 2022, cover an area of 82.86 ha, of which almost half (39.62 ha) is undeveloped greenery. The main largest municipal parks are: 1) Park pod Wałką with an area of 8.4 ha and 2) Lasek Miejski nad Puńcówką with an area of 8.96 ha, which is both a nature reserve and a forest area. More than a hectare is occupied by the following parks: 3) Góra Zamkowa with an area of 1.109 ha and 4) Park Liburnia with an area of 1.382 ha. Less than a hectare has 5) St. Trinity (0.7082 ha), 6) Kasztanowy Park (0.824 ha), 7) Church Park (0.485 ha) and 8) Peace Park (0.299 ha). All parks are maintained by the Municipal Road Administration.

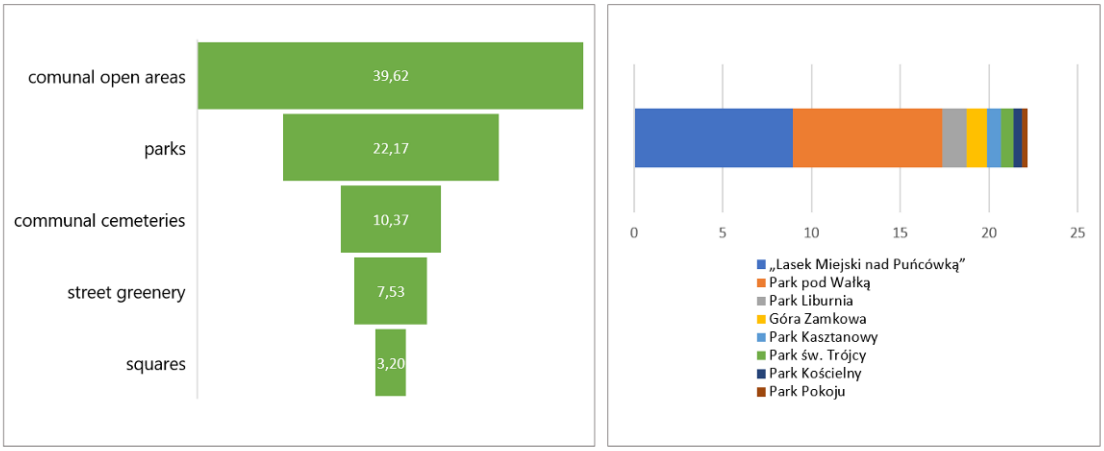

Fig. 3: Share of green areas (left) and park areas (right) in Cieszyn based on the communal list (as of October 25, 2022).

A large share of green areas is partially arranged or not arranged on municipal plots (39.62 ha maintained by MZD and 105.91 ha maintained by GK). These are spaces of various sizes, from as little as 70 m2 (plot no. 3/295) to 2.15 ha (plot no. 3/295) to 2.15 ha (plot no. 10/35). Some areas are today used as rest and recreation areas. They constitute a green potential intended for parks, squares, housing estate greenery, but also communal forests.

The development of green areas and the number of plantings and felling of trees and shrubs in Cieszyn in 2012-2021 were analysed. During this period, the area of communal forests, parks, lawns, cemeteries and street greenery did not change. Insignificant fluctuations concern the area of estate green areas. In 2012, the area of estate greenery was 38.5 ha. In 2013-2014, it decreased to 32.47 ha. In 2015, it amounted to 38.51 ha, and in 2016-2017 to 34.86 ha. From 2018 to 2021, the area of estate green areas is 37.23 ha.

Taking into account the management of dendroflora, the trend is downward both in terms of tree losses and tree plantings. Most trees were lost in 2013 (465), 2012 (244) and 2017 (223). The fewest trees were removed in 2021 (79), 2018 (81) and 2015 (112 specimens). The average number of trees removed each year in this period is 179, and 90 are planted. The number of new plantings in relation to the number of felled trees is almost twice lower, which means that one planted tree replaces as many as two removed trees. The coefficient of compensatory plantings is therefore 0.505, while it should be at least 1.0. With regard to shrubs, the situation looks favourable. The average annual replacement of one removed shrub in 2012-2017 is almost 12. The largest number of shrubs were planted in 2017 (1375 items) and 2012 (1015 items), the least in 2019 (151 items) and 2015 (201 specimens).

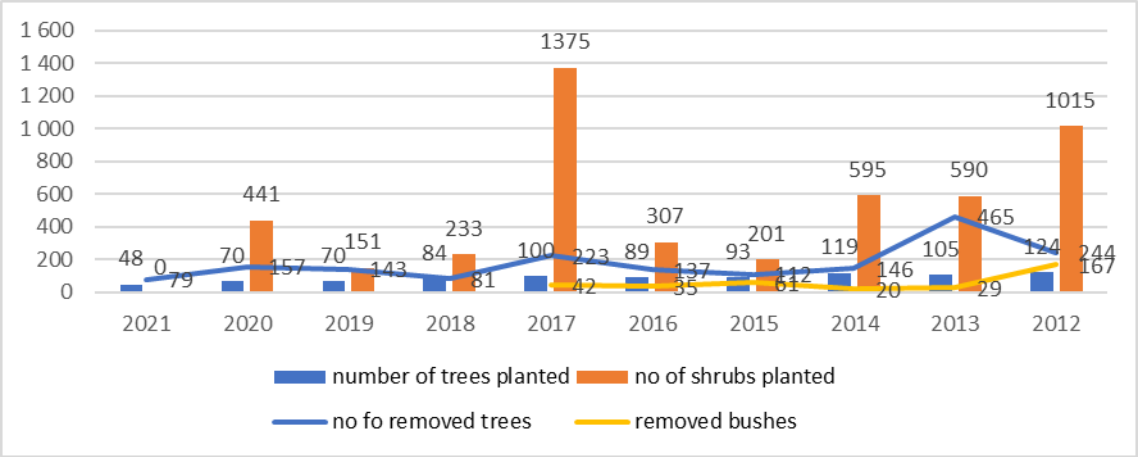

Fig. 4: Management of trees and shrubs in the commune of Cieszyn in 2012-2021 according to data from the Central Statistical Office.

Trees growing in representative places, in the downtown area, in parks and developed squares are in a relatively good health condition. Limited cuts to sanitary and emergency services are visible. Trees that are topped and deformed by excessive and incorrect reduction are not visible. Physiological drought can be noticed (especially in poplars, ashes and chestnuts, as well as in pines) and signs of fungal diseases, which is a phenomenon typical of mature and older trees growing in cities. Lindens, most species of natural maples, oaks and hornbeams are in good condition, which is influenced by soil conditions and a favorable microclimate for these trees. It should be emphasized that trees from oak-hornbeam habitats function well in Cieszyn, such as: dogwood, hornbeam, field maples, elms, as well as fruit trees (cherries, apples, hazel and walnut).
The trees in the zones of housing estates with multi-family buildings and in the greenery accompanying industrial plants are in a worse condition. There are topped, damaged trees with strong reduction and pruning of crowns. Canada poplars in particular are heavily infested with mistletoe and exude significant deadwood. Neighborhood greenery is largely coniferous and topiary plants (compact crown with a geometric habit). Often there is a lack of a well-thought-out arrangement of plants and interconnections between them.
Parks, squares and along the roads of Cieszyn lack perennial flowerbeds and ground cover shrubs that create free compositions, varied in terms of colours, scents, structure, form and shape. Due to the presence of narrow roadsides and relatively small spaces of squares, low greenery and vines are an important alternative to trees.

The green spaces of Cieszyn in the opinion of the residents
The survey was addressed to the inhabitants of the city of Cieszyn, including social activists. The largest group is represented by respondents aged 41-60 (100 people), 50 respondents were aged 25-40, 10 people aged >60.
A large group of respondents visit the green areas of Cieszyn "several times a week" (42%) and every day (35%), which means a high demand for public recreation areas. As many as 96% of respondents declared that there are available green areas within 15 minutes of their place of residence. This is a positive phenomenon for the implementation of the idea of a fifteen-minute city.
Large city parks and boulevards located along the Olza River were considered the most popular green areas by residents. In addition, downtown greenery (including Peace Park) due to its availability and rich program. Residents value green areas for the possibility of rest and recreation, accessibility and close location, equipping the areas with the necessary elements of small architecture and the presence of pedestrian and bicycle paths. Equally often, the answers included natural aspects, including the presence of trees providing shade, vegetation, including natural monuments and the presence of water (Olza river and Puńcówka stream and others). Some of the respondents emphasized the preference for wild undeveloped green areas.
The development, program, selection of plants and the state of preservation of the landscaped greenery in Cieszyn were assessed on a 5-point grading scale. The program received relatively the lowest rating (average score - 2.84 points out of 5 possible to obtain), development (average score - 2.94 points) and the condition of land (average - 2.83 points), with the prevailing assessment of these elements in the range of 1-3 points. The average evaluation of the plants was 3.1 points.

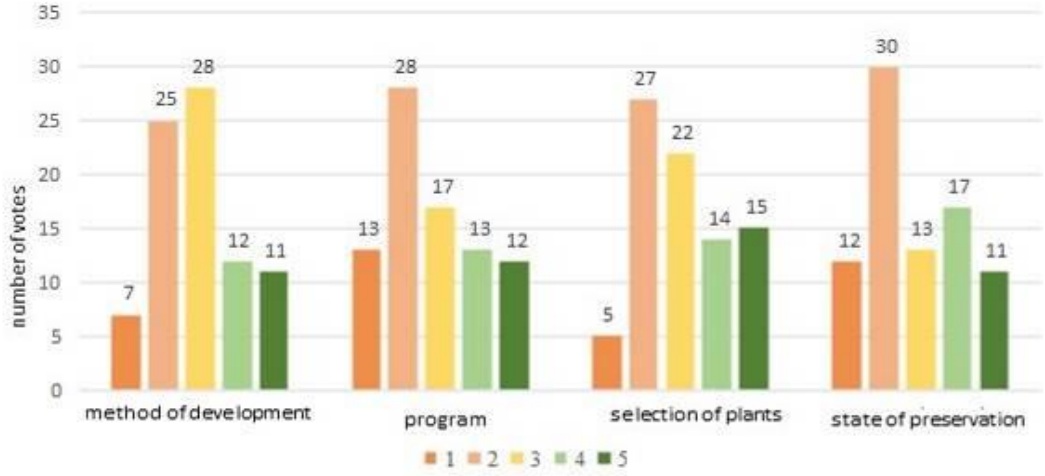

Fig. 5: Evaluation of aspects of green areas (own study, 2022).

Green areas indicated for modernization (revitalisation) included:

- revitalized market in Cieszyn - due to the lack of trees,
- parks next to churches established in the place of former cemeteries and Kasztanowy Park - due to the poor recreational program,
- intensively used facilities, i.e. the City Forest, Park Pokoju, Aleja Łyska for fear of degradation
- communal open areas, the potential parks - Cieślarówka, due to the presence of invasive plants and poor equipment (often in poor technical condition)
- an amphitheater which has lost its recreational value and is now used as a car park.

The respondents also pointed to the need to introduce trees along the streets and in housing estates, greater attention to the care and proper pruning of trees, the introduction of melliferous plants, as well as the enrichment of Cieszyn with pocket parks, benches and places for passive recreation, bicycle paths and places for jogging.

For ¼ of the respondents, the number of green areas in Cieszyn is sufficient. According to 33%, there is never too much green. For 31% of the respondents, greenery is not enough. Residents point to the need to make existing places more attractive, to protect old trees, to introduce more plants and trees, and to improve the care and development of green areas.

The open question concerning nature-related problems in Cieszyn was answered by 162 out of 166 respondents. 14 people (8.5%) indicated no problems with nature in Cieszyn. Some respondents gave several comments (tab. 1).

The open question concerning nature-related problems in Cieszyn was answered by 162 out of 166 respondents. 14 people (8.5%) indicated no problems with nature in Cieszyn. The respondents' answers were divided into 7 categories. The most frequently indicated problem is the inadequate care of greenery in Cieszyn, including: excessive logging or cutting of trees. This problem was indicated by 29% of all respondents. Excessive mowing and inadequate care of greenery were also often indicated (12% of respondents)

Deficiency and low diversity of greenery, incompetent use of natural values and low attractiveness, or the presence of invasive plants are the problems of the existing greenery in Cieszyn.

When assessing the management of greenery, the lack of a planned nature management strategy and education of residents (10.8%), the development of valuable natural areas, including meadows, as well as insufficient involvement of the city authorities in social participation were emphasized.

In the last question, the respondents were asked to answer the question about the potential of nature in Cieszyn. Only 12% of respondents do not see the natural potential in the commune or did not answer the question asked. The vast majority of respondents claim that the potential for the development of nature in Cieszyn is large or even huge, but not always used. Many people pointed out the high natural values of Cieszyn, including: its location on hills, among forests, meadows and areas by watercourses. The indications for development included the introduction of greenery to the market, construction of pocket parks, increasing biodiversity in existing parks by planting flowerbeds, increasing the degree of afforestation in the city, including along the streets. In addition: preserving wastelands, open, natural and wild areas intact or preserving and making them available to users.

According to the respondents, it is necessary to take care of the existing greenery and use its potential, exposing its values.

Tab. 1: Respondents' answers about nature-related problems in Cieszyn (own study, 2022).

Category	Problem	Number of votes	Total votes
Green spaces maintenance	excessive felling / trimming of trees and shrubs	46	94
	inadequate plant care	20	
	excessive mowing	20	
	use of herbicides	4	
	insufficient protection of trees during construction	4	
Problems of the existing green spaces	Green spaces deficiency	16	64
	neglected green spaces	12	
	incompetent exposure of natural values, low attractiveness	8	
	no new plantings	8	
	low plant diversity / shortage of natural areas	6	
	littering	4	
	expansion of invasive plants	4	
Nature management and social participation	lack of a planned strategy for nature management and education of residents	18	50
	development of green areas and wastelands	12	
	low awareness of nature and insufficient involvement of residents in the care of nature	10	
	no action on with adaptation to climate change	6	
	lack of understanding, cooperation and communication between the city and the inhabitants	4	
No problems		14	14
I have no opinion		12	12
other		6	6

Discussion and Conclusion

Although the statistics on the green areas and the degree of afforestation in Cieszyn are not optimistic, the city, both in the opinion of the residents and in the visual assessment of experts, seems green. This is mainly due to the favorable location of Cieszyn on the hills, in the valley of the Olza River and its numerous tributaries. Diversified topography allows you to borrow views with green massifs of trees, opens up the perspective of attractive landscapes, giving designers another tool for shaping space.

The diversified topography of Cieszyn and the large share of flowing waters should be considered as the basic value and determinant in planning and shaping the natural system of the city. The advantages of the functional and spatial structure of Cieszyn are the concentration of the industrial and service zone and the intensive, multi-family downtown development in the central and western parts of the city within a radius of 2 km from the main bridge on the Olza River (along the railway tracks and main road routes), leaving open areas used for agriculture with extensive homestead and single-family housing in the coastal zones of the north-western and eastern parts of the city. Cieszyn has potential in the implementation of the fifteen-minute city spatial policy.

In the opinion of some residents, Cieszyn has an optimal size, it is the green lung of Cieszyn Silesia, and in terms of natural values, it stands out positively among Silesian cities. Noteworthy are the picturesque meadows on the slopes of the hills and the plantations of watercourses. The advantage of the city is the presence of valuable nature reserves, protected landscape areas, ecological lands, nature and landscape complexes and documentation sites. However, there is a threat of their degradation with excessive use.

The advantage of large green areas (Town Forest, parks related to the Olza valley) is the combination of arranged greenery with natural (nature reserves, riparian forests) and semi-natural (meadow communities) systems. Thanks to such solutions, the recreational attractiveness of these areas increases, but also the risk of degradation of "wild" areas by destruction, trampling and encroachment of invasive plants increases. Among the invasive plants, perennials and climbers dominate: *Impatiens*

glandulifera; Japanese knotweed (*Reynoutria japonica*) and Virginia creeper (*Parthenocissus quinquefolia).*
It is recommended to carry out landscape valorization of the city, taking into account the scenic analysis. It will be the basis for assumptions regarding further development, the manner of shaping, maintaining and protecting the city's natural system.
A change in the management of trees in the city of Cieszyn is necessary. Trees should not decrease due to the low forest cover of the commune. Proven and already well-functioning species in the city should be used due to the specificity of soil and habitat conditions. The choice of plants should strictly depend on the type of soil.
Topographic and landscape diversity as well as the intensity of use of facilities should be taken into account in the management of green areas. Intensively used facilities will require intensive care and higher maintenance costs. Extensive zones (e.g. meadows, herbs, etc.) with limited access are allowed in these facilities.
If the recreational functions of the greenery maintenance zone (e.g. in the City Forest) are combined with the protection of the nature of riparian forests or nature reserves, expenditures for care and protection through the protection, trampling and expansion of invasive plants in the naturally valuable zone should be added.
It is advisable to shape new green areas and revitalize the existing facilities by enriching the recreation and leisure program and increasing biodiversity. The basis is actions that use the climate-creating role of greenery in the field of mitigation and adaptation to climate change.

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Souhrn

Výhodou rozsáhlých zelených ploch (Městské lesy, parky navazující na údolí Olzy) je kombinace upravené zeleně s přírodními (přírodní rezervace, lužní lesy) a polopřírodními (luční společenstva) systémy. Díky takovému řešení se zvyšuje rekreační atraktivita těchto ploch, ale zároveň se zvyšuje riziko degradace "divokých" ploch ničením, sešlapáváním a pronikáním invazních rostlin. Mezi invazními rostlinami dominují trvalky a popínavé rostliny: Netýkavka žláznatá (Impatiens glandulifera), křídlatka japonská (Reynoutria japonica) a devaterník pýřitý (Parthenocissus quinquefolia).
Doporučuje se provést valorizaci krajiny města s přihlédnutím ke krajinářské analýze. Ta bude podkladem pro předpoklady dalšího rozvoje, způsobu utváření, udržování a ochrany přírodního systému města.
Je nutná změna v hospodaření se stromy ve městě Cieszyn. Stromů by nemělo ubývat vzhledem k nízké lesnatosti obce. Měly by se používat osvědčené a ve městě již dobře fungující druhy vzhledem ke specifičnosti půdních a stanovištních podmínek. Výběr rostlin by měl striktně záviset na typu půdy.
Při správě zeleně by měla být zohledněna topografická a krajinná rozmanitost a intenzita využívání objektů. Intenzivně využívaná zařízení budou vyžadovat intenzivní péči a vyšší náklady na údržbu. V těchto zařízeních jsou přípustné extenzivní zóny (např. louky, byliny atd.) s omezeným přístupem.

V případě kombinace rekreační funkce zóny údržby zeleně (např. v Městských lesích) s ochranou přírody lužních lesů nebo přírodních rezervací je třeba připočítat výdaje na péči a ochranu prostřednictvím ochrany, sešlapávání a rozšiřování invazních rostlin v přírodně hodnotné zóně.
Je vhodné utvářet nové plochy zeleně a revitalizovat stávající zařízení obohacením rekreačního a volnočasového programu a zvýšením biodiverzity. Základem jsou opatření, která využívají klimatotvornou roli zeleně v oblasti zmírňování a přizpůsobování se klimatickým změnám.

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HEALTH VALUES OF FORESTS IN THE OPINION OF POLISH RESIDENTS

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Abstract
Scientific evidence pointing to the therapeutic, health functions of forests has been growing recently. It has already been repeatedly proven that visits to nature contribute to the restoration and preservation of people's mental health, as well as stress reduction. With the growing scientific evidence of the therapeutic properties of the natural environment, the importance of the forest in promoting public health is increasing. Public awareness of the health-promoting importance of forests is also growing. The results of our research show that people are aware of the importance of forests for their health, noting that these benefits fall into both physical, mental and social well-being categories.

Key words: Human well-being, health benefits, forest ecosystem services, social preferences

Introduction

One of the most visible global changes in the world is the increasing urbanisation. It is estimated that more than 80% of Europe's population will have live in urban areas by 2030. Urbanisation has brought many benefits to people such as increased well-being and improved provision of social services (education, administration, health, etc.) to communities. However, with advances in technology and civilisation, people are gradually starting to feel more and more disconnected from the natural world, with very negative consequences for health. Today, the major health problem of the 21st century is NCDs (non communicable diseases). The five 'major' NCDs are considered to be cardiovascular diseases (CVD), diabetes, cancer, chronic respiratory diseases and, more recently, mental disorders, including depression, which currently affects 7.2% of EU citizens. Underpinning many NCDs is obesity, which has been recognised as a chronic disease in its own right in many countries.
There are currently more than 38 million people living in Poland. The predominant group is people aged 15 to 64, but there is a clear increase in the proportion of older people, who today account for almost 19% of the total population. People's health is the subject of many analyses. Data on diseases are recorded by the Central Statistical Office. They show that the largest number of people recently died of cardiovascular diseases. Immediately behind them, the largest group were deaths from cancer and covid 19. There is also a large group of deaths from unexplained causes. Among the sick, a large group are people struggling with depression. Overweight is also a problem. Why are forests important for the preservation and protection of citizens in Poland? Firstly, Poland is dominated by public forests, largely managed by the State Forest Enterprise. By law, public forests are open to the public. Exceptions are forest crops, experimental areas, river headwaters. Secondly, Poland's forests account for nearly 30% of the The purpose of our survey was to determine the views of Polish people on the importance of forest ecosystem services for improving human healthcountry's total area, so they are in close proximity, easy to reach.

Material and methods

The research material consists of the results of questionnaire surveys, conducted in 2020 on the territory within the range of the Regional Directorate of State Forests (RDSF) in Radom, in the central-eastern part of Poland. Due to the ongoing pandemic, it was decided that an online survey would be conducted. A link to the survey, created on the Webankieta platform, was made available on social networks such as Facebook, Instagram and Twitter, as well as on the websites of the RDLP in Radom. An advantage of the online format was the elimination of the problem of unanswered questions, as moving to each next question required answering the previous one. The survey was open from July to September 2020. Respondents were asked to provide information on their gender, age, level of education, place of residence, number of children in the family. The questionnaire consisted of seventeen content questions, including two questions on the health benefits provided by forests. The results obtained are discussed in this manuscript. Statistical analysis was conducted using the Chi2 test.

Results

A total of 1402 respondents took part in the survey, including 655 women (46.7%) and 747 men (53.3%). Respondents aged 31-40 years were the most numerous group (31.1%). Respondents aged 18-30 accounted for 27.8% of respondents, those aged 41-50 (24%), and those aged 51 and over 17.1% of respondents. Urban residents were the most numerous group. The study involved 807 city dwellers (57.6%), of whom 18.6% of the respondents came from small cities (up to 15,000 inhabitants), 23.2% from medium-sized cities (15-100,000 inhabitants) and 15.8% from large cities (over 100,000 inhabitants). 42.4% of respondents came from rural areas. The vast majority of respondents had a university degree (64.6%). Secondary education was held by 32.0% of respondents, and those who finished with a primary education made up only 3.4% of respondents. The most numerous group were respondents with children (62.1%), of which two children in the family were declared by 47.4% of respondents; three and more children by 14.7% of respondents.

Research results indicate that forest provides a variety of benefits to people. Respondents mainly pointed to mental health benefits (41.6%), physical health benefits (31.5%), increases knowledge of the forest (11.5%). Forest, in particular recreation in the forest also allows people to develop passion and interests (10.4%) and provides better social integration (5%). Based on statistical analysis using the Chi2 test, the following socio-demographic variables were found to differentiate respondents' views on the importance of the forest's health function: gender (p=0.0397), education (p=9.60E-08) and family situation (p=0.0057). In the male group, the percentage indicating mental health benefits was lower than in the female group (36.3% and 47.8%, respectively). With higher education, respondents' belief in the importance of the forest's health functions and the forest's provision of mental health benefits increased, while the percentage indicating benefits such as "increased knowledge of the forest" or "nature, and social integration" decreased. Among those with 1-2 children and among those without children, the opinion that contact with the forest provides mental health benefits prevailed, while physical health benefits were more important among respondents from families with many children.

Forests are important for human health because improving social relations and environmental behaviour. For a large proportion of respondents (58.9%), spending time in the forest helps them to improve their relationships with loved ones. They also believe (30.4%) that being in the forest leads to behavioural chenges. Health and well-being are associated with maintaining good social relationships. And it is an opportunity to meet new people (10.7%). Interestingly, women (23.2%) were more likely than men (14.9%) to emphasize the importance of the benefit of building ties with family/friends (p=0.0012). It also appeared more often in the responses of residents of rural areas (21.5%) and small towns (19.6%) (respectively: medium cities: 15.3% and large cities: 15.4%) (p=0.006).

We also asked respondents about the benefits the forest provides in terms of mental health. According to the respondents staying in the forest increases their well-being (47.3%). A very large group (42.5%) said that going to the forest has a stress relieving effect. For 10.2% of respondents it was important that contact with the forest allows them to maintain emotional balance.

Discussion

As Hartig et al. (2014) notes, people cannot stay healthy without clean air, clean water, food and other resources provided as "ecosystem services." Forests contribute significantly to maintaining and protecting human health. These benefits are related to the fact that forest ecosystems are an important place for recreation and leisure, the realization of physical activity, contribute to building good social relations and the formation of pro-environmental behavior. As our survey shows, health benefits are very strongly associated with recreation in forest areas in the opinion of respondents.

There are many studies that have analyzed the effect of contact with nature, the impact of the forest on people's mental health. Most of this type of work is based on psychological tests, analysis of physiological parameters (blood pressure, heart rate, skin thermal conductivity, salivary cortisol, etc.). This type of research shows exactly what is the effect of the forest on humans. Interestingly, most of these works examined the regenerative properties of the forest environment undertaken as a result of short-term recreational activities (Bielinis et al. 2020, Janeczko et al. 2020) or much longer - several-day recreational programs (Han et al. 2016). These studies provide detailed data on how different variations of the environment affect mood, the increase of positive or negative feelings, anger, depression, attentiveness, vitality, etc.

There is already sample evidence that nature can help people restore, regenerate psycho-physical forces. Previous studies have shown that recreation in the forest contributes to feelings of vitality (Bowler et al. 2010, Janeczko et al. 2019). Nature, by helping people maintain the adaptive resources needed to cope with the demands of life, can reduce the risk of chronic stress-related diseases, as well as promote a number of intermediate outcomes, such as increased subjective well-being (Hartig

et al. 2014). Previous research has already provided credible evidence of the benefits of contact with nature to avoid health problems associated with chronic stress and attention fatigue. Studies by Korpela et al. (2008), Pasanen et al. (2018), Jung et al. (2015) have shown that people's moods and positive feelings increase in natural areas. Jung et al. (2015) found that negative emotions were generally lower in the forest than in the city. Natural areas allow people to move away from stressors and/or reduce their perceptual range.

Rather, our research shows what is the general view of people about the health benefits provided by the forest and what is their awareness of the relationship between the forest and human health. Based on the results we can say that the awareness is quite high. That people understand that they need contact with the forest, they also know that physical activity is a prerequisite for health. The forest, especially those in the range of agglomerations, is also increasingly an arena for physical activities undertaken as part of organized sports (Janeczko et al. 2019). In Poland, the past few years have seen a significant increase in running, biking and walking events in forests in the vicinity of urban agglomerations.

Our results show that people have a need to seek information that is helpful in achieving better health and a longer life. They also see contact with the forest as an opportunity to build good relationships with their environment. Health and well-being are associated with maintaining good social relationships. Social isolation has already been proven to be a known predictor of morbidity and mortality (Nieminen et al. 2010). Green space can play an important role in supporting social interaction. Son and Ha (2013) found that increasing contact with nature helps improve social and emotional interactions in modern society, helps promote an overall sense of community, reduces loneliness and increases social support. For this reason, green spaces, including forests, are particularly important in tourism and recreation for people with disabilities and the elderly (Łobożewicz 2000, Woźnicka 2014). There are also studies that have shown that exposure to the forest can increase people's cooperation and involvement in solving environmental problems (Zelenski et al. 2015).

Conclusion

Changes in nature, environmental pollution are linked to many diseases. Forests contribute significantly to the maintenance and protection of human health. People are aware of the enormous importance of forests for their physical and mental health and also human well-being. With increasing scientific evidence on the therapeutic effects of the forest environment, the importance of the forest in promoting public health is growing. The links between the natural environment and human wellbeing is important to many organisations working within the public health and environmental sectors. Such activities in Poland are also undertaken by the State Forests. Thanks to ongoing programmes such as: "Train in the forest" or "I run because I like forests", as well as "Freedom is in nature" people are encouraged to do physical activities. Project "Good from the Forest" is also part of a society-wide campaign to raise consumer awareness, encourage the public to choose organic, natural and healthy food. Also Polish national parks engaged in promoting contact with nature. At the same time, there is a lot of other entities that, taking advantage of the wave of public interest in the health functions of forests, organise various types of holidays, walks related to the idea of forest bathing. In Poland, there is a growing number of organisations providing training, awarding various certificates and collecting money for this type of activity. These companies do not participate in the maintenance of the recreational infrastructure, in the breeding and management of the forest.

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Souhrn
S přibývajícími vědeckými poznatky o léčivých účincích lesního prostředí roste význam lesa pro podporu veřejného zdraví. Tento článek prezentuje výsledky dotazníkového šetření, které bylo provedeno v Polsku v roce 2000 mezi více než tisícovkou zájemců o rekreaci v lese. Výsledky ukazují, že lidé si uvědomují význam lesů pro své zdraví. Respondenti poukazovali především na blahodárné účinky na duševní zdraví, tělesné zdraví a zvyšování znalostí o lese. Lesy jsou důležité pro lidské zdraví, protože zlepšují sociální vztahy a ekologické chování. Podle respondentů pobyt v lese zvyšuje jejich pohodu, působí proti stresu a umožňuje jim udržovat emocionální rovnováhu. Je třeba předpokládat, že toto vysoké povědomí o prospěšnosti kontaktu s lesem je jedním z faktorů, které přispívají k rostoucímu významu sociálních funkcí lesa

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HISTORICAL EVOLUTION OF FESTIVALS IN GUIMARAS ISLAND, PHILIPPINES: ITS IMPLICATION TO TOURISM INDUSTRY GROWTH

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Abstract
This study was conducted to determine the different festivals in Guimaras and their significant contributions to the tourism industry through a qualitative-quantitative research design. The data were gathered from the people in the tourism industry in the province of Guimaras and in five municipalities in the province for the past five years using focused group discussion. Result of the study showed that there were festivals in the provincial, municipal and barangay levels. It also revealed that festivals in this island province contributed to its visitors' arrival. Thus, tremendous increase in the number of local excursionists which ranked first is noted for the past five years. Local tourists ranked second, foreign excursionist ranked third and foreign tourists ranked fourth. When monthly arrivals are taken into consideration, the month of May ranked first, March ranked second, and April ranked third. Another contribution of festivals in the province was evident in its notably increasing agri-trade and tourism fair sales for the past five years.

Key words: festivals, evolution, excursionists, tourists

Introduction

A festival is known to most people as a day of celebration or festivities. There are many festivals celebrated throughout the world and the Philippines is no exception. Often, a province, town, or municipality celebrates a festival in the Philippines. A festival is viewed by the researcher as a means of sharing the history, identity and values of the place and people to others and the younger generations. A festival is also a way to attract visitors to come to the province, town, or municipality therefore a festival has an impact on the hosting place. Since festivals are celebrated throughout the world it is very important to learn, understand, and measure its impacts on the hosting community. Falassi (1987) defines a festival as an event, a social phenomenon, encountered in virtually all human cultures. The colorful variety and dramatic intensity of its dynamic choreographic and aesthetic aspects, the signs of deep meaning underlying them, its historical roots and the involvement of the "natives" have always attracted the attention of casual visitors, have consumed travelers and men of letters alike. Furthermore, Falassi explained that festivals in the social sciences are simply taken from common language, where the term covers a constellation of very different events, sacred and profane, private and public, sanctioning tradition and introducing innovation, proposing nostalgic revivals, providing the expressive means for the survival of the most archaic folk customs, and celebrating the highly speculative and experimental avant-gardes of the elite fine arts. Etymologically the term festival derives ultimately from the Latin festum. But originally Latin had two terms for festive events: festum, for "public joy, merriment, revelry." And feria, meaning "abstinence from work in honor of the gods. Both terms were used in the plural form, festa and feriae, which indicates that at that time festivals lasted for many days and included many events. In classical Latin, the two terms tended to become synonyms, as the two types of events tended to merge (Luna, 2015).

Guimaras Island is known for many of its festivals which were celebrated by the people in the community. These festivals portray religion, practices, norms and even attitudes of the people in the province. There are many sources of the idea of celebrating the festivals. Some focus on food associated with harvests which are blended with the festivals. Festivals create more opportunity for people to earn a living for it can be a source of fund or income generating projects of the province. These celebrations offer a sense of belongingness for religion, social, and many more.

This study was anchored to the Attribution Theory which explain the world and to determine the cause of an event or behavior (e.g. why people do what they do).

The researchers as witnesses of how valuable festivals for people are, were inspired to conduct this study in order to determine the effects of festivals to economic way of life of the people in Guimaras.

Material and methods

Guimaras Island is considered one of the exotic islands in the Philippines. It is located in the northwest part of the Philippines archipelago called Visayas. The original name was Himal-us but was changed to Guimaras after the folktale of the ill-fated lovers named Princess Guima and the slave Aras, who defied tradition for their romance. The island was once a sub-province of Iloilo but by virtue of R.A. 7160 it was proclaimed a regular province on May 22, 1992.

The province is basically agricultural, with palay, coconut, mango, vegetables, livestock, poultry, and fishing as major products. Likewise, the major industries in the island are tourism, fruit processing, coconut processing, handicrafts making, mining, and lime production (http://www.tourism.gov.ph/SitePages/InteractiveSitesPage.aspx?site ID=36, retrieved August 2016).

Qualitative-quantitative research design utilizing the data that were taken as a result of focus group discussion with tourism officers in the tourism industry in addition to the secondary data obtained from the provincial tourism office and five Municipalities of the province of Guimaras who served as the respondents of the study.

Objectives of the study have been as follows:

1. To determine the different festivals in Guimaras.
2. To identify the proponents of the festivals.
3. To evaluate the implications of the festivals in the Island of Guimaras to the Tourism Industry growth of the province.

Results

A. Festivals on Guimaras

Next table (table 1) presents the overview of all the festivals held on Guimaras over year.

Tab. 1: Overview of all the festivals held on Guimaras over year

A. The province of Guimaras festivals
1. Manggahan Festival - gives emphasis on the promotion of Guimaras Mango
2. Pagtaltal sa Bala-an Bukid - country's religious festival
3. Padyak Kaligtasan – sport (biking) festival
4. Kasadyahan sa Kabukiran – environmental festival focused on greening of Guimaras
B. Municipal Festivals
5. Palayag Festival (Buenavista) - in honor of the town’s Patron Saint Sr. Sto. Nino
6. Mangggahan sa Kabanwahanan (Buenavista)
7. Sadsaran Festival (Nueva Valencia) – dancing festival
8. Manggahan sa Kabanwahanan (Nueva Valencia)
9. Balsahan Festival (Sibunag) - the foundation day of the Municipality
10. Manggahan sa Kabanwahanan (Sibunag)
11. Bulantihan Festival (Jordan) – celebration of harvest
12. Manggahan sa Kabanwahanan (Jordan)
13. Asinan Festival (San Lorenzo) – food festival
14. Manggahan sa Kabanwahanan (San Lorenzo)
C. Barangay Festivals
15. Pamalandong sa Tamborong (Tamborong) - religious festival
16. Banigan Festival (Sapal) – local products promotional festival
17. Harvest Festival Suclaran
18. Saranggola Festival (San Roque) - kite flying festival
19. Mini Paraw Festival (Rizal)
20. Fluvial Procession (Sto. Rosario) – religious festival
21. Worship Festival sa Semana Santa sa Buenavista – religious festival
22. Ambolong Festival (Salvacion) – healing and treatment festival
23. Paskwa sa Barangay in Salvacion – pre-Christmas festival
24. Buena Paskwa (Buenavista) - municipality's Christmas celebrations
25. Binagtong Festival (Cabalagnan)
26. Pangasi Festival (Lanipe) – farming and spiritual festival
27. Sibiran Festival (Dolores) – fishing festival
28. Bayuhan Festival (Salvacion) - rice and food processing festival

29.	Niyogyogan Festival (Oracon) – agricultural and farming festival
30.	Karosahan Festival (Napandong) - agricultural festival
31.	Manokan Festival (Concordia) – agricultural and livestock festival
32.	Kadagatan Festival (San Roque) - fishing and marine festival
33.	Panakayon Festival (La Paz) - fishing and marine festival
34.	RARA Festival (Calaya) – local products promoting festival
35.	Sinulog Festival in Oracon
36.	Patubas Festival (San Isidro) –
37.	Panginhas Festival (Alegria) – marine harvest celebrating festival

B. Implications of Festivals on Tourism Industry Growth of the Province

Figure 1 shows the visitors arrival in the province of Guimaras for the period 2012 - 2016.

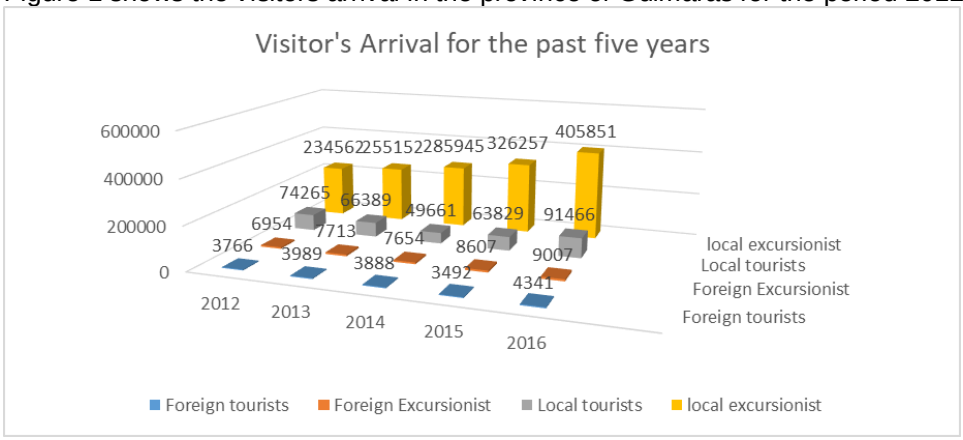

Fig. 1: Visitors' arrival in the province of Guimaras for the period 2012 - 2016

Figure 2 shows the visitor's arrival in 2016 per month in comparison with festivals running in adequate month.

Fig. 2: Visitor's arrival in 2016 per month

Figure 3 presents the Agri-trade and Tourism Fair Sales of the province of Guimaras for the past six years. Based on the gathered data, it was shown that there was a notable increase of sales from 2014 to 2017.

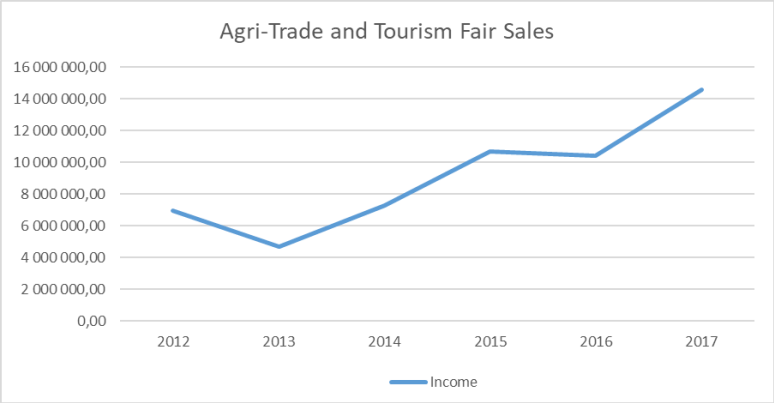

Fig. 3: Agri-trade and tourism fair sales 2012 – 2017 in thousands PHP

Discussion

It was shown in the figure 1 chart that higher number of visitors' arrivals represented the local excursionists or those visitors coming outside Guimaras and within the Philippines and have stayed in less than 24 hours in the destination; tremendous increase in the number of local excursionists is also noted for the past five years. Local tourists ranked second in terms of arrival in the province; records showed that there was a notable increase of arrivals of local tourists from 2014 to 2016. Foreign excursionists ranked third in terms of arrival in the province; a tremendous increase of arrival is also noted from 2012 to 2016. Foreign tourists ranked 4th in terms of the number of arrivals; an increase of arrival is also noted in 2016.

It was shown in figure 2 chart that in terms of monthly monitoring of the arrival of visitors, the month of May ranked first, March ranked second, and April ranked third while in terms of the number of festivals, the month of April ranked first, January and February ranked second, and March ranked third. Hence, it was shown in this chart that the number of festivals does not contribute to the number of visitors arrival in the province.

Even though there is not obvious significant relation between the number of festivals taking place on Guimaras and the visitors coming to Guimaras, the increasing trend of visitor numbers is possible to observe within several last years. It corresponds also to the regular annual increments of agri-trade and tourism fair sales returning back to the local economy. Comparing the results given in figure 1 and 3 it seems that predominantly the local visitors have caused mentioned increasing trend.

Conclusion

The province is rich in festivals that showcase the culture of the people in Guimaras. The festivals in the province of Guimaras contributed to the visitors' arrival when taken but the visitors' arrival is not dependent on the number of festivals when monthly monitoring is considered. In addition, festivals contributed to the increase in agri-trade and tourism fair sales for the past five years.

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Souhrn

Na ostrově Guimaras, severozápadní Visayas, Filipíny byl zkoumán vztah mezi množstvím festivalů pořádaných na centrální, regionální a místní úrovni a počtem přijíždějících návštěvníků ostrova či turistů. Zkoumán byl rovněž potenciální přínos festivalů, které jsou většinou orientovány na propagaci domácích produktů jak zemědělských, tak rukodělných na výnosy místního turistického ruchu, resp. místních farmářů.

Výsledky ukázaly že v posuzovaném období (2012–2016, resp. 2017) se návštěvnost ostrova signifikantně zvyšuje, nicméně festivaly jako takové nemají na tento trend významný vliv. Zdá se, že jejich význam je výrazně lokalizován do místních komunit.
Z hlediska struktury návštěvníků převažují návštěvníci či turisté z Filipín. Jejich zvyšující se počet v čase logicky přináší zvyšující se výnosy z prodeje výrobků či služeb jak v oblasti turistického ruchu, tak v oblasti místního zemědělství.

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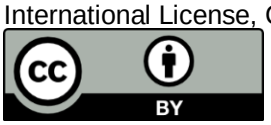

HOW HIGH ARE THE ECONOMIC BENEFITS OF OUTDOOR RECREATIONAL USE FROM THE NEWLY DESIGNATED PROTECTED LANDSCAPE AREA?

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Abstract
In addition to preserving biodiversity, protected landscape areas provide many ecosystem services to society, including the wide range of opportunities for outdoor recreation. A number of studies have examined the recreation value and other economic benefits of protected areas designated in the past, however less work has been devoted to assessing the economic effects in the case that a large-scale protected area is newly established. This article aims to estimate the change in recreation demand and the resulting regional economic benefits for the Soutok region, i.e. the area where the Morava and Dyje rivers meet, if a protected landscape area of 139 km^2 is declared here. In the study, the methods of visitor monitoring with non-market valuation methods and input-output analysis are combined to measure the shift in recreation demand and the resulting economic effects induced by this change.

Key words: visitor monitoring, preference survey, travel cost model, choice experiment, input-output analysis

Introduction

The protection of large areas with high natural and cultural value in the form of a protected landscape area (PLA) or national park is important for the preservation of biodiversity and ecological integrity, but also for the maintenance of ecological processes. The result of them is a number of ecosystem services and private and social benefits, including a wide range of opportunities for the realization of many outdoor recreational activities. Protected areas in many countries represent attractive tourist destinations, and visitors with their spending positively affect the regional economies adjacent to these large-scale protected areas.
Although a number of empirical studies provide the estimates of recreation values and other economic impacts for protected areas that have been already established in the past, but less research is devoted to assessing the change in visitation and the induced economic effects if a new protected area is planned to be declared in a given natural area.
The aim of the article is to estimate the change in recreation demand and the resulting economic impacts on the local economy in the Soutok region if a new PLA is declared here. The proposal of nature protection is the designation of the Soutok PLA in the area of confluence of the Morava and Dyje rivers covering floodplain primeval deciduous forests with water and wetland ecosystems and meadows with solitary old trees in total 139 km^2. The proposed system of nature protection of the Soutok PLA should enable sustainable forest management on approximately 90% of the territory, resulting in uneven-aged forest stands.

Methods and data

Various methods of visitor monitoring (automatic counting devices and personal counting) were combined with non-market valuation methods (travel cost method and choice experiment) to measure the current recreation demand and the demand shift (potential visitation) if a PLA is established in the Soutok area.
Three automatic devices continuously recorded the visitors' passes on the tourist-frequented paths in different parts of the Soutok area during the monitored period, i.e. from the end of October 2020 to the middle of September 2021. In addition, to determine the structure of visitors, the personal monitoring was carried out at 4 monitoring sites during 3 monitoring days in the peak tourist season at the turn of July and August 2021.
In order to analyze the recreation behavior of the Soutok visitors (including their expenditures) and their environmental preferences towards various forms of forest stands representing the proposed variants of nature protection (including declaration of PLA), two surveys were conducted. One survey was realized as a face-to-face survey with a standardized paper questionnaire on a sample (N=250) of current visitors of the Soutok area in the summer of 2021 (on-site survey) and the other as an on-line

questionnaire survey on a sample (N=513) of the Czech general population (off-site survey) in September 2021. The environmental preferences as a person's choice of a forest type under a certain type of nature protection were derived from the discrete choice experiment conducted as a part of both surveys. An example of a choice experiment question is shown in Figure 1.

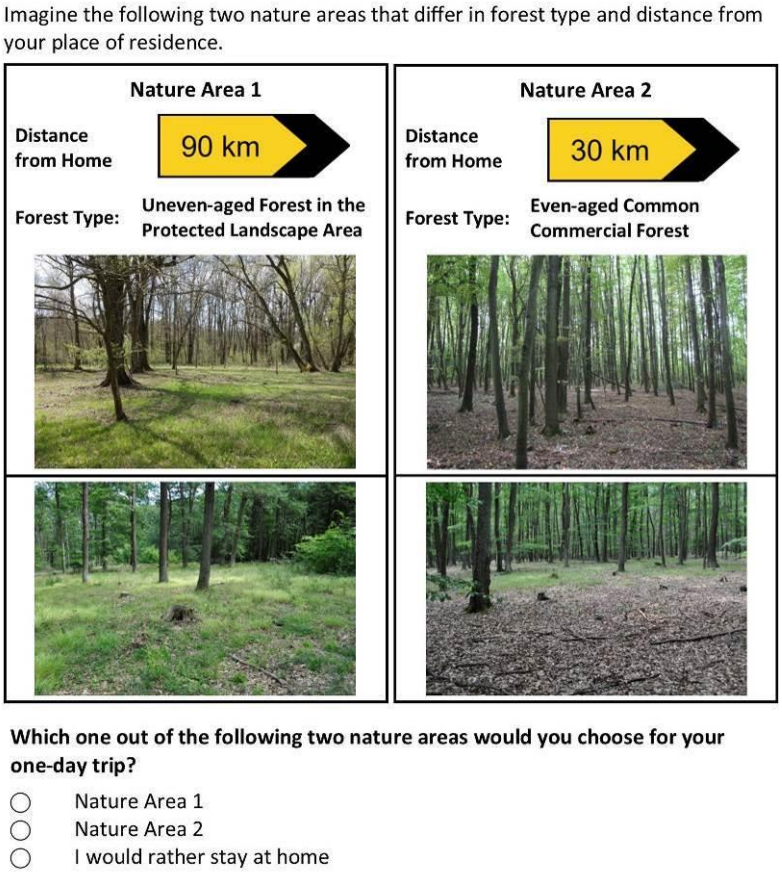

Fig. 1: Example of a choice experiment question.

The local economic effects induced by the expenditures of current and potential visitors of the Soutok region were estimated with regional economic multipliers in the structure of spending on accommodation, meals, transport, parking and entrance fees and souvenirs. The effects of the first and second order measured by regional production and regional gross value added (respectively by gross domestic product, GDP) were considered. Direct effects (1st order) represent changes in the economy due to direct visitor spending, indirect effects (2nd order) represent intermediate consumption of primary sectors. The estimation of regional multipliers was based on a cross-sectoral national and regional input-output analysis, for which national and regional symmetric input-output tables were used (CSO, 2015; Fischer et al., 2018).
The research methods and data used are described in detail in Melichar et al. (2021).

Results

In total during the monitored period, 379 thousand of visitors' passes were recorded by automatic counting devices located in the Soutok area. After calibrating visitation records from counting devices and extrapolating them for the entire proposed PLA territory, the total annual visitation (labeled as current visitation) for the analyzed period (i.e. from the second half of September 2020 to the first half of September 2021) amounts to 299 thousand of visitors (in person-days per year). The spatial distribution of annual visitation intensities on tourist paths in the Soutok region is depicted on the map in Figure 2.

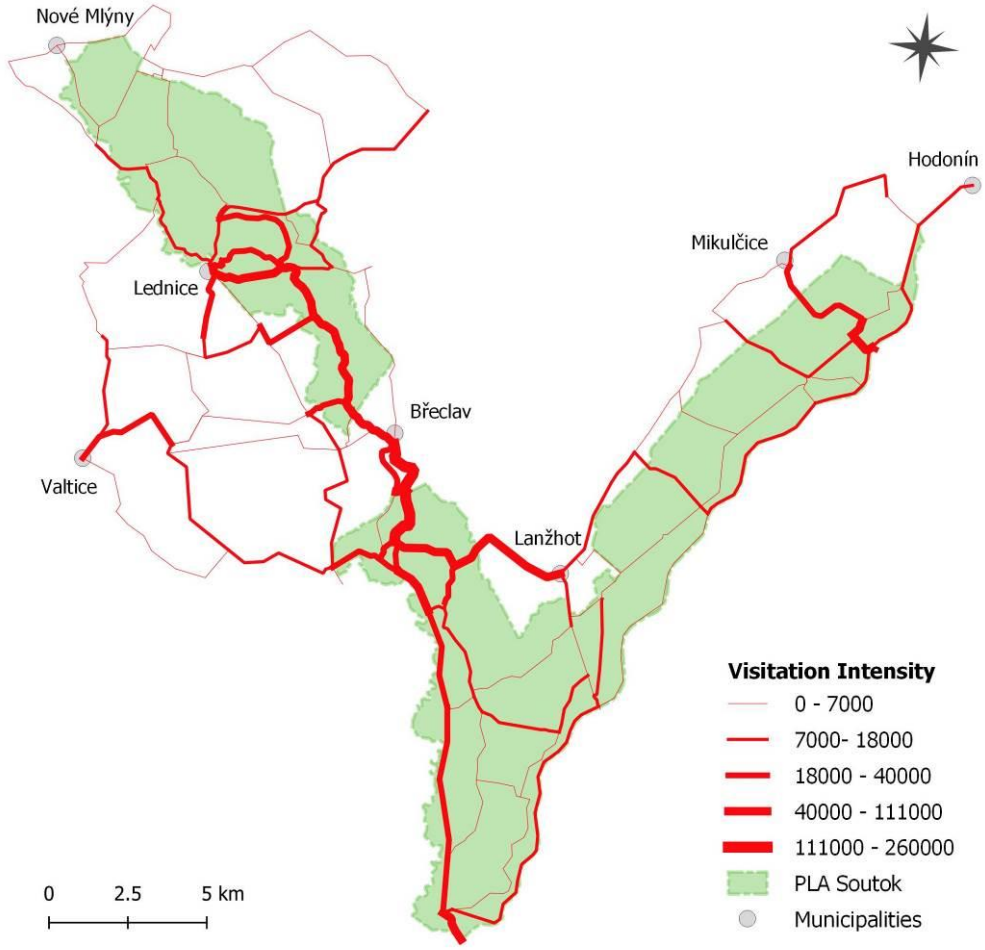

Fig. 2: Map of intensities of current visitation on the tourist paths in the Soutok region (annual number of visitors' passes during the analyzed period 9/2020-9/2021). Source: Melichar et al. (2021)

As graph (a) in Figure 3 shows, the more-day visits account for 64 % of total annual visitation. The more-day visitation was estimated at almost 192 thousand person-days per year.
In the case of declaration of a PLA, the annual visitation of the Soutok region will increase by 48 %, i.e. by 144 thousand of person-days, compared to the current visitation. This positive change in recreation demand is labeled as potential visitation. As a result of the PLA establishment, one-day and more-day visitations will increase by 61 % and 41 %, respectively. After this change, the total annual visitation of the Soutok region, in the sum of current and potential visitation, will be amounted to 443 thousand person-days (see graph (a) in Figure 3).
The current visitors contribute annually to the Soutok regional economy with their expenditures in the amount of CZK 198.1 million (in 2021 prices), of which 94 % are the expenses of more-day visitors. The visitors' expenditures lead to an increase in annual regional production and annual gross value added (or GDP) of the regional economy by CZK 207.2 million and CZK 69.2 million, respectively. The direct and indirect effects of visitors' spending contribute to GDP by CZK 41 million and 28.2 million, respectively.
The growth in recreation demand due to the declaration of a PLA will contribute to an increase in annual regional production by CZK 87.5 million, with CZK 29.3 million is attributed to the increase in regional GDP (see graph (b) in Figure 3). At the same time, more than 74 % of the increase in regional production is contributed by the spending of more-day visitors on accommodation and meals.

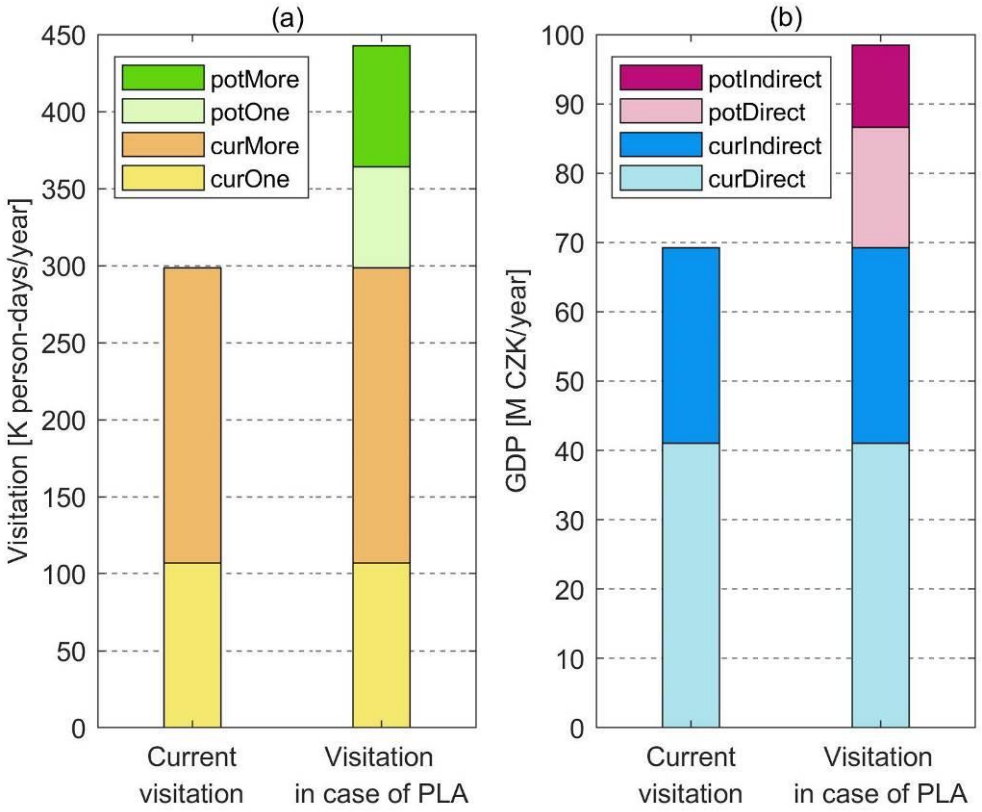

Fig. 3: Annual visitation structured into one-day and more-day trips (a) and creation of gross value added according to direct and indirect impacts (b) at the current state of nature protection and at the declaration of the Soutok PLA.

Note: curOne/curMore – current visitation of one-day/more-day visitors, potOne/potMore – potential visitation of one-day/more-day visitors, curDirect/curIndirect – direct/indirect impacts of the current visitation on the GDP change, potDirect/potIndirect – direct/indirect impacts of the potential visitation on the GDP change.

Conclusion

Outdoor recreation in the Soutok area has been shown to have positive impacts on the regional economy. These positive effects are mainly attributed to more-day visitors. The change in the age structure of forest stands due to the declaration of a PLA will increase the visitation in the area, and thus will generate other beneficial economic impacts. However, the increase in recreation demand can also be accompanied by potential adverse effects (e.g. wildlife disturbance, congestion and increased local cost of living).

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Souhrn

Ochrana rozsáhlých přírodně a kulturně hodnotných území formou chráněné krajinné oblasti či národního parku je významná pro zachování biodiversity. Je rovněž důležitá pro podporu ekologických procesů, jejichž výsledkem je řada ekosystémových služeb a společenských přínosů, včetně široké

škály příležitostí pro realizování rekreačních aktivit ve volné přírodě. Empirická evidence přináší odhady rekreačních a dalších ekonomických přínosů pro chráněná území, jež byla vyhlášena v minulosti, méně výzkumů se však věnuje posouzení změny návštěvnosti a vyvolaných ekonomických efektů v případě, že dojde nově k vyhlášení velkoplošného chráněného území v dané přírodní oblasti. Tento článek si klade za cíl odhadnout změnu poptávky po rekreaci a z toho plynoucí ekonomické přínosy pro region Soutoku, tedy oblast soutoku řek Moravy a Dyje, pokud zde dojde k vyhlášení chráněné krajinné oblasti (CHKO) o rozloze 139 km^2. Kvantifikace regionálních ekonomických efektů současné a potenciální návštěvnosti reprezentující změnu poptávky po rekreaci v daném území v případě vyhlášení CHKO Soutok vychází z analýzy kvantitativních a kvalitativních ukazatelů rekreačního využívání oblasti Soutoku a z meziodvětvové národní a regionální analýzy. Výsledky naznačují, že navrhovaná varianta ochrany území v kategorii CHKO přispěje k významnému nárůstu poptávky po rekreaci a s tím spojenému zvýšení celkových výdajů návštěvníků a produkce ekonomiky regionu. Vyhlášení CHKO zvýší roční návštěvnost Soutoku o 48 %, tj. o 144 tis. osobo-dnů, oproti současnému stavu (299 tis. osobo-dnů v roce 2021). Růst návštěvnosti a celkových výdajů realizovaných návštěvníky v regionu Soutoku následně přispěje ke zvýšení roční regionální produkce o 87,5 mil. Kč, kdy 29,3 mil. Kč z těchto dopadů připadne na zvýšení hrubého domácího produktu (HDP) regionální ekonomiky Soutoku. Na zvýšení regionální produkce se přitom z více než 74 % podílí výdaje vícedenních návštěvníků vynaložené na ubytování a stravování.

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HOW TO MEASURE AND USE NATURE-BASED RECREATION EFFECTS: EXAMPLE OF RESULTS FOR THE VLTAVA RIVER CASCADE

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Abstract

Despite the long-term needs for research on benefits associated with recreation in nature-based areas that would be localized and methodologically sound, the evidence of such results is still very scarce at Czech and even at international level of tourism and recreation research, as well as in project evaluation practice. We strived for such results in a four-year interdisciplinary project "Recreational purposes of Vltava river cascade and its economic potential under the climate change". This contribution briefly presents the highlights of our results, the full set of results being publicly available at a web application https://shiny.fzp.czu.cz/kaskada-rekreace/ (in Czech language).

Based on the results of the project, we demonstrate and discuss the particular uses of various socio-economic indicators that have been estimated for the pilot site of the Vltava river cascade for communication with local stakeholders and regional to national decision-makers, for project/subsidy evaluation etc. This demonstration is relevant across disciplines such as water management, tourism, land management, nature protection etc.

Key words: water-based recreation; tourism impacts; recreation ecosystem service; climate change scenarios; interdisciplinary modelling

Introduction

Despite the long-term needs for research on benefits associated with recreation in nature-based areas that would be localized and methodologically sound, the evidence of such results is still very scarce at Czech and even at international level of tourism and recreation research, as well as in project evaluation practice. Practitioners will most likely fail if they try to find examples of research results that would be on top of that also comprehensive, simply commented even for non-economists, and directly utilizable in various levels and types of decision-making (national to local, strategic to operational etc.) eg. in tourism evaluation for destination management, regional development or spatial planning.

We strived for such results in a four-year interdisciplinary project "Recreational purposes of Vltava river cascade and its economic potential under the climate change" and aim to present them to the practitioners and researchers at the RAOP conference. Following a thorough procedure of linking climatic scenarios, hydrological model, water balance and water management model and several types of socio-economic models, we will show and discuss:

a) how the present visitation loads driven by water-based activities at the Vltava river cascade translate into the total societal value of recreation ecosystem service (relevant for cost-benefit analyses) and into total economic effects on the local and regional economy (incl. GDP and employment);

b) how climate change is expected to affect both the potential for recreation and these economic measures associated with water-based recreation; and

c) how the particular results (measures) are valid, robust and explicitly linked with their uses in decision-making (eg. cost-benefit analyses or communication with economic subjects in the area) in an intuitive and methodologically sound way.

Despite being mentioned as important for most multi-purpose water reservoirs, the quantification of social benefits of recreation is usually not covered in the applied research on prioritization of the allocation of water resources among different uses (including cost-benefit analyses and optimization models).

Materials and methods

The pilot area for this study is the stretch of the Vltava river from České Budějovice to the Vrané dam. The study benefits from an interdisciplinary modeling approach - we link climatic scenarios, hydrological/water balance and water management models and several types of socio-economic models.

Climate change scenarios for precipitation and temperature were developed using advanced delta change method, on the basis of three sets of climatic model simulations (CMIP5, CMIP6, LENS). After calibration of the estimates with observed data on precipitation and temperature and runoff series adjusted for water use in the Vltava Cascade pilot area, the scenario data series of precipitation and temperature were used as input into two models of hydrological balance (GR4J and BILAN), to estimate runoff and other variables related to future hydrological balance. Calibrated model GR4J, better performing at estimation of minimal runoff, was employed for the final simulation of future hydrological balance.

In contrast to the conventional evaluation of climate change impacts at specific time slices (eg. years 2020-2050, 2050-2070), the results of the study are reported for a change in hydroclimatic variables in relation to temperature increase (+1, +2 and +3°C), i.e. an indicator of the intensity of climate change; and are grouped into three clusters that represent three possible variations of the pattern of changes in hydroclimatic variables on the catchment area.

Socio-economic models were developed based on an original data survey in the area (Kaprová, 2020; Mácová 2022) and characterize: i) the total nonmarket social benefits related to water-related recreation activities in the pilot area in monetary terms estimated through a microeconomic model of recreation demand; and ii) the total market effect of water-related recreationists´ spending on the income of regional businesses and service providers, on regional employment etc. derived from cross-sectoral input-output analysis (Kaprová, 2022). Changes in recreation demand as a response to water level manipulation were modeled using contingent behavior model (for decrease of water level by 1-2 m) and benefit transfer function (>2 m). The aggregation of economic effects is based on mobile positioning data from CE-Traffic and T-Mobile, in combination with visitation trends reported by the Czech Statistical Office.

Details of the methodology are available eg. in Mácová et al. (2022).

Results

In terms of climate change impacts, three main trends are identified for the pilot area, all of which assume a decline in summer runoffs and an increase or stagnation in winter runoffs. Average annual runoffs increase for the most favorable cluster of scenarios even with up to +2°C warming; while for the two other scenario clusters, it always decreases compared to current temperature conditions, which holds for all temperature changes examined (+1 to +3 °C).

As climate change progresses, water management in the reservoirs becomes more intensive to ensure the main purposes of the storage function of the dams.

In terms of recreation, the analysis of water balance was used to quantify the probabilistic characteristics of water level fluctuations on three indicators of recreational use of the river and river banks – access to water from the river bank, possibility to use existing mooring spots by boats and navigability of the waterway.

In socio-economic analysis, we estimate that the intensity of water-related visitation at the pilot site reaches 5.7 to 8.9 million person-days annually. The presence of visitors at the pilot site translates into (i) annual social non-market benefits of 0.5-0.8 billion CZK (which represents an estimate of the social value of the recreation ecosystem service generated by water ecosystems at the pilot area). Further for market effects (ii), the total of 2.4-3.7 billion CZK of visitor spending related to visits to water areas at the pilot site translate into direct, indirect and induced effects on all sectors of economy, and yield 0.9 to 1.9 billion regional gross value added (a rough proxy for GDP), in total; and 900 to 1500 full-time equivalents as indicator of yearly generated jobs. Half of the market effects is generated in the area up to 10 km from water. All the socio-economic results reported in this paragraph were estimated and adjusted with the aim to represent an average year right before covid-19 pandemics.

The pressure on recreation use is expected to grow even in view of climatic scenarios. Less dramatic changes of water level (<2 m decrease) do not significantly affect the demand for water-based recreation at the pilot site and the predicted visitation intensities. For larger water level changes, there is a noticeable decrease in water-related recreational activities; however, for most scenarios these negative changes are offset by visitation growth in response to increased average air temperatures.

The average change in visitation loads and economic measures (i) and (ii) associated with water-based recreation at the pilot site are estimated for water dam Orlík and Slapy. The predicted effects of particular combinations of climate change scenarios and modeling clusters show a total decrease in

visitation (and subsequent economic effects) only for Orlík dam and the combination of scenario +3°C and the most unfavorable modeling cluster. For all the other scenario/cluster combinations at Orlík dam, the visitation intensity and economic effects are predicted to increase in future. For Slapy dam, all the scenario/cluster combinations up to +3°C suggest a total growth of social and market effects under climate change.

Discussion

The analysis is based on most up-to-date primary data and models. Robustness of the results was tested in all stages of modeling. Wherever applicable, the economic modeling and aggregation of the economic effects (i) and (ii) employ sensitivity analyses to parameter distribution, assumptions on distribution etc.

On the basis of the results presented above, we further demonstrate how to distinguish different economic indicators and their use in communication, and in project evaluation (not only in water management, but also in nature protection, project/subsidy evaluation in general etc). In some existing guidances that are available in CZ for use in decision-making (eg. SUDOP, 2017), various indicators are distinguished by their use. Other existing guidelines such as IP LIFE guidance on evaluation of effects of LIFE projects (and other subsidy evaluation guidelines) are less specific about which economic measure is relevant to achieve a potentially desired outcome. The explicit link of the monetary results with their uses in decision-making are described further below for the two types of economic measures analyzed in our project:

(i) Social value of the recreation ecosystem service generated by water ecosystems estimated through non-market valuation technique (recreation demand analysis) is a methodologically sound measure for the use in cost-benefit analyses of projects, for justifying the public expenses aimed at retaining/enhancing the recreation function of the area etc. This result is however not much comprehensive for eg. inhabitants of the area, owners and employees of businesses related to tourism. In this study, climate change will not most likely hinder the total social value of the pilot site for recreation - on the contrary, it is expected to increase.

(ii) Effects on regional economy are generally comprehensible for communication with economic subjects in the area and for discussions of projects/public support aimed at enhancing employment, regional GDP or regional income with national or regional policymakers. A bit thoughtful selection of particular economic indicators is needed as some (gross value added, employment in FTE) are more comprehensive than others (output, income) for presentation to non-macroeconomists and non-statisticians. For evaluation of projects, status quo needs to be correctly specified together with the boundaries of the analysis (national input output data are generally not sufficient for analysis of regional or local impacts of recreation on economy if most visitors to the place are of Czech origin; exemptions are one-off events). In this study, even under climate change the regional economy related to recreation use of the Cascade is most likely to grow.

In the trending ecosystem service accounting concept (EC, 2020), both concepts (i) and (ii) can be employed.

Tourist expenditure in a nature-based area is an indicator that remains (much) more easily measured than correctly clarified and used in policy-making. Perhaps interestingly for many decision-makers, the recreationist´s expenditure itself is not a correct measure of economic effect nor of recreation value.

Conclusion

The article focuses on social value and socio-economic impacts of water-related recreation associated with the largest system of dams in the Czech Republic that is characterized by multipurpose use. The results of this study are a vital prerequisite for more informed and therefore more sustainable analyses of climate change impacts on multipurpose use of water reservoirs.

We summarize the highlights of the results that are publicly available and concisely presented (in Czech) at a web application https://shiny.fzp.czu.cz/kaskada-rekreace/ (Strnad et al., 2023). The app also discusses the particular uses of various socio-economic indicators presented in this contribution.

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Souhrn
Přes dlouhodobou potřebu výzkumu socio-ekonomických přínosů spojených s rekreací v přírodních oblastech, který by poskytoval lokálně specifické a metodologicky dobře podložené výsledky, jsou takovéto výsledky výzkumu stále velmi vzácné jak na české, tak i mezinárodní úrovni výzkumu cestovního ruchu a rekreace, stejně jako v praxi hodnocení projektů. Ve čtyřletém interdisciplinárním projektu "Rekreační účely vltavské kaskády a její ekonomický potenciál v podmínkách klimatické změny" jsme se snažili takovýchto výsledků dosáhnout. V tomto příspěvku stručně představujeme jejich shrnutí, přičemž veškeré výsledky jsou dostupné ve webové aplikaci https://shiny.fzp.czu.cz/kaskada-rekreace/ .
Na základě výsledků projektu demonstrujeme a diskutujeme konkrétní využití různých socioekonomických ukazatelů, které byly odhadnuty pro pilotní lokalitu Vltavské kaskády, pro různé účely: komunikaci s místními aktéry, v rozhodování na regionální a celostátní úrovni, pro hodnocení projektů/dotací atd. Tato diskuse je relevantní napříč různými obory jako je vodní hospodářství, cestovní ruch, management krajiny, ochrana přírody atd.

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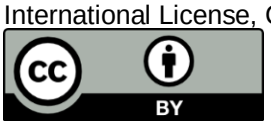

HOW TO SUPPORT CARBON SEQUESTRATION AND RECREATIONAL POTENTIAL AT THE SAME TIME

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Abstract
In recent years, planting trees to protect the climate has become very popular both in the world and here in the Czech Republic. The Paris Agreement in December 2015 and the resulting Nationally Determined Contributions significantly supported the need for the creation and improvement of carbon accounting methods for investments into the forest sector. Appropriately chosen and well-executed tree planting offers a natural, ecological, relatively cheap, and above all simple way to reduce the amount of carbon dioxide (CO2) in the atmosphere as well a number of other environmental benefits. One of these benefits is the positive effects on human well-being and landscape aesthetics both of which is commonly utilized to support recreational potential. However, understanding the financial value of environmental benefits (ecosystem functions) of natural ecosystems and woody vegetation has been an ongoing challenge that still limits the full utilization of close-to-nature landscape management up to this day. Here we show how carbon sequestration potential of individual trees can be evaluated which can in return serve as a motivation tool for conscious tree planting in the rural landscape during all steps of decision making process.

Key words: tree planting, rural landscape, biomass, CO^2 concentration

Introduction

In recent years, planting trees for climate protection has become very popular both in the world and in the Czech Republic. Based on the Paris Agreement of December 2015 and the resulting Nationally Determined Contributions have significantly supported the need for the development and improvement of carbon accounting methods for investments not only in forestry (Van der Gaast et al., 2018). Appropriately chosen and well executed tree planting offers a natural, ecological, relatively cheap, and above all simple way to reduce the amount of carbon dioxide (CO2) in the atmosphere. At the same time, trees are very popular with a large part of the urban population in particular. This combination has given rise to many initiatives that have started to plant trees with the financial support of donors who want to offset their carbon footprint or simply contribute to environmentally beneficial projects.
As part of the carbon cycle, trees are an important reservoir of CO2, absorbing and storing it in the wood pulp, where it can remain for tens to hundreds of years. During its lifetime, a tree absorbs CO2 associated with its growth. You could say that the tree feeds on CO2. The tree takes CO2 from the air and begins to process it through photosynthesis. This gas contains two elements - oxygen and carbon. The tree doesn't need the oxygen, so it releases it back into the atmosphere and keeps only the carbon. This is converted into sugars, which the tree uses for its growth. Some of the carbon is shipped to the leaves, and the carbon that ends up in the wood can be held there for decades. When the tree dies, its tissues begin to decompose and become part of the soil. During the process of decomposition, CO2 is released back into the air by the respiration of the microbes that cause the decomposition, but some of the carbon remains in the soil for decades or centuries. Terrestrial plants, along with soil, hold approximately 2,500 gigatons of carbon, which is 3 times more than is found in the atmosphere (Waring, 2021).
It should also be said that trees are indispensable on a planetary scale for many other reasons, and carbon sequestration is just one ecosystem service on an incalculably long list (Miura et al., 2015). They are also widely sought after by people for recreation, relaxation and even promote better mental health. It is clear that trees are an important tool not only for protecting the climate, maintaining biodiversity and ecological stability, but also for maintaining a good quality of life for people.
In the Czech Republic, forest covers 33% of its territory. This is a relatively high figure, but it does not in itself guarantee sufficient climate function or sufficient CO2 storage. This is mainly due to the deterioration of the current state of forests in the Czech Republic and rapidly changing climatic conditions, especially warming causing an increase in evapotranspiration (Kupec et al., 2021). The current composition of our forests is 70% coniferous forests and 30% deciduous forests, although the natural composition corresponding to natural conditions is exactly the opposite, i.e. 35% coniferous

and 65% deciduous (CENIA, 2022). This has a major impact on spruce in particular, which was planted in areas outside its natural habitat where it was too warm and dry for it, making the trees more vulnerable. Monocultures, production forests full of trees of the same age with trees planted too densely are also less resilient. This brings to the forefront the importance of green infrastructure, e.g. trees growing outside of the forest land, which is extremely important for the health of landscapes and communities. This is where the intersection between climate protection and recreational potential can be seen.

Planting trees that match the natural species composition in suitable locations outside the forest can help to improve the environment ecologically and has the potential to improve the quality of place for people to live in and travel to. In addition, it will promote CO2 storage. A good example of planting 'scattered greenery' is, among other things, the restoration of old dirt roads that have been ploughed for agricultural purposes in the past. Similarly, planting, for example, avenues along cycle paths, restoring orchards and planting in villages can also help them to adapt better to climate change. Such multifunctional approach has been called for a long time now (Otte et al., 2007)

The ideal species for planting in our conditions are native forest and noble fruit species. Non-native tree species do not belong in our nature, usually do not provide food for native insects and can be invasive and there use is limited by the Nature law (114/1992 Coll. Nature and Landscape Protection Act). Therefore, planting should always be planned and implemented under the supervision of experts. Unprofessional planting can cause more harm than good, either by choosing unsuitable species or inappropriate locations. Inappropriate species may not thrive on the site, may have invasive potential or may cause allergies, for example. On a poorly chosen site, trees may not survive or have the opposite effect to that expected. Similarly, it is important to remember that the Czech landscape is a cultural landscape, where different types of use and management have historically been mixed. Planting should not be a source of excessive restriction of its other functions.

Material and methods

To assess the efficiency of trees for carbon sequestration, it is necessary to know how much CO2 such a tree can absorb in its lifetime. That is, the amount that is captured in its body at maturity. This amount is determined by the volume of its total biomass. The non-invasive determination of a tree's biomass is relatively complicated, mainly because of the very diverse shapes of the crown and branches. Thus, in practice, we usually rely mainly on trunk thickness and tree height. For forestry purposes and economic tree species, we have a large amount of data available and, as a result, there are mathematical equations for individual species that can estimate tree biomass with accuracy reaching or exceeding 90% based on stem diameter and tree height alone (Zianis et al., 2005). The situation is more complicated for non-forest and fruit trees. For these species not primarily grown for timber, there is insufficient growth data available and their growth may also differ significantly from their forest counterparts.

Anyway, determining the biomass of an individual tree is the first step. Based on this and the average wood density for the species, the dry weight of the tree can then be calculated. About half of this mass is then made up of carbon. According to the molar mass of the elements in the CO2 molecule, the number is multiplied to find out how much CO2 has been used for the growth of the tree and retained in the biomass. In order to estimate as accurately as possible the potential amount of CO2 that can be retained in the bodies of newly planted trees over their lifetime, it is therefore necessary to know the expected size of the tree at mature age.

In order to get a general idea of the amount of biomass of commonly growing fruit trees, the actual field measurements were carried out in cooperation between CI2, o. p. s. (www.offsetujemeco2.cz), the landscape company Memory of the Landscape, s.r.o. (www.pamet-krajiny.cz) and Mendel University in Brno. Locations with mature fruit trees were selected. They were surveyed for basic dendrometric characteristics, physiological age and growth conditions according to a modified methodology presented by the Czech Nature Conservation Agency (AOPK CR standards, 01 001 Tree Condition Assessment, https://nature.cz/platne-standardy).

Results

A total of 584 fruit tree specimens were evaluated. These were commonly occurring fruit tree species without distinguishing varieties. 128 pears (*Pyrus communis*), 138 apple trees (*Malus domestica*), 122 cherries (*Prunus avium*) and 170 plums (*Prunus domestica*) were evaluated. The majority of individuals were in the physiological stage 4 - mature tree on site 2 - with good growing conditions.

Tab. 1: Median values for evaluated tree species

Fruit tree	height (m)	coefficient of variation	DBH (cm)	coefficient of variation	CO2 sequestration (ton)
Pear	10,9	0,18	50,50	0,18	2,21
Apple	6,8	0,17	36,00	0,17	1,38
Cherry	8,3	0,17	41,50	0,17	1,54
Plum	6,1	0,12	38,50	0,1	0,97

The coefficient of variation on more than 120 individuals of each fruit tree species did not exceed 0,2 (Table 1). Thus, the results can be interpreted in a way that more than 80% of the individuals were very similar to each other in dendrometric parameters. This indicates that under similar growth conditions and at similar physiological ages, the variability in growth of fruit trees is not so dramatic as to preclude generalization of the results. The results show that extensively grown long-lived fruit trees (cherry, apple and pear) are able to sequestrate around 1,5 tons of CO2 during their lifetime.

Discussion

Planting trees alone will not stop climate change, but it will contribute to reducing greenhouse gases already present in the atmosphere. While this is a long-term issue, lasting several decades, the CO2 that already exists can be actively absorbed. In contrast, renewable energy sources, for example, work immediately when they are installed, but do not 'merely' emit new CO2 during their operation and do close to nothing to reduce its current concentrations. It is therefore necessary to look for other strategies to remove the carbon that has already accumulated in the atmosphere. A combination of several measures at the same time is therefore ideal. In this sense, the benefits of tree planting come not only from the reduction of greenhouse gases, but from the overall positive benefits to the landscape and its inhabitants described in the introduction. In addition, trees also help us to better adapt to changes in the climate, for example during hot summers, and improve the quality of the environment in which we live.

At the same time, the current campaigns to plant new trees are commendable, but they must be done judiciously. It is not only the number of trees that matters, but also their characteristics, species composition and site-specific conditions. Young plantings will only be effective in terms of greenhouse gas retention if they reach mature age. They should therefore be given proper care. A major risk of these planting initiatives is when they focus primarily on the number of trees planted or their growth rate. Both are inappropriate indicators of a tree's ultimate carbon storage capacity and even worse indicators of biodiversity. The solution is therefore not to reforest every available area. Trees planted in places where no trees should grow will not provide the desired benefit. Neither will trees that are unnecessarily felled. On the other hand, every suitably planted tree that lives to a mature age counts.

Conclusions

Appropriately chosen and well-executed tree planting offers a natural, ecological, relatively cheap, and above all simple way to reduce the amount of carbon dioxide (CO^2) in the atmosphere as well a number of other environmental benefits. One of these benefits is the positive effects on human well-being and landscape aesthetics both of which is commonly utilized to support recreational potential. However, understanding the financial value of environmental benefits (ecosystem functions) of natural ecosystems and woody vegetation has been an ongoing challenge that still limits the full utilization of close-to-nature landscape management up to this day. According to our result, the total CO2 sequestered in mature most common fruit trees in the CR was estimated to ca 1,5 tons (0,97 – 2,21 according to tree species). This can help to motivate and promote future greening projects especially in the rural landscape where extensive management of fruit trees has been a part of the traditional and cultural way of life.

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Souhrn
V posledních letech se výsadba stromů na ochranu klimatu stala ve světě i u nás v České republice velmi populární. Pařížská dohoda z prosince 2015 a z ní vyplývající národně stanovené příspěvky významně podpořily potřebu vytvoření a zdokonalení metod uhlíkového účetnictví pro investice do lesního sektoru. Vhodně zvolená a dobře provedená výsadba stromů nabízí přirozený, ekologický, relativně levný a především jednoduchý způsob, jak snížit množství oxidu uhličitého (CO2) v atmosféře i řadu dalších environmentálních přínosů. Jedním z těchto přínosů je pozitivní vliv na pohodu člověka a estetiku krajiny, přičemž obojí je běžně využíváno k podpoře rekreačního potenciálu. Podle našeho výsledku bylo celkové množství CO2 sekvestrovaného ve vzrostlých nejběžnějších ovocných stromech v ČR odhadnuto na cca 1,5 tuny (0,97 - 2,21 podle druhu stromu). To může přispět k motivaci a podpoře budoucích ekologizačních projektů zejména ve venkovské krajině, kde je extenzivní hospodaření s ovocnými stromy součástí tradičního a kulturního způsobu života.

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CHANGE OF THE WAY THAT LANDSCAPE IS USED AND IT IS EFFECT ON THE RECREATIONAL AND TOURIST POTENTIAL

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Abstract
Dirt roads and footpaths together with landscape elements form a landscape mosaic. As the density of the dirt road network increases, the fragmentation of the landscape increases. The landscape is becoming more varied and, above all, more accessible, whether for the management of agricultural land or free tourism and recreation. This article deals with the analysis of the historical development of transport infrastructure on the example of the Vilémovice u Macochy model area - part of the Moravian Karst protected area. The Moravian Karst belongs to the most important karst areas in the Czech Republic and also in central Europe. The Macocha gorge, which is frequently visited by tourists is located in the area of interest. The territory is also crossed by the *Moravskoslezská svatojakubská* tourist Route and *Srdcem jižní Moravy* cycle Route. It is a popular tourist and recreational area. The density of the road network and its quality indicate the degree of recreational and tourist development of the region. The network of dirt roads in the open countryside has undergone significant changes in the last century. Unfortunately, the roads got in the way of this trend. This resulted in an inaccessible and impenetrable landscape. Recently, this trend is reversing and new dirt roads are being designed and implemented. These are mainly implemented as part of the land consolidation process. The newly realized roads serve to make land available for land owners, for agricultural production, transport and to make the landscape more accessible. Harmonious integration of existing and newly implemented dirt roads into the landscape is important, including the selection of appropriate

Key words: dirt road, landscape fragmentation; land consolidation, land ownership; tourism; recreation

Introduction

The development of the transport network has both positive and negative effects on the environment and tourism. The transport network consists of motorways, roads, local roads, dirt roads, forest roads and cycle paths. The construction of the transport network is subject to the Czech state standards that specify their technical parameters (ŘSD, 2023). In the historical context, roads have been and are being transformed. The route, surface, use and density have changed. The road network is designed according to the need and intensity of use. The newly constructed road network increases the potential for tourism, and new roads are created to increase connectivity, land connectivity and accessibility (Boston, 2016).

When planning new paths in agricultural landscapes, nature and landscape protection aspects must be considered. Safe passage through the landscape for wildlife can be ensured by building territorial systems of ecological stability (Yemshanov, 2022). The creation of new paths in accordance with the territorial system of ecological stability can be implemented in the process of land consolidation (Karásek, 2017). The recreational and touristic significance of the area is influenced by the natural conditions, the cultural and historical significance of the site and, last but not least, the accessibility and permeability of the landscape. Accessibility and attractiveness of the area are linked to visit ability (Monz, 2021). However, in tourist-rich sites there are also negative impacts of human behaviour towards the landscape. These phenomena are often compounded by the effects of climate change leading to ecosystem disruption. The newly constructed road network with planting of trees, connecting important destinations in the landscape is attractive for tourists, allowing their better movement in the territory for both walking and cycling (Palatková, 2014). It also allows to increase the recreational potential of the territory by implementing accompanying eco-stabilization elements (windbreaks, alleys, small landscape elements), rest areas (rest stops, benches) in connection with the economic and ecological requirements for the development of the territory. The presented article highlights the possibilities of using the land consolidation process to positively influence the tourism potential of small rural communities.

Materials and methods

For the purpose of this article, the tourist attractive locality of Vilémovice u Macochy was selected, where the density of the road network from the 1950s to the present day was analysed, including the newly proposed state of the road network, which was created within the framework of the ongoing land consolidation. Land consolidation is essential for the creation of a network of dirt roads that make the area more accessible, increase the ecological value of the area and the recreational potential of the village.

The village is located in the Czech Republic in the South Moravian Region, in the Blansko district to the west of the town of Blansko in the Moravian Karst Protected Landscape Area (Fig.1).

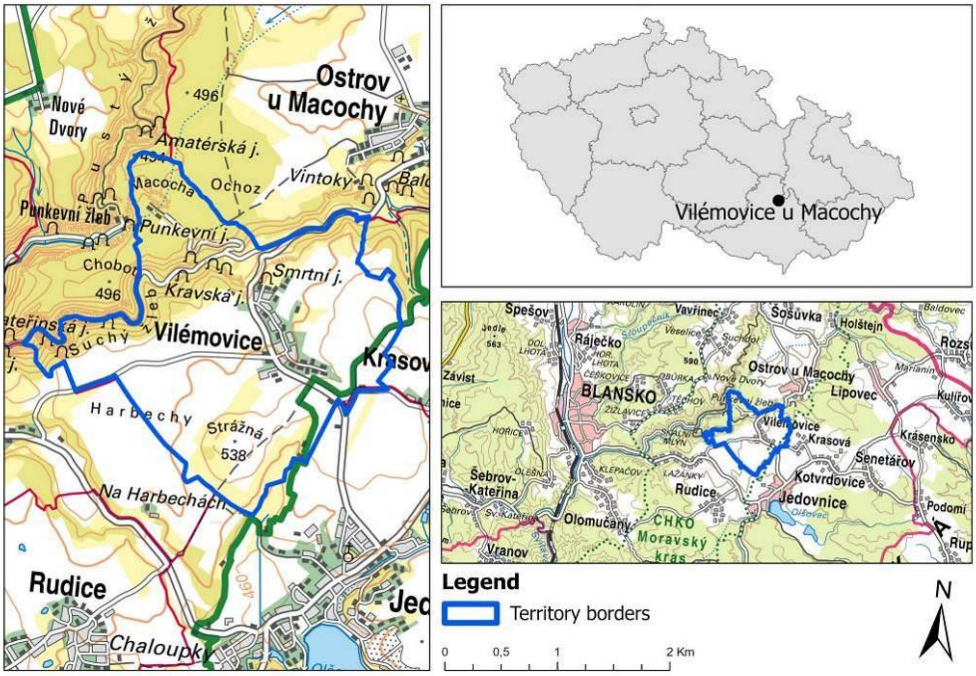

Fig. 1: The study area Vilémovice u Macochy

This article was prepared on the basis of available data provided by the Czech Office of Surveying and Cadastre (territorial boundaries, historical and current map images), on the basis of which the digitization and calculation of the road network density was carried out. In addition, data borrowed from the State Land Office were used to analyse the density of the road network corresponding to the newly proposed and discussed state of the road network in the area under consideration. All analyses were prepared with using ArcGIS Pro tools.

Results and Discussion

Analyses found that the density of the road network was around 6.88 km/km^2 in the 1950s. This relatively high density is due to the high number of roads that were in the area, this was the state before the collectivisation of agriculture. In the following periods, this situation was considerably disturbed by the ongoing land consolidation and the dismantling of natural boundaries. Furthermore, the density of the road network was calculated for the situation in 2000 and 2010, which showed a rapid decrease in the density of the road network, almost by half, see Fig.2. This very unfavourable situation has continued up to the present day, where the total length of the road network in the study area is around 19.52 km (density 3.75 km/km2). And it is the result of large-scale farming accompanied by the removal of most of the existing dirt roads. At the turn of 2022 and 2023, a proposal for a new road network in the area was made, which was gradually discussed with local experts and representatives of the state administration and subsequently approved by the municipal council. The design and addition of the road network will now increase the total length of roads to 27.52 km, a number close to the original situation before the collectivization of agriculture (see Fig.2).

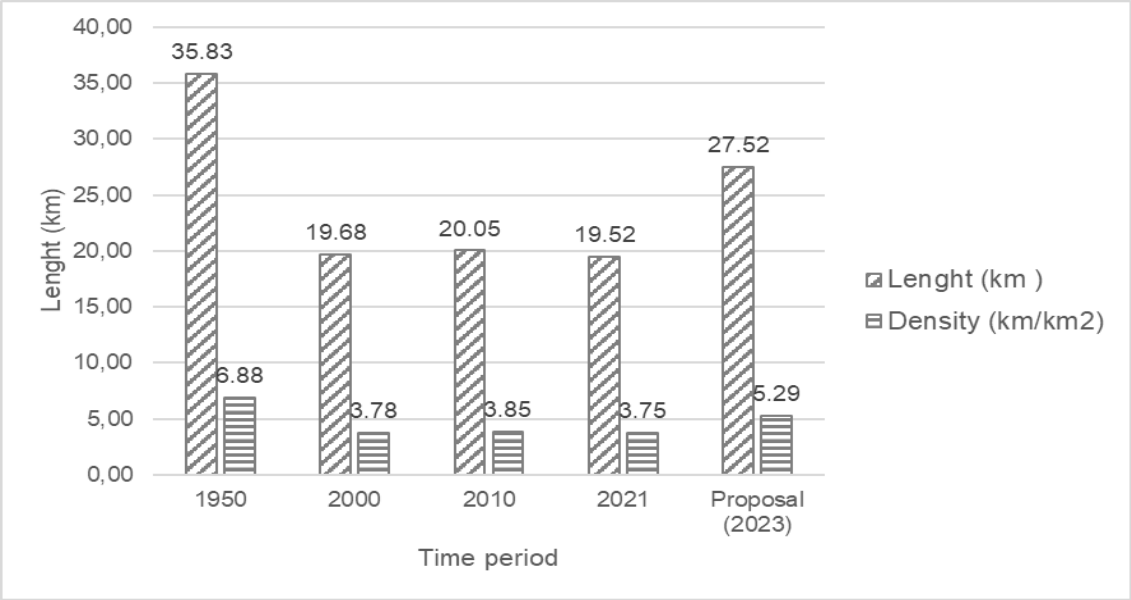

Fig. 2: Change in density and length of the road network in the area of interest over time

In the process of land consolidation, which is in progress in this municipality, a new road network has been proposed, complementing the existing dirt roads. The current state of the transport infrastructure in the area does not correspond to the current conditions of farming and landscape permeability. The design of the new roads will make the land more accessible, connect the area and increase its recreational potential. The existing marked hiking and cycling trails are supplemented by newly created trails through the proposed dirt road system. The whole area is located in the Moravian Karst Protected Landscape Area, so it can be stated that the process of land consolidation in such attractive locations can increase the recreational potential of rural villages. The development of the road network during 1950-2023 is shown in Fig.3.

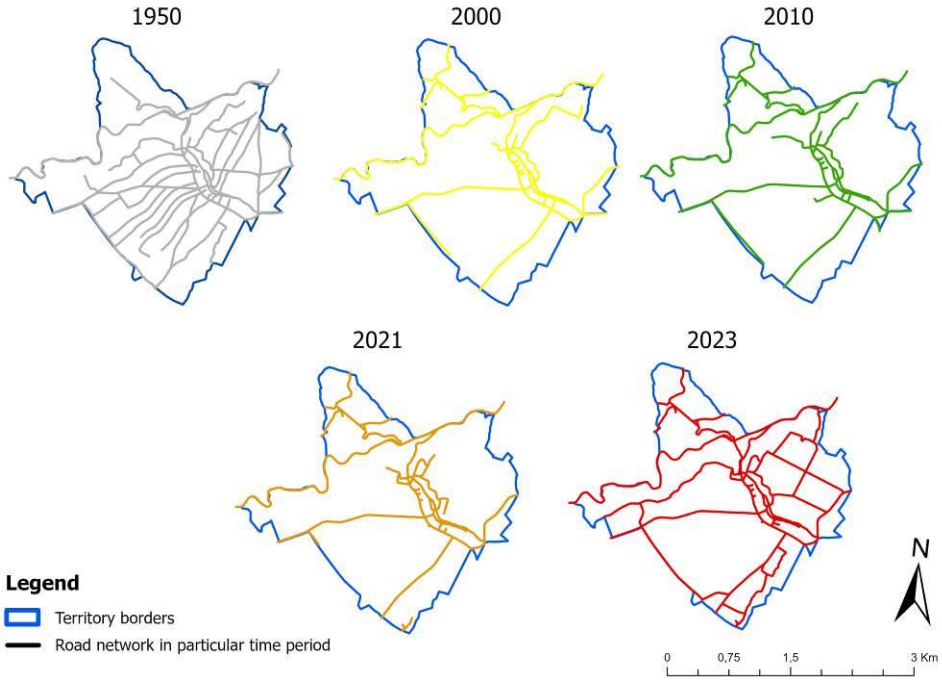

Fig. 3. The development of the road network during 1950-2023

All roads will be transferred to the ownership of the municipality, will connect a wider area and can diversify the movement of tourists. Paved and unpaved dirt roads can be used for recreation, both for normal hiking and cycling. The current road network consisted of a total length of 19.52 km; the

proposed length of the road network is now 27.52 km, an increase of 8 km. The following Fig. 4 shows the original road network in 1950 compared to the newly proposed road network (2023).

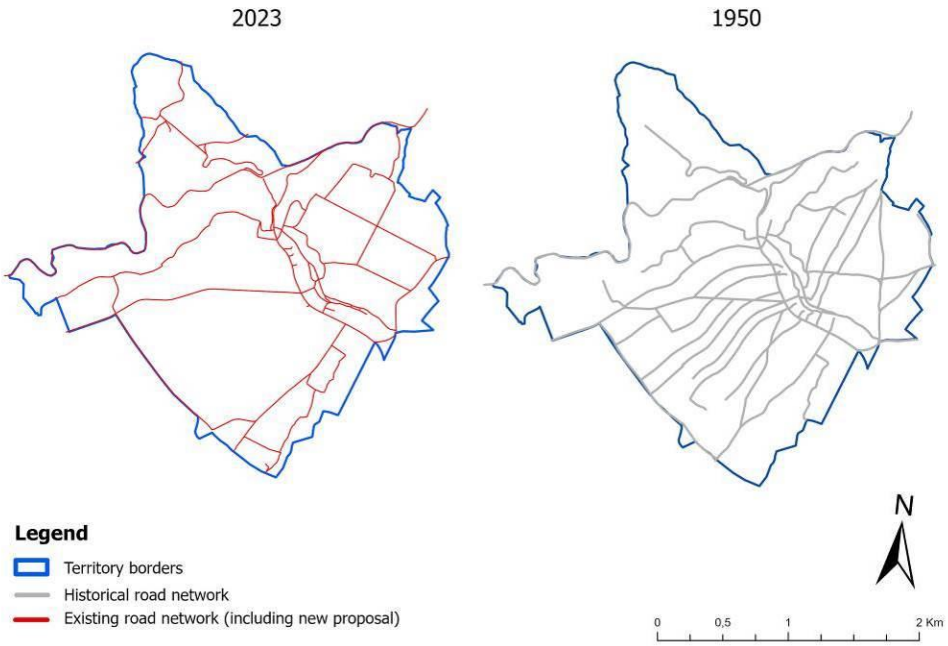

Fig. 4: Comparison of the original 1950 road network and the newly proposed 2023 road network

Conclusion

In the article, the possibilities of linking the objectives of land improvements with the increase of recreational potential of the village and its surroundings were shown by using the example of land improvements in a recreational and tourist attractive area. The new road network will have a positive impact on regional tourism development in the area of interest. Greater choice of destinations for walking and cycling trips and access to attractive sites will help to disperse visitor density over a wider area. Each visitor can choose different route according to their own criteria (e.g.: length of the journey, surface of the path, etc.). Planting of natural tree species is planned around some of the paths. These plantations will reduce the surface temperature of the paths and the surrounding air. The positive effect of the newly built paths with vegetation is also the protection of the land and the increase of biodiversity in the area. Roads used for agricultural machinery have a positive effect in reducing the passage of these large agricultural vehicles through the village.

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Souhrn
V příspěvku bylo na příkladu řešení pozemkové úpravy v rekreačně a turisticky atraktivním území poukázáno na možnosti propojení cílů pozemkových úprav se zvýšením rekreačního potenciálu obce a jejího okolí. Nová cestní síť bude mít pozitivní vliv na regionální rozvoj cestovního ruchu v zájmovém území. Větší možnost výběru cílů pěších i cyklistických výletů a zpřístupnění atraktivních lokalit přispěje k rozptýlení hustoty návštěvníků ve větším prostoru. Každý návštěvník si může zvolit libovolnou trasu dle svých kritérií (např.: délka cesty, povrch cesty atd.). V okolí některých cest se plánuje výsadba původních druhů dřevin. Tyto porosty budou snižovat teplotu povrchu cest a okolního vzduchu. Pozitivním efektem nově vybudovaných cest s vegetací je i ochrana zemědělského půdního fondu (ZPF) a zvýšení biodiverzity v území. Cesty, sloužící pro zemědělskou techniku, mají pozitivní efekt ve snížení průjezdu velké zemědělské techniky obcí.

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IMPLEMENTATION OF GREEN INFRASTRUCTURE ELEMENTS TO MITIGATE CLIMATE CHANGE AND IMPROVE RECREATION IN THE MUNICIPALITY OF DRIENOV, SLOVAKIA

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Abstract
Green infrastructure, as an often-used term in several political documents and strategies of the European Commission dealing with the protection of biodiversity, adaptation to climate change, protection of water resources and flood prevention, serves as a tool to ensure ecological, environmental, economic, social and urbanistic benefits through natural solutions. From a sociological point of view, green areas represent a landscape element with recreational potential in a residential environment. The task of green infrastructure is to connect individual areas of greenery at the level of cities, municipalities and in the open country. Together with the blue infrastructure, it provides various forms of benefit for the population in urban settlements and improves the quality of life. Green and blue infrastructure solutions are particularly important in the urban environment, where more than 60% of the EU population (and approx. 53% of the Slovakia population) lives.
The contribution is focused on the design and subsequent implementation of green infrastructure elements in the village of Drienov, situated in the east of Slovakia in the Kosice Basin (Košická kotlina). The goal is to create infrastructure elements and objects that together will create a functional unit and improve the quality of life of people in the village. The goal can be fulfilled by creating several separate objects whose technical and social functions are interconnected. The results of this study are proposed elements as green areas made of semi-vegetated blocks, an underground tank, a rain garden in the exterior premises of the Drienov municipal office and a semi-vegetated retaining wall, which in the future would form a pleasant relaxation zone supplemented by trees, bushes, flowers and benches.

Key words: green areas, Kosice Basin, rain garden, retention tank, vegetation retaining wall

Introduction

Despite the fact that the term "green infrastructure" is used in several political documents and strategies of the European Commission dealing with the protection of biodiversity (EC 2020), adaptation to climate change (EC 2021), protection of water resources and flood protection, it is still a relatively new term in Slovakia (Hudeková et al. 2018). In the Nature and Landscape Protection Act (NC SR 2002), green infrastructure is defined as a network of natural and semi-natural elements, primarily green areas and water ecosystems, which is created and managed to provide a wide range of ecosystem services, with particular attention to ensuring biological diversity, ecological stability and favourable environment and the connection of the urbanized environment with the surrounding landscape. Green infrastructure is also understood as an effective measure to mitigate the effects of climate change mainly in urban areas and also to improve the quality of life in the context of recreation (Zeleňáková & Junáková 2022).
Through the natural retention and absorption capacity of vegetation and soil, green infrastructure can, for example, be used to reduce the amount of stormwater runoff into sewer systems and subsequently into lakes, rivers and streams. Increasing the sequestration of carbon, improving air quality, mitigating the urban heat island effect, creating additional habitats for wildlife and creating places for recreation (Junáková et al. 2020) could be among the benefits of green infrastructure in such a case. Green areas also contribute to the creation of a cultural and historical environment and determine the identity of cities, as well as the scenery of urban and suburban areas in which people live and work. Studies (Xu et al. 2019; De Sousa et al. 2012) show that green infrastructure solutions are less expensive than grey infrastructure solutions and provide a range of additional benefits for local economies, social sphere and the wider environment. However, in an urbanized landscape, green infrastructure can also be implemented by fusion with grey infrastructure (Balko et al. 2017).
Respect for nature on the part of human activity is important for the development of cities and residential areas, therefore the effective construction of green infrastructure according to valid standards is authoritative when implementing new urban areas.
The aim of the paper is to design and implement green infrastructure elements in the village of Drienov.

Material and methods

The village of Drienov is located in the east of Slovakia. It is located in the Košice basin in the valley of the Drienovský streams and its tributaries. It flows into the Torysa River. Administratively, the village belongs to the district of Prešov and the Prešov self-governing region. The cadastre of the village is located in the southern part of the district. The altitude of the village center is 219 m above sea level. The entire cadastral territory of the Drienov village is located in a moderately warm area with an average July temperature of 16 °C to 18 °C. The January temperature average ranges from -3 °C to -4 °C. The average annual temperatures in the moderately warm areas vary from 4° C to 8° C. The amount of precipitation in this area is around 600 to 700 mm per year, while its amount increases with altitude. On average, the month with the most precipitation is July, followed by June and August. December is the poorest month for rainfall.

In order to increase the ecological stability in the village of Drienov and improve the quality of people's life and the recreation potential of the village itself, elements and objects of green infrastructure were designed in the village, which together will create a functional unit.

General technical description of the proposed water retention measures

Several separate objects were designed, which technical and social functions are interconnected. The basic proposed elements are: green areas made of semi-vegetated blocks, an underground tank, a raingarden in the exterior premises of the Drienov municipal office and a semi-vegetated retaining wall, which in the future would form a pleasant relaxation zone supplemented by trees, bushes, flowers and benches.

Semi-vegetated blocks belong to important green alternatives for building paved areas. The block system is resistant to impacts, chemicals, UV radiation, high traffic loads and bacteria found in the ground. Their perforated surface creates a space for water absorption and they have very good properties for roads with medium loads (suitable for parking lots and driveways). They make it possible to transform paved areas into a green zone, and their great advantage is the possibility of use immediately after installation.

Other methods of reducing rainwater runoff from roofs are technically more demanding, but they also have much greater possibilities of using collected rainwater. An example is an ***underground collection tank*** buried below ground level, which enables the collection and subsequent use /retention/ of rainwater as service water in the building or for irrigation garden needs.

Raingarden, as another important green infrastructure element, serves to collect rainwater from reinforced impermeable surfaces, such as roofs, sidewalks, parking lots, driveways. The water should be retained in it for a maximum of 48 hours. The size of the rain garden will influence the depth and slopes. The ideal depth of a raingarden is between 15-30 cm. At a depth of 15 cm, the rain garden will need to be quite large to have enough capacity to accumulate the collected volume of rain. On the other hand, a rain garden deeper than 30 cm may retain rainwater for too long depending on the soil substrate. In general, raingarden slope gradients of more than 12% are not suitable. The installation of a rain garden is recommended in the lowest areas of the flat part of the plot. Determining the size (infiltration area) of a rain garden for well-draining sandy soil is recommended at a ratio of 5:1 (collection area to rain garden area). If the soils are of poorer quality and less permeable, then a ratio of 3:1 is recommended. The collection area is 150 m^2, the area of the raingarden is 30-40 m^2. If the floor plan area of the rain garden exceeds 30 m^2, it is recommended to divide the rain garden into several smaller gardens. The maximum area of the rain garden is 45 m^2.

Height differences in the terrain on the plot can be solved in several ways, but the technically simplest alternative is the construction of ***retaining walls***. It is a structure that is mainly used to separate height differences in the terrain, between buildings or between individual plots of land. Its function also consists in preventing landslides from the slope, it levels the terrain and often architecturally completes the garden and the environment by planting plants and bushes.

Results and discussion

Fig. 1 shows a situational drawing of the individual proposed objects of green infrastructure in the village of Drienov.

Fig. 1: Location of individual proposed objects of green infrastructure in the village of Drienov (SO.01 Main green semi-vegetated area, SO.02 Side green semi-vegetated area, SO.03 Underground retention tank, SO.04 Raingarden, SO.05 Vegetation retaining wall, SO.06 Belt of greenery)

Main green semi-vegetated area *(SO.01)* ***and side green semi-vegetated area*** *(SO.02): The* original surface is formed as a degraded asphalt-gravel layer and it needs to be replaced. The proposed semi-vegetated area will be made of concrete original prefabs 600x1500x15000 mm (15pcs – SO.01 and 11 pcs – SO.02) filled with soil compacted layer by layer from demolition works and subsequently as a reinforced road formed by layers of gravel embankment fr. 0-62mm of thickness 200 mm, mechanical reinforced aggregate fr. 16-32mm with a thickness of 150 mm and a bed layer fr. 4-8mm thickness 50mm. They need to be thoroughly compacted. Before laying the top layer formed by system perforated grass blocks 80 mm thick, it is necessary to lay a layer of geotextile, after laying the blocks it is necessary to backfill with crushed stone fraction 4-8 mm for their stabilization. A curb will be installed around the perimeter in a concrete bed made of plain concrete. It is necessary to observe a technological break. The total paved area is 211.50 m^2 for SO.01 and 172.00 m^2 for SO.02.

Underground retention tank *(SO.03): the* building of the municipal office will be drained using a drainage pipe under the ground and from there to a collection tank in the back part of the property in the green belt next to the sidewalk. The water inflow to the collection retention tank will be guided by gravity on the facade with an outlet to the collection tank with a volume of 5,000 L, through a Ø 150 pipe and treated by a filter unit in front of the tank. A pump will be installed in the collection tank for the possible use of rainwater for irrigation of the surroundings in drier months. The outflow of water in case of overfilling of the collection tank will flow through the overflow through a Ø 150 pipe and then into the raingarden. The capacity of the underground reservoir is determined on the basis of 5-year average of long-term precipitation totals for the Prešov district, runoff coefficient and area of the roof of the municipal office.

The central part of the territory can be used for the construction of a ***raingarden*** *(SO.04).* It would be a raingarden that would serve to retain water in the soil in the exterior premises of the municipal office. The inflow of water to the raingarden would be from the collection underground tank after its maximum volume filling, or drainage of the nearby retaining vegetation wall. The raingarden will have an irregular oval shape with an area of up to 40 m^2.

The vegetation retaining wall *(SO.05)* will be part of common outdoor spaces and serves to ensure height differences in the terrain and around paved areas. The height difference in studied area is variable according to the configuration of the terrain and reaches a height of approx. 2.10 m. The retaining wall is designed as a gravity wall, with original concrete prefabs loaded on one side by earth

pressure. Concrete prefabs are stored lying down. In the gaps formed by placing the panels lying down, there is a layer of soil, sand and substrate for planting suitable plants and bushes to improve the climate and supplemented with ecological system of vegetation retaining wall (ECObag), which will form the visible side of the retaining wall. After the plants are planted, the ECObags will over time become overgrown with vegetation, so they will not be visible and thus they create a green wall.
The elements of green infrastructure in the studied area will also be complemented by a ***green belt*** *(SO.06)* consisting of trees (2 pieces of Tilia tomentosa Silver Globe, 3 pieces of Prunus cerasifera Nigra), bushes (24 pieces of Berberis thunbergii) and beds of perennials.

Conclusion

Vegetation is an integral part of the urban structure of settlements and is often referred to as an essential naturalizing component of the environment in cities. In connection with global warming and climate change, the environmental aspects of building green infrastructure elements in cities are coming to the fore. In addition to having physical, psychological, emotional and socio-economic benefits for the individual and society, the elements of green infrastructure create opportunities to connect urban and rural areas and create pleasant places to live and work.
The paper summarizes the design and creation of possible elements and objects of green infrastructure in the village of Drienov (Slovakia) with the aim of mitigating the impacts of climate change in the urban environment. Green areas made of semi-vegetated blocks, an underground retention tank, a rain garden and a semi-vegetated retaining wall can be included among the important elements of green infrastructure, which are also applied in the studied area.

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Souhrn

Vegetace je nedílnou součástí urbánní struktury sídel a bývá označována za nezbytnou naturalizační složku prostředí ve městech. V souvislosti s globálním oteplováním a klimatickými změnami vystupují do popředí ekologické aspekty budování prvků zelené infrastruktury ve městech. Kromě fyzického, psychologického, emocionálního a socioekonomického přínosu pro jednotlivce a společnost, vytvářejí prvky zelené infrastruktury příležitosti pro propojení městských a venkovských oblastí a vytvoření příjemných míst pro život a práci. Příspěvek shrnuje návrh a tvorbu možných prvků a objektů zelené infrastruktury v obci Drienov (Slovensko) s cílem zmírnit dopady změny klimatu na městské prostředí. Mezi významné prvky zelené infrastruktury, které se uplatňují i ve studovaném území, lze zařadit

plochy zeleně z polovegetačních tvárnic, podzemní retenční nádrž, dešťovou zahradu a polovegetační opěrnou zeď.

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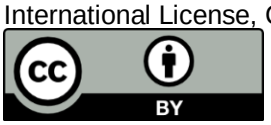

IMPLICATIONS OF THE NATURE OF FORESTRY AND WOOD ENTERPRISES IN LATVIA

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Abstract
Latvia has a significantly developed forestry sector, which accounts for the largest share of the state's income under the management of the Ministry of Agriculture. Latvian State Forests manages a forest area of 1.4 million hectares, but the total managed area reaches 1.6 million hectares. The Total turnover of Latvia's State forests in 2021 reached 405.3 million euros. Irrespective of the success of the forest sector in Latvia, the structure and organization suffer setbacks such as the imperfections such as misinformation and other poor practices to the forest owners that benefit wood-buying companies and other countries such as Sweden. Understing the Latvian forest sector's challenges could improve it to meet the sustainability aspects, private forest owner needs, and welfare in the forest business. We conducted and presented qualitative and exploratory studies on Latvian forests at the macro level. Moreover, the study demonstrates the implications of the nature of forestry and wood enterprises in Latvia as well as recommendations for forest sustainability..

Key words: Forest and wood Enterprises, forest governance, Forest landscape conservation, Forest recreational services, imperfect information, sustainable forestry

Introduction

Latvia is one of the greenest countries in Europe with approximately 52% forest land, compared to 1923, when the forest cover in Latvia was only 23% (Investment and Development Agency of Latvia, 2022). Forest land occupies 3 million ha, of which 1,6 million ha of forest land is managed and administrated by Latvian State forests and the rest is owned by the private sector. The growth of forest areas is also predicted in the future, as the natural overgrowth of lands not used for agriculture, as well as artificial afforestation, will continue.

JSC "Latvia's State Forests" joint stock company (LVM) was established in 2000 and the main goal of the company is to ensure the preservation and increase the value of forests owned by the State. Also, important thing is to ensure the accessibility of the forests to the public, because it is common thing to spend weekends in the lap of nature in Latvia. The people of Latvia have long been associated with the forest - it has been a source of both food and health, a source of building materials and fuel, and an opportunity to relax and find inspiration (Latvijas valsts meži, 2022). At the moment, there are more than 300 tourist hiking places in the state forests.

Undeniably, the company is a stable partner in the market of timber, so the main aim of management is the production of high-quality timber. More than 23% of forests are managed to maintain the protection of nature. Moreover, to conserve biological diversity, the company also protects territories as forest stands for genetic resources of different tree species. Latvian State forests implement state interests considering the Latvian Forest policy by making a profit from timber selling.

The main part of income comes from selling timber, which was 6,64 million m3 (annual growth of 12 mil. m3) and net profit after taxes was 111,5 million euros in 2021. The main timber products are Roundwood and fuel chips. Latvian State forests provide not only recreation and hunting services but also provide a market with tree seeds and plants. For instance, nine nurseries owned by the company sold 55.3 million plants of which 12,9 mil. pieces were exported. State forests is responsible for forest road maintenance and constructed about 345 km in 2021 (Latvijas valsts meži, 2022b). Considering the various interests in society, the company's management aim is to provide the greatest possible added value and increase the number of new job opportunities for the locals. A total of 1280 employees were at LVM last year (Latvijas valsts meži, 2022c). The company has also set the values for employees – honesty, work results, achievements, competence and cooperation.

Each year, the enterprise implements projects in environmental clean-up, educates children about pollution and how to respect the environment, and pays attention to the popularisation of wooden buildings. LVM every year donates money to support educational projects, charity, culture and sports (Sveicars, 2022). So, the company, when planning its activities, is aware that it is responsible at every

step towards the company's employees, customers, owners, municipalities, business partners and the entire society of Latvia. The company is aware of its essential role in solving economic, social and environmental issues important to interested parties - the company's strategy is focused on the balanced development of economic, social and environmental areas.
So, at the end of the day, Latvia State Forests is responsible not only for the timber market and making a profit but caring about the entire society and the environmental landscape of Latvia, which is critical to maintaining forest sustainability. Because there is no viability of the forest, without educated individuals in the forest sector.
This qualitative and exploratory study on Latvian forests at the macro level. Moreover, the study demonstrates the implications of the nature of forestry and wood enterprises in Latvia as well as recommendations for forest sustainability

Material and methods
The study is purely qualitative. It explored the forestry sector of Latvia using major secondary sources. Various websites and other online databases were searched and data was obtained (Bamwesigye, 2019, Bamwesigye and Hlavackova, 2018, DiCicco-Bloom and Crabtree, 2006, Fossey, et al., 2002). Our study analysed the qualitative content to objectively achieve the aim of this work. Much of the work is from the country of study Latvia. The Latvian forestry sector suffers some innadequences like the majority of the forest sectors around the world. Understanding such challenges could lead to opportunities that could promote sustainable forest management and government.

Results and Discussion
Latvia has a very developed forestry sector, which accounts for the largest share of the state's income. Mainly, we have to thank the Latvian State Forests, whose sole shareholder is the Ministry of Agriculture. Latvian State Forests has several structural units, including "LVM Mežsaimniecība", "LVM Zemes dzīles" ", "LVM Seeds and Plants", "LVM Recreation and Hunting", "LVM Business System Solutions". The company manages a forest area of 1.4 million hectares, but the total managed area reaches 1.6 million hectares. The net turnover of Latvia's State forests in 2021 reached 405.3 million euros. In the parish with 13 districts and a total area of 247,274 ha, several thousand people are employed and cooperation with a large number of private sector workers who develop forests according to state legislation has been promoted (Investment and Development Agency of Latvia, 2022, Sveicars, 2022).
However, it is much different in the private sector, there the ignorance of the forest owners is used for the benefit of the company, which buys the property, cuts the forest and sells the land to other countries - let's say to Sweden. In this way, increasing their revenues. It is also observed that the cuttings are made carelessly, leaving assortments that damage the forest soil by leaving ditches that have been created with tractors, and there are cases where even the forest owners don't pick up the phone later, simply don't fix the ditches or restore the forest infrastructure, and unfortunately, our forest services can't track everything so well, because there is no unified database, let's say it's like in Estonia, where every feeling is marked and the information is accessible to every civilian - not only those who work in the forest sector. However, Latvian State Forests is trying to eradicate it, because by concluding a contract with them, the company is strengthened evaluated, and there must be no violations - if there are any, the contracts are terminated, and no one wants that, because the encroached forests are of high quality and easy to develop, and many other benefits come from working with this company (Sveicars, 2022).
Let's take a look at one of the largest companies, here its activities are divided into forestry, logging, repair of forest machines and logistics, as well as accounting. In forestry, there is a forest evaluation process, it is determined what methods can be used to improve it, and how its infrastructure can be developed. After that, the logging master decides according to which methods and technological processes he will develop or maintain the feeling. Then all this is coordinated with the state forest service, which accepts or rejects the request. If accepted, then operations are carried out in logistics, bringing the tractor equipment to the felling so that it can be developed - the operator and the mechanic are responsible for the tractors, who tell whether the tractor needs maintenance, or whether the work can continue. The logging process is carried out and the assortment is delivered to the main log pile, where the logistics-secondary transport that takes the wood to the port or where it is at that moment begins to work harvest more profitably, of course taking into account other feelings and their pile volumes. After all this work, an economic calculation is made whether the felling was profitable or not, to know the day before whether it is profitable to take such feelings or not.

Implications of the Nature of Forestry and wood enterprises in Latvia

Forest and wood Enterprises in Latvia follow certain laws that are developed by the Ministry of Agriculture, supposed to maintain sustainable Forestry. Seeing as the forest areas and the wood resources are not decreasing in Latvia but on the contrary are continuing to grow, from 1923. when the forest cover in Latvia was 23% over time it doubled and reached 52% (Investment and Development Agency of Latvia, 2022, Legal Acts of The Republic of Latvia, 2015). That would mean that the laws that are set for forestry and wood Enterprises are helping to maintain sustainable Forestry, right? Unfortunately, there are still many articles and sources that claim that Latvian forestry is not sustainable and is ruining biodiversity.

In Latvia forestry and wood, Enterprise follows the goals and principles defined in Latvia's forestry policy, as well as the regulation contained in the forest law and other regulatory acts related to Forest management and nature protection. Latvian Forest management is sustainable and internationally recognized. The laws that the forestry and wood Enterprises must follow are meant to realise sustainable forest management which would include Forest management and use in a manner and intensity that preserves the forest's biological diversity, productivity, resilience, viability and potential in the present and Future, the ability to fulfil important ecological, Economic and Social functions locally, nationally and global level, and does not pose a threat to other ecosystems.

One of the main reasons that forestry in Latvia is considered sustainable is because of the goal of Forest restoration to create productive and biologically sustainable forest stands that would provide the economy with the necessary wood products and income for the forest owner. According to the Forest Law, every forest owner or legal possessor is obliged to restore the forest within five years. The requirements of the reforestation regulations and the decisions taken by the forest owners or legal owners in the selection of the tree species to be rehabilitated ensure the reforestation with five main tree species, which are the most valuable. So, if everyone has to follow the laws based on sustainable forestry, felling forests in accordance with nature protection laws, reforestation up to a certain period of time, with a certain amount of trees per ha and even with the most economically valuable species, why are there people who believe that forests are not sustainably managed? One keyword that often appears in the definition of sustainable Forestry, is sustainable forestry standards for Latvia (Estonian Fund for Nature, 2020).

In Latvia, the national economy is largely based on the production of wood products, and the forest industry is one of the most significant segments of the economy. The problem is the rapid demand for biomass, from countries such as the Netherlands, Denmark and Great Britain and Latvia's desire to meet this demand, as well as the desire of owners and companies not to miss the opportunity to get better profits. Because if the demand for wood is high the prices, they are willing to pay also go up, so in forest owners' opinions it's the best time to cut down the forests and receive higher pay. So, in Latvia, the main problem occurs when there's a high demand in the market for wood, and wood products (Estonian Fund for Nature, 2020). Thus, it leads to intensive logging where the extraction of wood for different kinds of products place an increasingly important role. It has led to a rapid decrease in carbon sequestration in Latvian forests and some even say that in the future the forest lands will become a CO2 source rather than an absorber. Species biodiversity is an important indicator of forest health but it is vastly affected by clear cuts and deforestation in general. Clearcutting is one of the most used deforestation methods in Latvia, it is more harmful to the forest diversity, it strongly affects the change of habitat for birds, animals, and insects as well as erosion. Seeing that, does it really mean that sustainability standards based on voluntary certification ensure the role of maintaining natural diversity and maintaining climate change?

In overall view, Latvia has strong laws and standards that forest and wood Enterprises must follow. Forestry is one of the most important economic resources for Latvia. Some Forest Enterprises may find loopholes in the law to wreak more benefits but it won't go unnoticed for long, because in the end forestry is one of the main income for the Latvian government and they will not jeopardize the sustainable income, so they will strive for sustainable Forestry and having the pressure from the EU they will do it correctly. There will always be people who will not be satisfied with the government's choices but they are also the people who will put pressure on the government and set some kind of boundaries that they won't be able to cross.

Conclusion and Recommendations for forest sustainability in Latvia

We could carry out sustainable forest improvement, firstly, starting with the education of forest owners, which would be Latvia's State forest responsibility. Secondly, to create a single database that provides inventory data and the contract price offered for forest ownership. Balancing small companies that destroy the economy of large companies, as well as luring employees with softer conditions towards work culture, work safety should be the priority (Zute-Vītola, 2022).

Establishment of price floor for the forest to avoid cases of fraud, and forest companies and owners would compete with investors from other countries. Moreover, Latvia would ensure both forest control and smart management. In the list of the hundred largest private forest owners, 54 companies belong to foreign investors and 46 to Latvians. Approximately 78,000 hectares of Latvian forests belong to "IKEA", moreover, the company acquired such large forest areas in a relatively short time, taking over other companies that decided to leave the Latvian market.

People in Latvia still tend to pollute forests with garbage. This is confirmed both by last year's increase in the amount of waste collected in the state's forests and by the observation of foresters. Cameras discourage people from littering, but they cannot be installed in the entire forest.

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Souhrn

Lotyšsko má značně rozvinuté lesnictví, které tvoří největší část příjmů státu spravovaného ministerstvem zemědělství. Lotyšské státní lesy obhospodařují lesy o rozloze 1,4 milionu hektarů, ale celková obhospodařovaná plocha dosahuje 1,6 milionu hektarů. Celkový obrat Lotyšských státních lesů v roce 2021 dosáhl 405,3 milionu eur. Bez ohledu na úspěch lesnického sektoru v Lotyšsku trpí jeho struktura a organizace nevýhodami, jako jsou nedokonalosti, například dezinformace a další špatné postupy vůči vlastníkům lesů, z nichž těží společnosti nakupující dřevo a jiné země, například Švédsko. Podcenění problémů lotyšského lesnického sektoru by mohlo vést k jeho zlepšení, aby splňoval aspekty udržitelnosti, potřeby soukromých vlastníků lesů a blahobyt v lesním hospodářství.

Provedli jsme a prezentovali kvalitativní a průzkumné studie o lotyšských lesích na makroúrovni. Studie navíc ukazuje důsledky povahy lesnictví a dřevařských podniků v Lotyšsku a také doporučení pro udržitelnost lesů.

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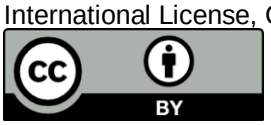

INFLUENCE OF RECREATIONAL ACTIVITIES ON THE DISTRIBUTION OF FOREST WILD BOAR ROOTING

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Abstract

The wild boar is a widely distributed and locally very numerous animal. The same is true in the conditions of Central Europe. Outside the growing season, it concentrates in forests, where it also actively searches for food sources. During this activity, it disturbs the soil surface, thereby significantly affecting the dynamics of the ecosystem. From an economic point of view, it limits the natural renewal of tree species, but from an ecological point of view, it changes habitat conditions and thus helps to increase biodiversity. Factors influencing the distribution of rooting across forest stands may be different. In this paper, we focused on the human factor and its influence on the rooting activity of wild boar in the Hodonínská Dúbrava, National natural monuments.

Key words: Disturbance, wildlife, soil surface, animal activity, diversity

Introduction

The wild boar (*Sus scrofa*) is one of the species that has the potential to significantly influence its environment through its feeding behaviour in conjunction with high abundance and adaptability (Schley and Roper 2003, Massei et al. 2015, Drimaj et al. 2015). In places with a high number of wild boars, both human economic activities and the diversity and stability of ecosystems are affected. Given that there is only partial information on the consequences of higher numbers of wild boars on ecosystems, monitoring the long-term consequences of the existence of pigs in model environments is very important. Only on the basis of verified data is it possible to determine the necessary level of regulation of the wild boar population and other management measures (Keuling et al. 2016, Kamler and Drimaj 2021). The study is therefore primarily focused on understanding the importance of wild boars for the forest ecosystem and the impact of their existence on the composition of the vegetation. Indeed, wild boars rooting the soil surface to a large extent and thereby significantly interfere with the pedological conditions of habitats and the development of plant communities (Fattorini and Ferretti 2020, Matas et al. 2021). This contribution aims to evaluate the distribution of wild boar rooting in the context of linear constructions and recreational activities in Hodonínská Dúbrava, National natural monuments.

Materials and methods

The study area is located northwest of the town of Hodonín and has an area of 970 ha (48.8741272N, 17.0870033E; between the town of Hodonín, ponds around the river Kyjovka, and the road between the town of Hodonín and the village of Mutěnice). Part of the territory is included in the protected area of the Hodonínská Dúbrava, National natural monument. The primary communities are the heat-loving Pannonian oak forests on the sand, the commercial forests are made up mainly of oak (*Quercus* sp.), Scots pine (*Pinus sylvestris*), ash (*Fraxinus* sp.), hornbeam (*Carpinus betulus*) and other deciduous trees are mixed in. The geological subsoil consists of Tertiary clays, gravels and sands. The relief is flat to slightly wavy. The study area is interwoven with a dense network of forest roads, hiking trails and waterways. Of the large mammals, wild boar, roe deer (*Capreolus capreolus*) and hare (*Lepus europaeus*) are found here all year round.

The entire site of interest was covered by a system of parallel lines on which data collection took place. A strip 6m wide was monitored along the lines. All engraving from the wild boar was recorded in this belt. In the ArcMap 10.2 (ESRI) program, the strips were subsequently cut into sub-plots measuring 6×6m (36m^2). Some of these plots contained a certain proportion of irrigated area (N = 1,643) and some did not (N = 20,145). Distances from hiking trails, roads and watercourses (i.e. the tested factors) were also calculated using the ArcMap program. Subsequently, it was determined whether these factors have an effect on the intensity of engraving in a forest environment.

Due to the extensiveness of the data set, the Kolmogorov–Smirnov test was used to test normality. Differences between the sets of rooted and unrooted sub-plots (distance from hiking trails, public roads, forest paths and water courses) were evaluated by Mann-Whitney U-test. GLMs were created to determine the dependence between the proportion of the plot and the distance from the above-mentioned elements. All tests were performed at a confidence interval of $\alpha = 0.05$.

Results

The results showed that the distance from the individual factors did not play any role in deciding whether a wild boar would root in a given subarea or not ($p = 1.00$). However, distance had an effect on rooting intensity for some factors. One of these factors was the distance from the public roads, where the damage to the subsurface by rooting increased with increasing distance ($r^2 = 0.02$, $p = 0.001$). The second significant factor was the effect of the distance to the water courses, when the proportion of the rooted area decreased with increasing distance ($r^2 = 0.03$, $p = 0.001$). The distance from the hiking trails or the forest paths had no effect on the engraving from the wild boar.

Discussion

Hiking trails do not affect the rooting activity of wild boars in any way, which may be due to the fact that wild boars are active mainly at night, when there are no people on these trails. Of course, these trails are scented by humans, but wild boars are able to evaluate the riskiness of a given smell very well, so they do not feel threatened in the vicinity of these trails. In the same way, forest roads, which are mainly used for the movement of forest equipment during the day, do not pose any risk to them.

On the contrary, public roads are intensively used even during the night, so wild boars are disturb and occur at greater distances from the road. A positive effect on rooting has been demonstrated at water courses. Water courses represent a sought-after source of water and food in the drying environment there (on the sand), because the presence of a large number of plants and animals is linked to the increased humidity.

This study is the first result of extensive and long-term research focused on the importance of wild boar rooting for the forest ecosystem. We will continue to process and evaluate the obtained data and try to clarify the positive and negative impacts of this activity on the biodiversity of valuable ecosystems as well as common economic forests (and not only in them).

Conclusion

Our study showed that damage to the soil surface by wild boar rooting is not affected by the presence of hiking trails and forest paths. On the contrary, the distance from public roads and waterways has a certain influence.

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Souhrn
Prase divoké je hojně rozšířeným a lokálně velmi početným velkým kopytníkem. Stejně tak je tomu i v podmínkách střední Evropy. Mimo vegetační období se soustřeďuje v lesích, kde také aktivně vyhledává zdroje potravy. Při této činnosti narušuje povrch půdy, čímž výrazně ovlivňuje dynamiku ekosystému. Z ekonomického hlediska omezuje přirozenou obnovu dřevin, ale z ekologického mění stanovištní podmínky a napomáhá tak ke zvýšení biodiverzity. Faktory ovlivňující distribuci rytí napříč lesními porosty mohou být různé. V tomto příspěvku jsme se zaměřili na vliv veřejných cest, turistických tras a vodních toků na intenzitu rytí divokými prasaty v NPP Hodonínská Dúbrava. Z hodnocených faktorů se jako významné ukázaly vzdálenosti od veřejných cest a vodních toků. Naopak vzdálenost od turistických tras či lesních cest neměla na disturbanci půdního povrchu žádný vliv.

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INNOVATIVE TECHNOLOGY OF SAPLINGS PLANTING FOR INCREASE TOURISM POTENTIAL OF THE LANDSCAPE

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Abstract

The saplings extractor is intended primarily for replanting all types of seedling forest trees included a bale of soil without disturbing the root system. Trees growing along roads or already grown to a certain extent trees in the landscape are often need to be transplanted due to landscaping or urban planning. These trees can be used, for example, in popular tourist localities, where they can speed up the regeneration of the landscape and make visitors' stay more pleasant. However, this activities shouldn't be provided only manually, but some advanced technologies have to be used. The goal of this paper is presenting a new technology for mechanized planting using the production potential of the seedling trees. The principle of the saplings extractor lies in excavating a pit at the site that will be the subject of tree replanting, and then transplanting the pre-lifted up seedling forest tree into the prepared excavated pit. The last phase is to backfill the pit all around with soil from the excavated pit after the sapling was picked up. This paper emphasise the economic advantages of new technology and provides the saplings planting solutions in the form of landscaping, road tree rows or ornamental trees in an urbanized environment.

Key words: forest planting, forest regeneration, landscape regeneration, sapling extractor, tree transplanting

Introduction

The goal of most national economies is the production of forest resources through the intensive silviculture methods in connection with growing consumption and wood demand in the world. (Shestibratov et al. 2018). It follows, that forest regeneration is an essential part of the forestry. After logging, the stand reforestation is complicated by many factors, such as competitive vegetation, drought or frost (Grossnickle 2000). Additionally, environmental factors can affect the forest regeneration include soil quality, weed presence or invasive species that may discontinue the natural regeneration process or cause insufficient seed dispersal (Rey Benayas et al. 2008*).* For this reason, it is necessary to carry out an appropriate site preparation that might improve the stand conditions and thus increase the survival and growth of the planted seedlings within an artificial regeneration (Wallertz et al. 2018; Staněk et al. 2022). However, this process brings increased financial costs. Therefore, the main condition to gain a successful cultivation of forest plantation is the correct area selection as well as the planting stock variety and species selection, which is optimal in specific climatic conditions (Morkovina et al. 2019).

In order to reduce the economic costs of forest regeneration, the so-called natural regeneration is also used. The main advantage of natural regeneration compared to artificial regeneration is reduced implementation costs substantially (Cruz-Alonso et al. 2019). This is primarily about the financial costs spending on purchase of the forest seedlings.

The aforementioned issues relating to artificial and natural regeneration might be avoided when using the saplings extractor technology.

Materials and methods

The decisive factors affecting the economic indicators of forest regeneration are mainly: price of the purchased planting stock; number of workers needed; physical demand and time consumption of relating labors; saplings survival; the future forest stand care and protection. Within the research, the forest regeneration and forest plantation care economic costs were compared between the saplings extractor and manual slit planting using a hoe. The comparison of both methods lies primarly in the time consumption, financial costs of planting stock and labor activities related to the site reforestation. Due to the fact, that the extractor transplants saplings with a height of 1.5 to 2.8 m, their survival is considerably high. For this reason, planting in a square spacing 3 x 3 m is sufficient, i.e. approx. 1,200 pieces of saplings per hectare. Under optimal conditions, the planting performance is approx. 10 saplings per hour, when the seedling forest is located within a reach of 50 m to 100 m. Therefore, 80 pieces of saplings might be replanted during one work shift.

Results

Table 1 presents the reforestation costs and forest plantation care until the stand provision on area of 1 ha by slit planting with use a manual hoe.

Tab. 1: Economic evaluation of forest regeneration using a manual axe-hoe

Type of action	The classic method technology - 1 ha	Amount [pcs]	Price [CZK]	Total [CZK]
Material purchase	Min. planting stock (decree no. 456/2021 Sb.)	7 000 pcs	10	70 000
Planting	Manual reforestation with a hoe	7 000 pcs	25	175 000
Weeding	Mechanized weeding (2x a year)	6 yrs	8 000	48 000
Chemical protection	Repellent + work, browsing protection, autumn	4 yrs	0,7	19 600
Protection of game	Game-proof fence construction	1 ha	9 000	9 000
Reiterating care	New stock purchase (survival 75 % on area)	1 750 pcs	10	17 500
	Reforestation work	1 750 pcs	25	43 750
	Reduction of time delaying production	4 yrs	1 500	6 000
Total costs				**382 850**

Table 2 presents the forest regeneration costs on area of 1 ha using the saplings exctractor that transplants taller trees lifted out from natural rejuvenation within the reach of the seedling forest site into a square spacing pattern 3 x 3 m.

Tab. 2: Economic evaluation of forest regeneration using the saplings extractor in 3 x 3m square spacing

Type of action	The saplings extractor technology - 1 ha	Amount [pcs]	Price [CZK]	Total [CZK]
Extraction Transport	Tractor performance with adapter - 10 pcs/hour - fuel etc.	1 200	60	72 000
	Planting 3 x 3 m square spacing –> 1,200 pcs/ha - operator	1 200	30	36 000
Planting	Ancillary works - adapter control, surface treatment	1 200	25	30 000
Total costs				**138 000**

Table 3 presents the forest regeneration costs on area of 1 ha using the saplings exctractor that transplants smaller trees lifted out from natural rejuvenation within the reach of the seedling forest site into a square spacing pattern 2 x 2 m.

Tab. 3: Economic evaluation of forest regeneration using the saplings extractor in 2 x 2 m square spacing

Type of action	The saplings extractor technology - 1 ha	Amount [pcs]	Price [CZK]	Total [CZK]
Extraction Transport	Tractor performance with adapter - 10 pcs/hour - fuel etc.	2 500	60	150 000
	Planting 2 x 2 m square spacing –> 2,500 pcs/ha - operator	2 500	30	75 000
Planting	Ancillary works - adapter control, surface treatment	2 500	25	62 500
Total costs				**287 500**

The obtained results show that the saplings extractor utilization represents significantly lower costs than "conventional" forest regeneration, that comprises i.e. the planting stock purchase, the weed protection, the game damage protection, etc. Specifically, the reforestation financial costs using the saplings extractor in a 3 x 3 m square spacing pattern compared to the default manual reforestation represents a saving of CZK 244,850. In case of the saplings extractor usage in a 2 x 2 m square spacing pattern, there is a decrease in financial costs compared to manual reforestation by CZK 98,080. When using a new technology, the financial amount difference of saplings planting between a 2 x 2 m and a 3 x 3 m square spacing pattern is CZK 149,500.

The results show that a significant cost item is the planting stock purchase. With help of the saplings extractor, only required tree species are selected and transplanted to the site. Therefore, there is no need to invest a financial means further.

Conclusion and Discussion

The economic benefits using the presented technology consist in:

- utilization of forest species seedlings, i.e. no acquisition costs for planting stock material. This represents a significant expenditure of financial sources (Bullock et al 2011) and the high costs of afforestation or forest regeneration will reduce the overall profitability as well (Serrano-León et al. 2021);
- minimum number of employees - operator with + services, max. 2 persons;
- almost 95% survival of planted saplings
- no further investment is required within the stands care (removed costs of weed disposal; reduction of the costs of repeated forest regeneration; reduction of the time to ensure a forest plantation by an average of 2 years, thereby reducing costs of the game damage protection (game-proof fence maintenance, possibly repellents care); reduction of time, an average of 2 years, when the forest plot is effectively taken out of production due to the failure of afforestation or the slow growth. Grossnickle and El-Kassaby (2016) state that larger seedlings have a better ability to cope with competing vegetation and insect damage than smaller ones.

  The non-economic project benefits may be identified indirectly, when the saplings extractor is used on linear constructions - along power lines, railway transport routes, roads, in landscape, urban development, etc., where it is necessary to pick up sapling even in inaccessible terrain and then ensure the planting of clearings or avenues. Last but not least, transplanted saplings in this way also contribute to mitigate the effects of climate changes simultaneously supporting the function of the environment for storing carbon and preserving biodiversity (Staněk et al. 2020; Matos et al. 2020).

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Souhrn
Vyzvedávač odrostků je určen primárně k přesazování všech druhů náletových dřevin s balem zeminy bez narušení kořenového systému. Případně pro vysazování dřevin s balem zeminy, které byly vypěstovány např. v lesní školce. Náletové lesní dřeviny, ale i pouliční stromky, stromky podél silničních komunikací či stromky v krajině, které jsou již do určité míry vzrostlé, je zapotřebí z důvodu terénních úprav, rozvoje životního prostředí či urbanismu, často přesadit. Tuto činnost však nelze provádět pouze ručně, ale je nutno použít nějaké pokročilé technologie. Cílem tohoto příspěvku je představit nový vyzvedávač odrostků dřevin pro mechanizovanou výsadbu, který umožňuje využití produkčního potenciálu náletových dřevin. Princip vyzvedávače spočívá ve vyhloubení jámy v půdě na lokalitě, která bude předmětem vysazení dřeviny, a následném přesazení vyzvednuté náletové dřeviny do připravené vyhloubené jámy. Finálním krokem je zasypání jámy po vyzvednuté dřevině zeminou z vyhloubené jámy. Tento příspěvek zdůrazňuje ekonomické výhody při použití nové technologie během vysazováním odrostků v lesním hospodářství, ale i při úpravách krajiny, silničních stromořadí či okrasných dřevin v urbanizovaném prostředí.

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INTEGRATION OF NICHE AGRICULTURAL CROPS IN THE DEVELOPMENT OF ROMANIAN RURAL TOURISM. CASE STUDY: WALNUT CULTURE IN ROMANIA AFTER 1990

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Abstract
The study concerns walnut culture in Romania in the period 1990-2021. We considered the research useful because, in recent years, Romania had significant production at the European level. The walnut is a species of the tree protected by law, with ancient history in the Romanian landscape, reflected in toponymy and mentioned in medieval documents. Statistical data were used on the total number of trees per fruit and fruit production in tones. The analysis was carried out at the county level, making comparisons of the distribution of the percentages of the studied indicators. Although the total number of fruit trees registered a negative growth rate at the national level (-40%), for walnuts, the growth rate registered a very slight increase (+1%). In 2021, the largest number of trees will be found in Vâlcea County, which registers 5.85% of the total at the national level. In the same year, the lowest number of walnuts can be found in Ialomița County, with 0.09% of the national total. At the same time, walnut production at the national level registered a growth rate of +116%. The average value for each tree, obtained by calculation, increased at the level of Romania from 10 kg in 1990 to 30 kg in 2021. The results of this study highlighted, in the end, the importance of niche crops such as walnut culture in promoting Romanian traditions and rural tourism.

Key words: counties of Romania, Juglans trees, diachronic analysis, rural tourism

Introduction

At the end of 2022, according to statistical data at a national level, more than 47% of the Romanian population lived in rural areas (National Institute of Statistics, 2022) or "satellite" localities in the peri-urban area, which represents a fairly high percentage compared to that at European level, of only 24%. This percentage can equally express their still impotence, these rural localities in the national socio-economic and cultural system.

In the Sustainable Development Strategy for Romania (Sustainable Development Strategy for Romania, 2023), within Objective 11: Sustainable Cities and Communities, an important objective to be achieved by 2030 is strengthening efforts to protect and safeguard cultural and natural cultural and natural heritage and urban and rural landscape features. (Objective 11: Sustainable Cities and Communities, 2023)

Since ancient times, the shape of the landscape has continuously changed, and people confuse nature with what, in reality, is shaped by culture. The industrialization process in Romania has produced a series of significant changes in the natural landscape through the creation of high densities in urban areas, the urbanization of the natural and rural environment, and the loss of some defining elements of the cultural heritage.

In his work, *The Guide to the Valorization of the Rural Heritage* (Gafar and Grigorovschi, 2004), architects Michaela Gafar and Mircea Grigorovschi develop the idea of material and intangible tourism patrimony. The intangible touristic heritage represents the totality of traditional, oral, authentic creations, transmitted from generation to generation, expressed in literary, musical, choreographic, or theatrical forms, as well as all the practices, representations, expressions, knowledge, and abilities together with instruments, objects, accessories, and specific clothing.

In recent years, Romanian rural tourism has developed a lot by promoting its cultural heritage, especially the Romanian folk traditions, and more recently by integrating and highlighting the niche cultures (lavender, saffron, coriander, fennel, etc.) existing in all the counties of the country.

The walnut has a well-deserved place in this context. The common walnut is native to South-Eastern Europe and Asia : the Balkan Peninsula, Asia Minor, the Caucasus, China, and the Himalayas, and through culture, it has expanded much outside the area. (Silva News, 2023). It was considered since antiquity"the king of fruit trees" and regarded as a magical tree, the walnut (Juglans regia L.) was highly valued by the ancient Greeks for its fruits or the oil extracted from them. The scientific name of the walnut, Juglans regia, comes from the Latin language, Jupiter regia, which means"master of the gods." The Romans were also later interested in this fruit tree with its fruits and spread them throughout Europe, and today, France is the largest producer of nuts on the continent.

In Romania, walnut is cultivated in all country areas, from plain to about 800 m altitude ; in hilly areas, it is common, often submontane. In Banat, Oltenia, it seems spontaneous, disseminated in deciduous forests (Silva News, 2023).
From a landscape point of view, this magnificent tree, with its high stem and rich canopy, gives the traveler the image of a special painting for any park or garden. To these are added countless traditions, customs, legends, and superstitions related to this fruit tree, which has been included in the Romanian cultural heritage for centuries.
From an ecological point of view, the walnut tree is a tree with almost essential utility in many of the industrial branches (pharmacy, cosmetics, wood and furniture industry, food, etc.) ; from it are capitalized all the components : leaves, wood, buds, fruits and green or dry nut bark.
From an economic point of view, the walnut is an extremely good tree because for the care and maintenance of one hectare of nut orchard is spent annually on average, only 200-300 euros. In our country, walnut culture is protected according to Law 348/2003 (Law 348/2003, 2023), belongs to the category of grated trees, and is subject to the following special provisions : "The planting of walnuts shall be carried out with selected propagating material from approved nurseries. The feeling of edible walnuts and chestnut trees belonging to the category of grated trees, irrespective of the owner, shall be carried out based on authorization" (Law 348/2003, 2023).
The integration and promotion of niche cultures in Romanian rural tourism, together with the preservation of folk traditions and customs, represents one of the methods of reviving the current Romanian village and engaging the local population in this complex process.

Objectives
The socio-political and economic changes in Romania after 1990 generated periods of financial instability, instability in the labor market, an increase in the migration rate, etc. Although the rural population in Romania occupies a higher percentage than the European average, the forecast for the next decades could be more optimistic, given the urbanization process of these areas, so measures are needed to revitalize these localities. The objectives of this study aimed to carry out an analysis of niche crops in Romania (O1), with direct reference to walnut culture (O2) and the possibility of integrating them into the promotion of Romanian rural tourism (O3).

Methods and procedures
O1. This objective focused on the definition and analysis of niche cultures in Romania that were introduced in Romanian agriculture after 1990. After the fall of the communist regime, Romanian agriculture underwent a series of changes in the socio-political context, against the background of legislative implementation, of some decisions such as the reconstitution of the property right over the lands that were found in the patrimony of the agricultural cooperatives during the communist period, their dissolution and implicitly the fragmentation of these agricultural lands into smaller plots (Law 18/1991, 2023). As a result of these measures, the land was cultivated differently, depending on the possibility for each owner to invest in raw materials (seeds), fertilizers, and agricultural machinery. The commercial opening to the European market offered agricultural producers the to experiment, acclimatize and introduce in the list of cultivated products other species less used in the past or not at all, niche crops, which, in addition to the nutritional, aromatic, pharmaceutical, pharmaceutical, industrial qualities they could offer, were important elements for increasing the landscape quality of the area, to be integrated into different traditions and folk holidays, to create clothing items, etc. This category includes lavender, rose, walnut, goji, paulownia, fennel, coriander, etc.
O2. This study was conducted as a statistical analysis regarding the nut culture at the county and national levels. The main indicator was the number of trees per fruit, but some aspects of fruit production were also analyzed. Information provided by the National Institute of Statistics was used (National Institute of Statistics, 2022). There were included elements related to identifying areas suitable from an ecological point of view to this type of culture, toponymic aspects, and some agrotechnical characteristics of this crop. In this way, several aspects regarding the evolution of this culture in Romania could be rendered between 1990 and 2021.
O3. He aimed to identify solutions for integrating walnut culture in promoting Romanian rural tourism. In this respect, we started from the need to develop accommodation and food services in rural areas, to harmonize them with recreation programs through the participation of tourists in various local activities - agricultural, cultural, and religious.

Results and discussions
O1. After Romania acceded to the EU, the agricultural and rural development policy changed, requiring new approaches to integration into the EU internal market and respect for the Common Agricultural Policy. In this context, it was necessary to find new marketing solutions that would support

rural growers so that they could enter with increasingly varied products in the internal and European markets. The answer came from integrating niche crops in Romanian agriculture, with the adaptation of new species of fruit trees and shrubs, vegetables, or aromatic plants, to the pedoclimatic conditions in our country.

Thus, fields cultivated with lavender appeared (about 275 plantations throughout the country) (Vijulie et al., 2022) or roses (Counties: Alba, Braşov, Constanţa, Mureş) (Davis and Gaburici, 1999). A little shyer in the western-south-western part of the country, saffron is grown (Counties : Arad, Gorj, Bihor) (Vasile et al., 2021), in vegetable gardens, in addition to the well-known aromatic plants are grown more recently, coriander or fennel, in orchards we find new varieties of trees/fruit bushes of the type of gooseberry (Counties : Baia-Mare, Cluj, Mureş, Sălaj) (Gimbășanu, 2015) or goji (Counties : Buzău, Cluj) (Befu, 2015). The furniture industry has found a new source of raw materials with the advent of intensive crops of paulownia (jud. Bihor, Arad) (Teo, 2022), a fast-growing tree of more than 2-3 m/year.

O2. Along with all this, with millenary age, but rediscovered and supported in recent decades by European funding programs, the nut culture dominates through the ecological, economic, and financial benefits it offers (Lozan, 2023).

Tab. 1: Evolution of the number of walnut trees on fruit between 1990 - 2021

Walnuts	Number of trees		%		Growth rate
	1990	2021	1990	2021	
TOTAL ROMANIA	2070372	2088057	100.00	100.00	0.01
Alba - AB	28729	46928	1.39	2.25	0.63
Arad - AR	68528	46722	3.31	2.24	-0.32
Arges - AG	90702	82766	4.38	3.96	-0.09
Bacau -BC	67086	61232	3.24	2.93	-0.09
Bihor - BH	96100	90863	4.64	4.35	-0.05
Bistrita-Nasaud - BN	26156	42200	1.26	2.02	0.61
Botosani - BT	127722	48964	6.17	2.34	-0.62
Braila - BR	25456	20750	1.23	0.99	-0.18
Brasov - BV	25261	3811	1.22	0.18	-0.85
Buzau- BZ	52143	116040	2.52	5.56	1.23
Calarasi - CL	22576	6108	1.09	0.29	-0.73
Caras-Severin - CS	58357	56146	2.82	2.69	-0.04
Cluj - CJ	20506	27231	0.99	1.30	0.33
Constanta - CT	29890	124199	1.44	5.95	3.16
Covasna- CV	13733	19983	0.66	0.96	0.46
Dambovita - DB	49207	47941	2.38	2.30	-0.03
Dolj - DJ	41828	13696	2.02	0.66	-0.67
Galati - GL	44043	22920	2.13	1.10	-0.48
Giurgiu - GR	18547	20343	0.90	0.97	0.10
Gorj - GJ	90850	66241	4.39	3.17	-0.27
Harghita - HR	1639	6473	0.08	0.31	2.95
Hunedoara - HD	41199	77314	1.99	3.70	0.88
Ialomita - IL	24908	1799	1.20	0.09	-0.93
Iasi - IS	75229	69755	3.63	3.34	-0.07
Maramures - MM	80404	145424	3.88	6.96	0.81
Mehedinti - MH	41575	45666	2.01	2.19	0.10
Mures - MS	29442	57211	1.42	2.74	0.94
Neamt - NT	96780	32882	4.67	1.57	-0.66
Olt - OT	28901	31769	1.40	1.52	0.10
Prahova - PH	120590	83557	5.82	4.00	-0.31
Bucuresti - Ilfov - B/IF	23763	2122	1.15	0.10	-0.91
Salaj - SJ	14895	102807	0.72	4.92	5.90
Satu Mare - SM	51273	70523	2.48	3.38	0.38
Sibiu - SB	33627	9569	1.62	0.46	-0.72
Suceava - SV	53972	78058	2.61	3.74	0.45
Teleorman - TR	41265	19380	1.99	0.93	-0.53
Timis - TM	66825	32586	3.23	1.56	-0.51
Tulcea - TL	19431	2987	0.94	0.14	-0.85
Valcea - VL	66943	122179	3.23	5.85	0.83
Vaslui - VS	62488	49928	3.02	2.39	-0.20
Vrancea - VN	97803	80984	4.72	3.88	-0.17

Source: National Institute of Statistics

In Romania, according to data of the National Institute of Statistics (National Institute of Statistics, 2022), the number of walnut trees (2070372) accounted for 1.67% of the number of fruit trees at a national level, and in 2021 (2088057) it represented 2.79%. This shows us, on the one hand, that the walnut culture is a niche one, and on the other hand, that its importance has increased. The increase, however, is not due to an increase in the number of walnuts, which is only 17685 trees. It is due to the massive decrease between 1990 - 2021 in the number of other species of fruit trees (plum trees, apple trees, pear trees, peaches, cherries, and cherries, horses, and zarzari, and other trees), which makes the value in 2021 to represent only 59.6% of that of 1990. This situation reflects the effect of protecting the walnut by law.

From the statistical data presented, in 2021, the lowest number of walnut trees were in Ialomita County (0.09% of the total at a national level) and in the Bucharest-Ilfov region (0.10% of the total at a national level). The share of walnuts in the region circumscribed to the counties Vrancea, Buzău, Prahova, Dâmboviţa, Argeş, Vâlcea, Gorj, Mehedinţi counties is noted. These include predominantly hills with a southern exhibition, sunny and semi-sunny, located on the outside of the Curvature Carpathians and the Southern Carpathians, which are distinguished by the existence of a sheltered climate, following the ecological optimum of the walnut, in areas protected from frosts and early or late frosts, with low thermal (Silva News, 2023). These counties account for only 17.98% of Romania's surface but 30.83% of walnuts.

Many of the toponyms in Romania reflect the connection with this tree, including oiconims, from the past or current: Nucu, Nuci, Nucet, Valea Nucetului, Nucșoara, Valea Nucarilor. This is a sign of the existence and development of this culture since ancient times. C. Giurăscu in 1976 (Giurăscu, 1976) stated that the nuceturile from Vâlcea, Dâmboviţa, and Prahova counties are mentioned eary on. The nucetul from Vâlcea County (mentioned around 1400) gave the first name of the current monastery Cozia (in the past called Nucet), then changed to Cozia, in order not to be confused with the nut of Dâmbovița, where there is the Nucet monastery, mentioned documentary at the end of the XVth century (Mănăstirea Nucet, 2023).

It is appreciated that the very name Cozia comes from the word *coz* of Pecenego-Cumana origin, which also means walnut, the foundation of the monastery between 1386 and 1388, in a region where walnuts were growing (Mănăstirea Cozia, 2023).

It should be noted concerning the prefix *coz* and other toponyms, such as Cozla or Cozancea. For example, Cozancea is the name of a monastery in Botoşani County, founded in the second half of the seventeenth century (Mănăstirea Cozancea, 2023).

Another element that shows the connection between the spread of walnuts and the monastic hearths is the presence of several vestiges of some churches and cave cells in the area of Nucu locality in Buzău County.

At the level of Romania, the growth rate of trees was almost contagious, registering an increase of 0.01%. The growth rate was calculated by the formula: Growth rate = (Final value - Starting value) / Starting value.

Nut crop growth rates have evolved differently depending on the pedoclimatic conditions and development funding programs at the national and county level. From the calculations made, the situation of presents according to Table 1 and Figure 1, where the data at the county level were spatialized.

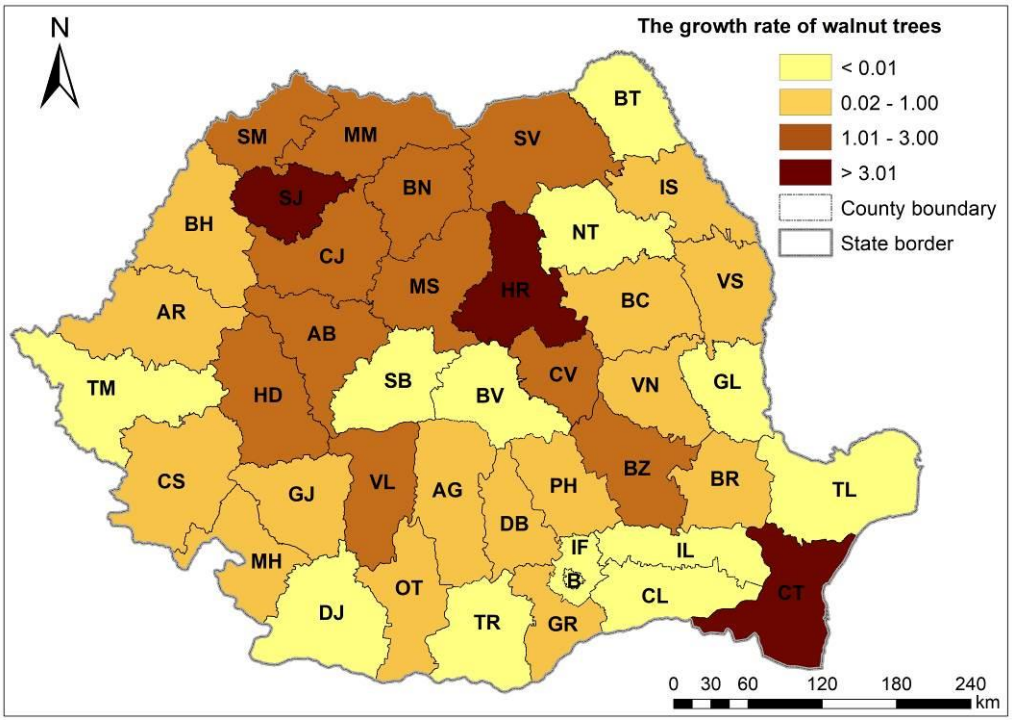

Fig. 1: The growth rate of walnut trees (1990-2021)

From the administrative point of view, the territory of Romania is divided into 41 counties and the municipality of Bucharest. In our analysis, Ilfov County and Bucharest Were analyzed together under the name of Bucharest-Ilfov Region. In 24 units, the growth rate recorded small negative variations, ranging from 0.03 to 0.93, and this situation was offset by increases in the other 17 units, with values between 0.10 and 5.90.

While the growth rate of the number of trees was only 1% (0.01) during the period under review, national nut production recorded a growth rate of 116%. Thus, the average value for each tree, obtained by calculation, increased in Romania three times, from 10 kg in 1990 to 30 kg in 2021.

This cannot be attributed to the increase in trees in the period under review. He can be put in touch with increasing the productivity of trees with their maturation carrying out special maintenance work and introducing varieties with faster maturation. The periodicity of the fructification of the common walnut, a cultivated, subspontane, or even spontaneous species, considered traditional in Romania, is almost annual, in September-October, the germination power is 60-80%, and the longevity is supra centennial (Silva News, 2023).

The entry period for fruiting, from sunrise to the production of the first fruits, lasts, depending on the variety, between 5 and 15 years. In grafted trees, the period of youth is 2-3 years shorter than in trees obtained directly from seeds. Some very early varieties have a very short youthful period, giving the first fruits even after 2-3 years (Zaharia, 2021).

The Romanian varieties with terminal fructification (Geoagiu 65, Jupâneşti, Argeşean, Velcor, Valrex, Valmit, Valcris, Șușița) are the best adapted to the ecological conditions in Romania and present the highest quality fruits (Ministry of Agriculture and Rural Development, 2023).

O3. In the last decade, special attention has been paid to rural tourism development in Romania as an inexhaustible source of promoting traditions, customs, festivals, and in general, all that means immaterial Romanian cultural heritage. The walnut tree is a tree with tradition in Romania, and it is an element often found in folk legends, old stories, traditions and customs of the village, proverbs, and sayings. It has been proven that revenues from rural tourism represent a beneficial source of local development of rural communities. Currently, even if only 33% of rural localities benefit from utilities, this inconvenience is not a problem for the owners of accommodation or food spaces because most of the tourists prefer to live just like in the past times, to participate in local activities, to enjoy traditional holidays, etc.

Many of the nut orchards can be found beside the monasteries, most of them located in places that belong administratively to the rural area, especially in connection with the use of the fruits of this tree in the realization of foods of ritual importance such as coliva, in connection with the commemoration of the departed, the martyrs of Wallachian and Moldavian, used in connection with the feast of the 40 Holy Martyrs of Sevastia (March 9), cakes used at traditional Christmas and Easter meals, or which

can be eaten as such during fasting periods. From the green walnuts collected before Sânziene (the day of the Birth of St. John the Baptist) about the middle of June, a very appreciated sweetness can be prepared (Biaplant, 2014).

Conclusion

Therefore, the integration of niche cultures is one of the means within reach of each rural community to promote cultural tourism heritage and economic development. Among the niche crops preserved but also developed through the introduction of new varieties in recent years in Romanian agriculture, the walnut represents one of the most profitable and useful species from all points of view. That is why it was considered opportune the discussion on the walnut situation in the last 30 years, along with elements regarding the possibility of integrating this culture in the promotion of the Romanian cultural heritage for the development of rural tourism in Romania. Of course, the analysis was not exhaustive, as future concerns may bring new elements and details to shed more light on this issue.

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Souhrn
Studie se zabývá pěstováním ořechů v Rumunsku v období 1990-2021. Výzkum jsme považovali za užitečný, protože v posledních letech mělo Rumunsko významnou produkci na evropské úrovni. Ořešák vlašský je zákonem chráněný druh stromu, který má v rumunské krajině dávnou historii, odráží se v toponymii a je zmiňován ve středověkých dokumentech.
Mnoho toponym v Rumunsku odráží souvislost s tímto stromem, včetně oikonym, z minulosti nebo současnosti: Nucu, Nuci, Nucet, Valea Nucetului, Nucșoara, Valea Nucarilor. To je známkou existence a rozvoje této kultury od pradávna. C. Giurăscu (1976) uvádí, že nuceturile z krajů Vâlcea, Dâmboviţa a Prahova jsou zmiňovány již v dávné minulosti. Nucetul z župy Vâlcea (zmiňovaný kolem roku 1400) dal první název současnému klášteru Cozia (v minulosti se nazýval Nucet), pak se změnil na Cozia, aby nebyl zaměňován s ořechem Dâmbovița, kde se nachází klášter Nucet, zmiňovaný listinně na konci XV. století.
Výsledky této studie nakonec zdůraznily význam nikových plodin, jako je ořechová kultura, pro propagaci rumunských tradic a venkovské turistiky.

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DESTINATION MANAGEMENT SUPPORT SYSTEM AND INTELLIGENT DESTINATION GUIDE FOR NATURAL DESTINATIONS

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Abstract
As a meaningful contribution to digital transformation in the tourism industry aiming to harmonize the needs and preferences of visitors with nature protection, a comprehensive and scalable destination management support system has been designed and developed. It is based on principles of carrying capacity and applies a systemic approach to tourism and destination. In close cooperation with area experts from Broumovsko, Bohemian Paradise, Iron Mountains, and Bohemian Switzerland, multifaceted models of the territories have been constructed, including visitation monitoring time series, paths and routes, and other geographical data. It also includes an extensive interpretative dataset containing geolocalized semantically tagged photos and short texts in several languages, which has been created according to a developed methodology. The system aid participative destination management via readily available visualization of data coming from a variety of sources, including calculated predictions. Using the same models and data, flows of visitors can be influenced via a gamified mobile tour guide application. The main steps involved in implementing the system as well as its main characteristics are briefly described in the paper.

Key words: visitor management; carrying capacity; protected areas; software tour guide

Introduction

Information and communication technologies (ICT) play a growing role in the tourism industry, accelerated in addition to the development of ICT technologies (Buhalis 2019) by social and economic changes, emphasis on the sustainability of tourism, personal development (Marx, Flynn, Kylänen 2021) and also by the impact of the SARS-COV pandemic. The current process is referred to as digital transformation in the tourism industry (Konstantinova 2019, Loureiro, Nascimento 2021). For the sustainability of tourism in natural (and often at the same time protected) areas, it is important to influence the flows, preferences, and behavior of visitors to the area in addition to the regulation and appropriate spatial structure of the tourism infrastructure. This influencing is based on dynamic knowledge of visitor flows and concentration, based on their monitoring (e.g. Shoval, Isaacson 2007; Shoval, Ahas 2016) and modeling of their flows in connection with external factors. In connection with the dynamic concept of carrying capacity (Zelenka, Kacetl 2014; Wang et al. 2020), the creation of a destination management support system (DMSS; not to be confused with destination management system) connected with an intelligent tour guide for mobile devices is a beneficial method. DMSS is a practical implementation of the systemic concept of the destination, based on a dynamic concept of carrying capacity (Pásková et al. 2021) and a systematic description of the natural and cultural resources of the destination, is described in Zejda, Zelenka (2019). This concept was further developed on the basis of research with key actors, verification of suitable methods of simulating the current state of the territory, and experience with its implementation. The intention of the submitted contribution is to briefly describe implementing a destination management support system n intelligent guide for natural areas, including the importance of the involvement of experts for selected areas and to characterize the main outcomes.

Materials and methods

The creation of DMSS follows the previous research on carrying capacity in tourism (Zelenka, Kacetl 2014; Pásková et al. 2021), analysis of the use of ICT in tourism sustainability (Zelenka, Pásková, Husáková 2015), and analysis of the implementation of participatory management in protected areas (Zelenka, Těšitel, Pásková 2013). Based on the theoretical foundation, the technical concept of DMSS (including the intelligent tour guide) has been conceived. For the experimental implementation of DMSS, territories of Broumovsko, Bohemian Paradise, Iron Mountains, and Bohemian Switzerland have been selected based on their physical characteristics, varied intensity and nature of tourism, their proximity and accessibility from Hradec Králové, and their readiness of their management for cooperation. The actual process of creating DMSS based on the underlying theoretical concepts was subsequently based involved:

*0 Research in the heritage interpretation methods and approaches;

*1 Cooperation with individual geoparks, Nature Conservation Agency of the Czech Republic (AOPK), and destination management agencies, whose experts determined areas suitable for photo documentation (while respecting the interests of nature and landscape protection), created or checked interpretation texts and coordinated the activities of documentation teams;
*2 Analysis of territories characteristics including zoning, trails used and usable for tourism, points of interest (top attractivities, often suffering from over-visitation, and actual or potential alternative goals both natural and cultural), visitor monitoring time series, and other characteristics of tourism, conceptual and strategic documents related to the management of visitors in the selected territories;
*3 Selection of algorithms, data structures, architectural principles, communication connections, and application of agile software development approaches to implement a comprehensive and scalable DMSS for selected territories;
*4 Creation of multifaceted territory models involving known territory characteristics and interpretative data within the developed DMSS followed by user testing and usability testing of both the web administrative interface and the tour guide.

Results

Research and development involving territory experts, photographers, documentarians, interpreters, translators, statisticians and data scientists, software architects, and developers concluded in the following practical results:

1. An interpretative data set consisting of almost 3000 mostly original photographies has been created, each photography geolocated, semantically tagged, and described, interpretative texts translated into five languages (English, German, Polish, Ukrainian, Russian);
2. Initial multifaceted models of territories have been constructed consisting of trails usable for tourism, visitation time series, interpretative content;
3. A Set of methodological guides covering the whole process of a photo-documentation and interpretation (organizing documentation activities, planning a documentation trip, taking photos and notes in-situ, authoring short interpretative texts, assigning GPS coordinates, semantic tagging, validating, importing, translating) have been created and evaluated;

Namely, comprehensive and scalable DMSS has been developed in the architecture of containerized microservices (Fig. *3*) which can run either centrally or in distributed deployments. It has a comprehensive web-based management interface and involves modules for:

- importing and management of photos and textual interpretation and for systematic translation (integrates machine translation, filtering, and full-text search) with status tracking, edit history, role-based approval workflow, and visualizing the coverage of the territory with photographs,
- defining a network of paths that can be used by visitors, namely the mobile guide users (the system calculates the suitable paths between selected points), creating recommended tours over the defined paths that can be actively offered to visitors, temporarily closing a path segment to exclude it from navigation,
- management of visitation time series, including advanced interpolation and predictive algorithms.
- visualization of tracking records received from registered visitors.

On the side of DMSS, a communication API is available to connect a mobile guide application that supports new user registration, provides the app with interpretation data, and receives tracking and telemetry data for analysis. A sample (referential) mobile application of the tourist guide has been developed, tested, and released (Fig. *4*). The main function of the application is gamified, geofencing is used to unlock the interpretive details of the places the user has passed by. It allows trail tracking and visualization of recorded trips. The application responds to status changes (foreground, background, off display, offline, online, low battery, etc.) and supports all commonly used Android versions. It adapts its behavior (e.g. frequency of communication with the server) according to the current state to optimize system resources.

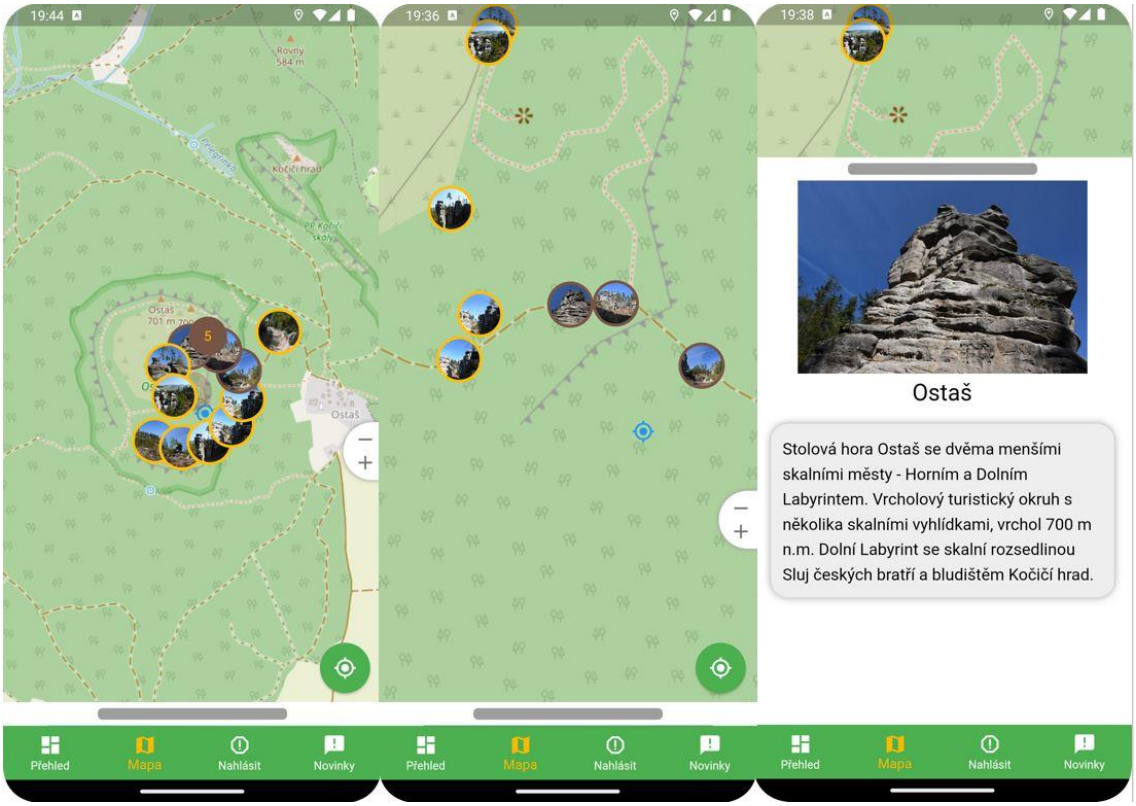

Fig. 3: Interpretation coverage visualization for Broumovsko; sample interpretative description of Ostaš consisting of geolocalized photography, semantic tags, timestamp and connected textual objects; sample of a proposed route with two partial circuits; aided online translation of texts; prediction of visitation in two sample profiles in the Iron Mountains.

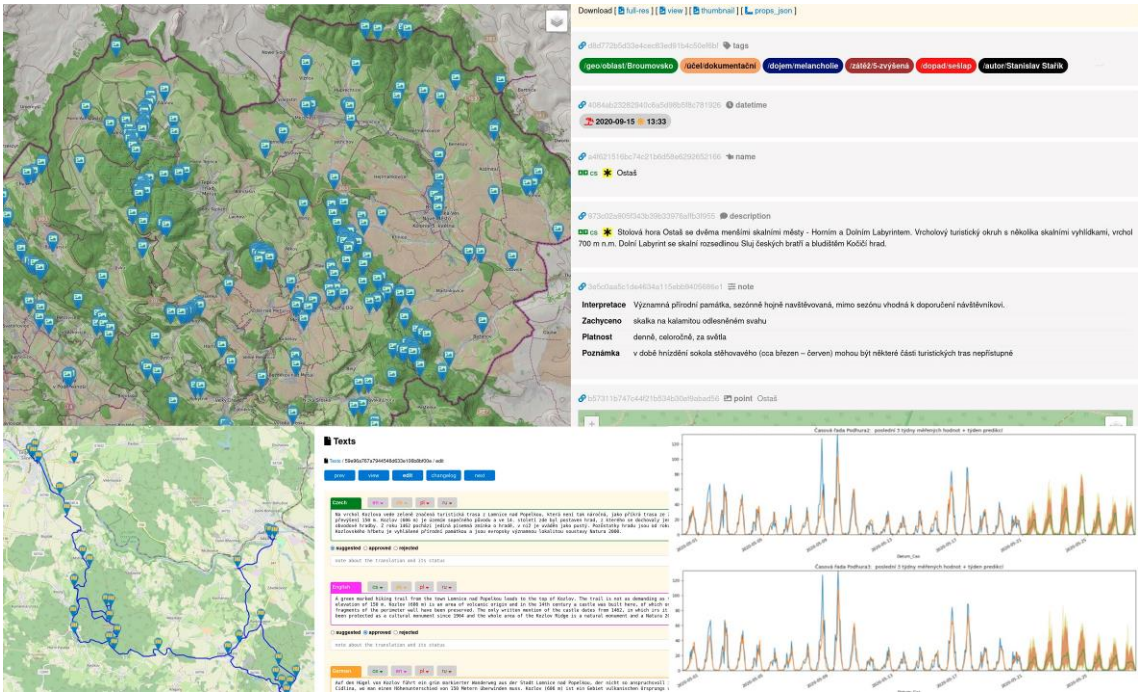

Fig. 4: Surroundings of Ostaš with examples of points of interest covered with photographs and interpretive text displayed in the mobile tour guide application.

Conclusion

As a practical application of the results of research concerning carrying capacity and systemic approaches to tourism and destination (Zelenka, Těšitel, Pásková 2013; Zelenka, Kacetl 2014; Zelenka, Pásková, Husáková 2015; Zejda, Zelenka 2019; Pásková et al. 2021), comprehensive, scalable DMSS has been designed and developed. In close cooperation with area experts from Broumovsko, Bohemian Paradise, Iron Mountains, and Bohemian Switzerland, characteristics of tourism including tourism-nature interactions in these territories have been thoroughly analyzed. Informed by the analysis, multifaceted models of involved territories have been constructed. They include visitation monitoring time series, paths and routes, and other geographical data and an extensive interpretative dataset containing geolocalized semantically tagged photos and short texts in several languages. The DMSS aids participative destination management via readily available visualization of available data from a variety of sources, including calculated predictions. Using the same models and data, flows of visitors can be influenced via a gamified mobile tour guide application.

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Souhrn

Jako praktická aplikace výsledků výzkumu únosné kapacity a systémových přístupů k cestovnímu ruchu a destinaci byl navržen a vyvinut komplexní, škálovatelný systém pro podporu destinačního managementu (DMSS). V úzké spolupráci s odborníky na danou oblast z Broumovska, Českého ráje, Železných hor a Českého Švýcarska byly důkladně analyzovány charakteristiky cestovního ruchu včetně interakcí cestovní ruch-příroda v těchto územích. Na základě této analýzy byly zkonstruovány modely zapojených území. Jejich součástí jsou časové řady z monitoringu návštěvnosti, struktura cest a tras a dalších geografických údajů a rozsáhlý interpretační datový soubor obsahující

geolokalizované sémanticky označené fotografie a krátké texty v několika jazycích. DMSS usnadňuje participativní destinační management prostřednictvím vizualizace dostupných dat z různých zdrojů vč. spočítaných predikcí. Pomocí stejných modelů a dat lze ovlivňovat toky návštěvníků prostřednictvím gamifikované mobilní průvodcovské aplikace.

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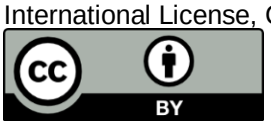

LANDSCAPE – ARCHITECTURAL PROPOSAL OF JANDURA PARK IN CANBERRA, AUSTRALIA: EXPERIENCE OF BILATERAL COOPERATION BETWEEN TWO UNIVERSITIES

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Abstract
In 2022, there was a possibility for the students of the Slovak University of Agriculture in Nitra (Slovakia) to participate at the Landscape – Architectural proposal of Jandura park in Canberra, together with the students from The University of Canberra (Australia). Jandura Park is situated nearby to the suburbs O'Connor and Turner. It is named after Mr Jan Jandura Puček, the first 'non-British man', who gain Australian Citizenship, at the first Australian citizenship ceremony at Canberra's Albert Hall on 3 February 1949. He was born in 1914 in Habovka, Orava region in Slovakia. The cooperation between 2 universities was initiated by The Embassy of the Slovak Republic in Canberra. After 3 months of discussions 10 landscape architectural proposals of the park have been prepared. The posters were presented in the park and at The Embassy of SR in Canberra.

Key words: green infrastructure, landscape architecture, urban parks, J. Jandura Puček

Introduction

Urban parks are great part of the green – blue infrastructure of the urban environment and offers several environmental and economic benefits, make contributions to the management of stormwater and support biodiversity in cities (Tóth, 2022). They are a valuable resource in designing sustainablecities (Dinep and Schwab, 2010). Urban parks serve also an education platform, social advantages, create a positive effect on physical and mental health (Čibik, et al., 2022; Dizdaroglu, 2022) and they are great places for everyday recreation and relaxation (Ball Scott, 2012; Supuka and Bihuňová, 2018).
Maintenance and preservation of social relations and meanings, which refer to diverse histories, values and relationship of contemporary population is defined by Low et al. (2005) as social sustainability.
Time-conscious urban design by Thwaites et al. (2007) consists of sets of environmental factors that can influence needs, satisfaction and raise environmental perception and evaluation. He named following environmental factors: diversity of people, diversity of functions, diversity of urban detail, social and physical accessibility and management and regulation of the spaces.
Tóth (2022) consider each green space element as a unique open space with its own values and qualities. Maksymenko et al. (2022) added that the establishment of the dialog with local population can not only modify the revitalisation of the space, but also can lead to more widespread use of nature-oriented practices in city parks. Site design decisions create the identity and function of the landscape proportion of the site with a program of sequenced zones. Planting design is a key to create contrasting spaces (Dinep and Schwab, 2010). Successful neighbourhood should meet longer – term needs - the cycle of the lifetime in addition to daily needs.
Some strategies for planning a sustainable urban park according to Dizdaroglu (2022) are: - Providing the green infrastructure, - Creating a place for people of all ages, - Building connected park systems within walking distance, - Implementing water and energy conservation practices, - Supporting and preserving biodiversity, - Environmental education, - Ensuring the long-term maintenance and management of the park,

Material and methods

The Embassy of Slovak Republic in Canberra has contacted the Faculty of Horticulture and Landscape Engineering SUA Nitra with the offer to cooperate with the University of Canberra (Australia) on Landscape architectural proposal of Jandura park in Canberra. The communication went through TEAMS application and due to different time zones, the suitable time schedule was agreed. Students and teachers used also MIRO application, which enable effective progress in creative and design process.
There have been applied methods as: terrain survey (done by students in Australia), review of the information about Jan Jandura Puček (done by Slovak students), on line discussions and presentations of the findings and ideas. At the end of the semester were final presentations of 10

landscape architectural proposals (5 done by students from Slovakia and 5 done by students from Australia).
Ján Jandura-Puček was born in 1914 in Habovka na Orava. He emigrated to Australia in 1939. He was 25 years old and worked as a woodcutter in eucalyptus forests. The situation in Czechoslovakia worsened, so he did not return to his wife, according to the original plan, but 10 years later his wife came to Canberra. Until 1949, Australian citizenship did not exist. Residents with permanent residence on this continent were British citizens. In 1949 the government finally decided to grant citizenship to the first non-British residents. They thus selected one person from each state and territory to be the first to be ceremoniously granted such citizenship. Ján Jandura was chosen as a representative of the Australian Capital Territory. He was even the first among those chosen to answer the question of what his previous citizenship was, briefly, in one word: "Czechoslovakian".

Results

Jandura park is situated in the middle of the city Canberra, following the Sullivan creek and at the same time it is part of the green belt of the city. There have been elaborated 5 landscape architectural designs by 5 groups of students on each side (Slovak and Australia). The topic, the main idea of the proposal was common for each group, but landscape-architectural design of the park was different.
Students were focusing on the functional zoning of the park, suitable interconnection to the neighbourhood and existing communications and original equipment referring to the Slovak culture and nature. The key factor, which Slovak students wanted to work with was imageability – as it is defined by Lynch (2007, p. 131,): “the quality which gives a high probability of evoking a strong image in any given observer”. The main ideas, which were elaborated were: TRANSI(T_S)TORY, CIRCLE OF LIFE, ARRIVAL IN RETROSPECT, THE JOURNEY FOR A BETTER LIFE and FROM SLOVAKIA TO AUSTRALIA.

Fig. 1: Proposal TRANSI(T-S)TORY (authors: Diškantová, Krajčovičová, Kriaučiuniene, 2022)

TRANSI(T_S)TORY The design of Jandura Park is closely related to the natural environment of the area. The revitalization of the Sullivan Creek will ensure its function as a green corridor and better connections with the Lyneham Wetlands. The naturalized stream, as well as planted new trees and perennial beds, will provide more habitats for game and create conditions for greater biodiversity in the area. Proposed elements will be in a uniform style, decorated with Slovak folk art patterns. The traditional patterns are chosen from the Slovak village – Čičmany. These design elements will provide some educational moment encouraging curiosity and interest.

Fig. 2: Proposal THE JOURNEY FOR A BETTER LIFE (authors: Belinska, Bodor, Kováčová, 2022)

THE JOURNEY FOR A BETTER LIFE
Proposed revitalisation will bring more possibilities to enjoy the outdoor recreational activities for the inhabitants of Canberra. Park is divided into three zones: leisure and pleasure, education and transit. The most dominant element is the canal, situated in the middle of the park. Its concrete character is preserved, but from a functional and visual point of view, is improved. Canal banks are transformed into terraces, which can be used for sitting and relaxing. Proposed ponds could collect the water and improve the microclimate conditions of the park. At the terraces of water canal are placed small blocks with information about the first migrants from different countries, who have been given Australian citizenship, including their portraits and short personal description.

Discussion

Cultural diversity provides a way to evaluate cultural and social sustainability and it is one observable outcome of the continuity of human groups in culturally significant places (Low et.al. 2005). Thwaites et al. (2007) used the term "time-conscious urban design", which is based on threefold concept merging architectural heritage preservation, ordinary old buildings´ preservation and multi-actorial change. The sense of place derives from the collaboration of three dimensions – the place, the experience of place and the meanings attributed to it. Ball Scott (2012) put emphases on the increasing longevity and increased percentage of older adults as a challenge for open space design.

One of the current trends in landscape architectural design, except the adaptation to climate changes, management of the rainfalls (Supuka and Bihuňová, 2018), applying new materials, inclusive design, different management of the open green spaces and increasing the biodiversity with flower meadows and fruit trees in the public open spaces (Bihuňova, et al., 2021). The sustainable design of urban parks is one of the most successful approaches in addressing the environmental problems of urban spaces (Dizdaroglu, 2022).

The similar inspirational concept as was used in above mentioned proposals (base on the life and work of famous person), was presented by Bihuňová, et.al. (2020) in the landscape architectural design of the city park in Martin, where a famous Slovak writer P.O.Hviezdoslav became the source of inspiration.

The main differences between Slovak and Australian students has appeared during the process of designing. All international groups have agreed at the main idea of the park, the main topic, but detailed elaboration was done separately. The Slovak students were more aimed at storytelling, their design was closely connected with the background and life of Jan Jandura, and traditions and folk culture in Slovakia. They have created several educational and informational zones in the park. On the other hand, the students from Canberra University were focusing on the vegetation design, revitalisation of the creek, with less emphases on J. Jandura and his background.

Conclusion

The international experience was great opportunity for students and for teachers. The discussions during the creative process and final presentations were fruitful and let to better understanding of the theoretical and practical skills of the students on both sites.

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Souhrn
V roce 2022 měli studenti Slovenské zemědělské univerzity v Nitře možnost zúčastnit se krajinářsko-architektonického návrhu parku Jandura v Canbeře společně se studenty z University of Canberra v Austrálii. Park je pojmenován po Jánu Jandurovi Pučkovi, prvním "ne-Britovi", který získal australské občanství a kterému bylo uděleno 3. února 1949 v canberrské Albert Hall. Narodil se v roce 1914 v Habovce na Oravě na Slovensku. Spolupráci mezi oběma univerzitami iniciovalo slovenské velvyslanectví v Canbeře. Po třech měsících diskusí bylo připraveno 10 krajinářských a architektonických návrhů parku (5 ze slovenské strany a 5 od studentů z Canberry). Konečné návrhy byly prezentovány v parku Jandura a na slovenském velvyslanectví v Canbeře.

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LANDSCAPE CHARACTER AND INTEGRATION OF MINING LAKES INTO THE LANDSCAPE - OPPORTUNITIES AND RISKS

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Abstract
This paper looks at the revitalisation of large mining lakes and their effective integration into the landscape. It also gives concrete examples of how lakes can be used for landscape restoration, the creation of valuable habitates, environmental education or recreation.

Key words: Landscape protection and creation, conflicts of interest

Introduction
Mineral resources play a key role in the industrial development of society. Extracted space is not only a necessary evil but also a great opportunity to enrich the landscape and develop its natural, socio-economic and cultural functions

Materials and methods
Large-scale extraction of raw materials takes place mainly on agricultural land and, to a lesser extent, on land intended for forestry. Reclamation of areas affected by mining is governed by Act No. 44/1988 Coll., on the Protection and Use of Mineral Resources (Mining Act), Act No. 334/1992 Coll. on the protection of the agricultural soil fund, and by Decree No. 271/2019 Coll. on the determination of procedures to ensure the protection of the agricultural soil fund. Reclamation of land intended for the performance of forest functions is governed by Act No. 289/1995 Coll., the Forest Act.
During last twenty years, the principles of natural restauration been increasingly used (Jongepierová, 2018), which have also been applied in presented sites.

Results
A reclamation project is always based on three pillars: extraction of the raw material - protection of existing values of the area – target use of the area. A well-designed reclamation plan takes advantage of the existing and potential values of the site, respects the memory of the landscape and coordinates potential conflicts of interest. Various interests meet here - water source, recreation, fish farming, water sports, local entrepreneurs, municipalities etc. Often nature conservationists - ornithologists, herpetologists, entomologists, botanists, etc. have very different or even contradictory requirements. Finding a compromise is thus the most challenging part of the work.
In my contribution, I would like to introduce you to two different sites - Spytihněv Gravel Pit and Náklo Sand Plant. I've been working on for a long time.

Gravel pit Spytihnev
The area of interest is situated in the Zlín Region, in a wide floodplain of the Morava River, south of the town Napajedla. The entire mining area lies within the Morava River Quaternary Protected Area, along which the supra-regional biocorridor of the TSES (Teritorial system of ecological stability) is routed. Before mining began, it was an intensively used agricultural landscape. A thorough mapping of the landscape preceded the start of mining in the 1990s. Subsequently, a reclamation plan was drawn up in the form of ongoing revitalisation with the aim of approximating the character of the original floodplain landscape and creating a framework for the trans-regional and local TSES.

Fig. 1: Spytihněv – total view

The reclamation plan was gradually developed into partial stages and gradually implemented over the years. The result of the reclamation is the creation of a nature-like floodplain landscape, in which the water and wetland areas of the floodplain forest segment, landscape greenery and especially differentiated grasslands alternate from the original high-stemmed meadows, through productive mesophilic areas to dry grasslands on a sandy substrate. The scale of the restored landscape is harmonious with the restored historic landscape structures (rounded water bodies with accompanying greenery, fruit plantations in the historic footprint, mosaic of meadows). The revitalised areas currently represent a segment of the restored valley floodplain and the overall space has a significantly higher ecological and aesthetic value than the original agrocenoses. The restored landscape also has a higher retention capacity, which was evident in the 2006 floods.
The target use of the site is also part of the plan, including transport accessibility (future use as part of marked hiking trails, horse and cycle paths, connection to the Bata Canal).
In the more remote part of the site, quiet areas without access are purposefully created.

Náklo sand mine

The Náklo sand mine is located in the Olomouc Region in the Morava River floodplain between the towns of Olomouc and Litovel. The mine is immediately adjacent to the Litovelské Pomoraví Protected Landscape Area. Intensive mining has been taking place here since 1945. Mining is large-scale , the mining edges are sharp, the shapes of the lakes are straight and geometric.
This is a very rich deposit. It is currently being mined from the bottom and gradually expanded slightly. The proportion of backfilled areas are limited and there are used as agricultural land again (after reclamation). The revitalisation therefore aims at restoring soil fertility to the exploited areas and promoting biodiversity. To this end, a Biodiversity Action Plan was developed by experts in 2016, focusing on the conservation of umbrella species. The recommendations were then incorporated into the Remediation and Reclamation Plan and is continuously updated and implemented.
The reclamation plan also includes the integration of the mining site into the landscape.
Mining takes place in a large-scale agricultural landscape, in an open landscape setting and close to settlements. To protect them, noise barriers with planting of greenery and other linear plantings have been implemented, completing the rough mosaic of the landscape. The alley planting of oaks and a group of different willows , there are in the area between the mining and the Litovelské Pomoraví Protected Landscape Area . All planting show good.
The mining lakes are a typical conflict site - in addition to nature conservation, fishermen, yachtsmen, holidaymakers and others who have colonised the shores and built up their facilities over the years are making a significant impact. Due to the proximity to the regional city, the situation has become difficult to sustain in recent years - the banks of the areas where mining has ceased are occupied by crowds of people enjoying the sun and water in the summer months. Hundreds of cars block roads, dirt tracks

and related areas. Local citizens are then forced to endure noise, heavy traffic and other negative impacts of recreation... This is a situation the mining company is seeking to address in cooperation with the municipalities. However, this is a very difficult task that requires the cooperation of the miners, landowners, the affected municipalities, the police and other government authorities.

Fig. 2: Náklo – overall view

Discussion

Adverse impacts on the landscape and the environment are most significant and unnoticeable, especially during the mining period, as they are manifested by direct disturbance and changes to the landscape and its components. A well-developed and phased reclamation plan can minimize these negative impacts, in no small part already during mining.

It proves necessary to monitor and refine the reclamation plan according to the actual development of the site. It is also very important to determine the reclamation objective and the possibilities of subsequent use of the site for the termination of mining. Many problems can be avoided by informing the public and cooperating with the municipalities and public authorities concerned

Conclusion

The practice shows increasing demands on the quality of the reclamation process from the reclamation plan, through the reclamation plan to the implementation project.

The exploited areas have great potential - not just the usual water management, recreational, sporting or fishing uses. New legislation (Decree No. 271/2019 Coll.) already allows for the allocation of part of the mining area for valuable habitats and protected species. However, there is also great scope for finding a new balance in the landscape. Targeted measures can make a significant contribution to adapting the landscape to climate change. Suitable areas can be found for the location of renewable energy sources. For successful implementation of the plans, it is essential that they are reflected in spatial planning documents.

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Souhrn

Příspěvek se zabývá potenciálem a využitím těžebních jezer, jejich zapojením do krajiny a možnostmi následného využití. Na příkladu dvou rozdílných lokalit je ukázána potřebnost zpracování rekultivačních plánů, záměru a projektů i v širších vztazích. Vzhledem k časovému odstupu od

zahájení těžby a vývoje na lokalitě se ukazuje nezbytnost monitoringu lokality a průběžné a zapracování nových zjištěných skutečností do sanačních a rekultivačních plánů.

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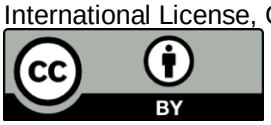

LANDSCAPE-ARCHITECTURAL SOLUTIONS AROUND THE RIVER VÁH IN SELECTED LOCALITIES IN THE SEREĎ CADASTRAL TERRITORY

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Abstract
In the past, the areas along the banks of the Váh River and their adjacent surroundings were important spaces for the recreation of the general public. The treated areas represent an important biotic component in the cultural type of landscape, in the warmest and driest region of Slovakia, with an emphasis on agricultural tradition. The article elaborates diverse ideas, attitudes and design solutions, with an emphasis on people's recreation, created by students of the Institute of Landscape Architecture from the Slovak University of Agriculture in Nitra, which were commissioned for revitalization by the Slovak association Príroda. In terms of the research by design approach, the aim of the contribution is to define the key design principles that students apply in their design solutions.

Key words: recreation, landscape architecture, environmental education, landscaping

Introduction

The landscape represents the basic living space not only for humans but also for all other living organisms (Miklós et al., 2019). The landscape and its ecosystems Schneider, Kalasová, Fialová, (2020) provide us with a range of benefits, whether direct or indirect, to satisfy life needs (Čibik et al., 2022a). They provide food, water and materials for the development of society, contribute to the regulation of many phenomena and processes that take place in the country, and also provide several cultural and recreational opportunities (Čibik et al., 2022b, Šinka et al. 2019). In the revitalization of the landscape, research is focused on the needs of restoration of burdened and endangered areas with an emphasis on the ecological stability of the landscape and adaptation to climate change (Rózová et. al., 2020), creation of adaptation strategies (Čibik et al. 2020b, Tóth, 2022), creation of territorial systems of ecological stability, landscape ecological plans and studies (Kuczman et al., 2022, Bechera et al., 2022, Čibik et al., 2020a, Back Prochnow et al., 2022) to ensure sustainable development of the country (Bihuňova et al. 2021, Mariš, 2022). The method of support is in the European Green Deal 2019 with the aim of helping European citizens to benefit from the benefits of sustainable ecological development. They cover a wide range of topics, with an emphasis on the protection of the green environment in Europe (Marišová et al., 2023). The article deals with diverse ideas, attitudes and design solutions along the banks of the Váh River and their adjacent surrounding areas of the dead arm with an emphasis on people's recreation. Design studies were created by students of the Institute of Landscape Architecture from SPU in Nitra, whose revitalization was commissioned by the Slovak association Príroda. The works were presented to the public in the city museum in Sered, as well as on the grounds of the Slovak University of Agriculture in Nitra.

Materials and methods

The assignment within the Landscape Design Studio course was to develop a design concept for an important open landscape space with an emphasis on recreational use. The request for revitalization was commissioned by the Slovak association Príroda. The landscape area is located in southwestern Slovakia, the Danube Plain on the right bank of the Váh River, in the Trnava Region, see fig 1. The addressed area is located on the eastern edge of the city of Sereď. The area of interest occupies 58 ha.

In addition to the river, the territory includes three bodies of water - dead branches of the Váh River, which are located in parts over the entire area. The territory belongs to the locality of willow-poplar forests (soft floodplain forest), which makes up approximately 90% of the area, and Carpathian oak-hornbeam forests, which make up approximately 10% of the area. They are found in the lowest places of valley floodplains of larger rivers, on floodplain soils rich in nutrients. The main ecological factor is regular surface water flooding. All green areas are not completely connected, they are usually multi-storey. The shrub layer is species-poor, it is dominated by young trees and invasive species. Hygrophilic and nitrophilic species are used in the herb layer. A typical feature is the high coverage and predominance of some fast-spreading autochthonous species, which are identified with potential

natural vegetation Miklós, (2002) such as *Fraxinus angustifolia* Vahl, *Populus alba* L., *Populus nigra* L., *Salix alba* L., *Salix x fragilis* L., *Salix x rubens*, *Salix triandra* L.. Currently, the area is used for recreational fishing, the existing greenery is neglected. From the point of view of the research by design approach, the goal of the paper is to define the key principles of design that students apply in their design solutions (Kuczman, 2018). The method consisted of two main parts - 1) analysis (broader relationships, historical, functional, spatial, visual and landscape analysis, as well as mapping of non-forest woody vegetation, which was an inevitable part of mapping for specific measures from the point of view of completing the woody composition. This mapping was carried out according to the methodology of Supuk et al (2013). 2) design (students worked in a design group that developed two different design concepts that resulted in solutions close to nature - "Recreation center" and "Support of biodiversity and water use in the landscape" (Kuczman et al., 2022).

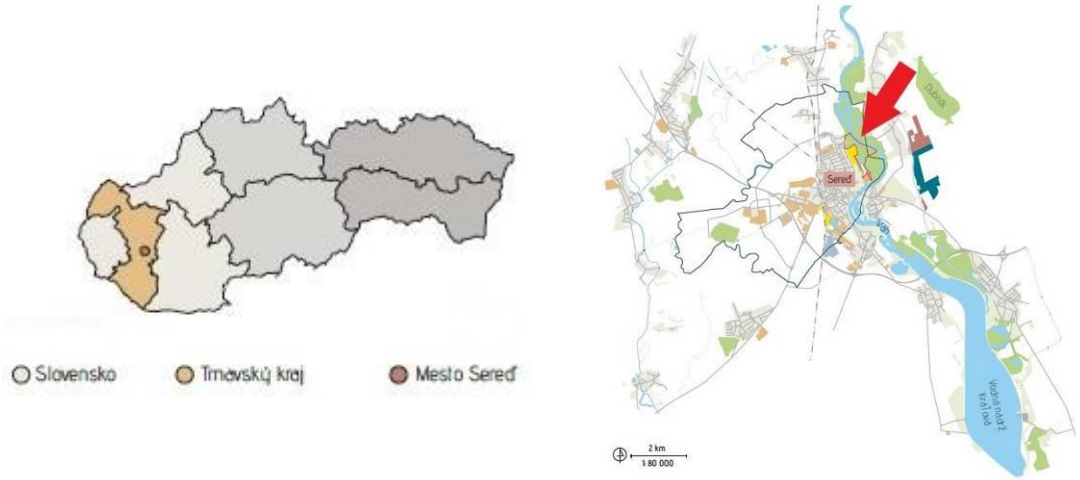

Fig 1: Localization of the addressed area within the Slovak Republic and the addressed area in relation to the city of Sereď.

Results

The result of the design process is two different design concepts full of many creative ideas and solutions. Students presented new activities and elements of environmental education and recreation for different age groups to future visitors. The solutions are presented in redistributed functional areas, see fig 2.

The students tried to connect the site with the surrounding landscape through natural elements and support the identity of the natural environment of floodplain forests. Both design concepts "Recreation Center" and "Connection with water and support of environmental biodiversity" used the huge potential for a number of functions and activities in the space that can attract city residents as well as tourists. These activities are rest, improvement of the surroundings of water bodies, recreation, revitalization of roads for comfortable and safe walking and cycling, creating views of the landscape, sitting by the fire, camping, sports, building playgrounds for children, athletes, seniors, bike park, improvement of cycle paths, space for fishing, culture, space for holding public or private events. The vast majority of roads, especially in the central part, are permanently wet due to their unevenness, which creates mud and hinders movement and endangers the safety of visitors. The solution was to restore them and build a new routing of the sidewalk network segments "A - D" see fig. 2, with a link to the newly built activities in the space. Raised wooden walkways were designed in waterlogged areas, which dominate sector "D". Through meadow communities, a new route of a natural trail was proposed in the form of mowed areas with visual connections with the surrounding natural or cultural landmarks, which represents segment "A" see fig. 2. In the segment "A and C" the spatial connection with the surrounding cultural and natural landmarks was used and supported, see fig. 3, within sector "C" was placed the observation tower fig. 4., which opens up views of the surrounding settlements and the countryside.

The southern part of this sector was supported by *Alnus glutinosa* L. species, which completed the stylization of the former Váh stream and stretches across the neighboring sector "D". In this sector, a dense stand of trees was used and supported for a ropeway for children. Segment "C" is dominated by the lake, which was sculpted for sport fishing, in the form of newly designed wooden jetties and in the adjacent parts, areas for outdoor picnics. In this space, furniture was designed in the form of couches,

shelters and various elements for sitting and grilling in nature. The main dominant feature of the Váh River area is made accessible by a network of footpaths from all segments in the treated area and banks built for sunbathing, swimming and year-round recreation for residents. There are a total of 15 types of canopy and 22 types of trees on the treated area. Felling of trees mainly concerns invasive and invasive species of trees, trees damaged by pests and beavers, broken and dry trees. This clearing was also supported to make available all areas in the treated area and for the needs of building natural paths. The species composition of the trees was supported by autochthonous tree species, in order to support the biodiversity and local identity of floodplain forests. In addition, they functionally strengthen the banks of the dead arms and the lake. The trees in the space significantly complete the biotope in the landscape, help the water cycle, its natural infiltration in the landscape, and improve the overall ecology and aesthetics of the adjacent urban part of the city of Sereď.

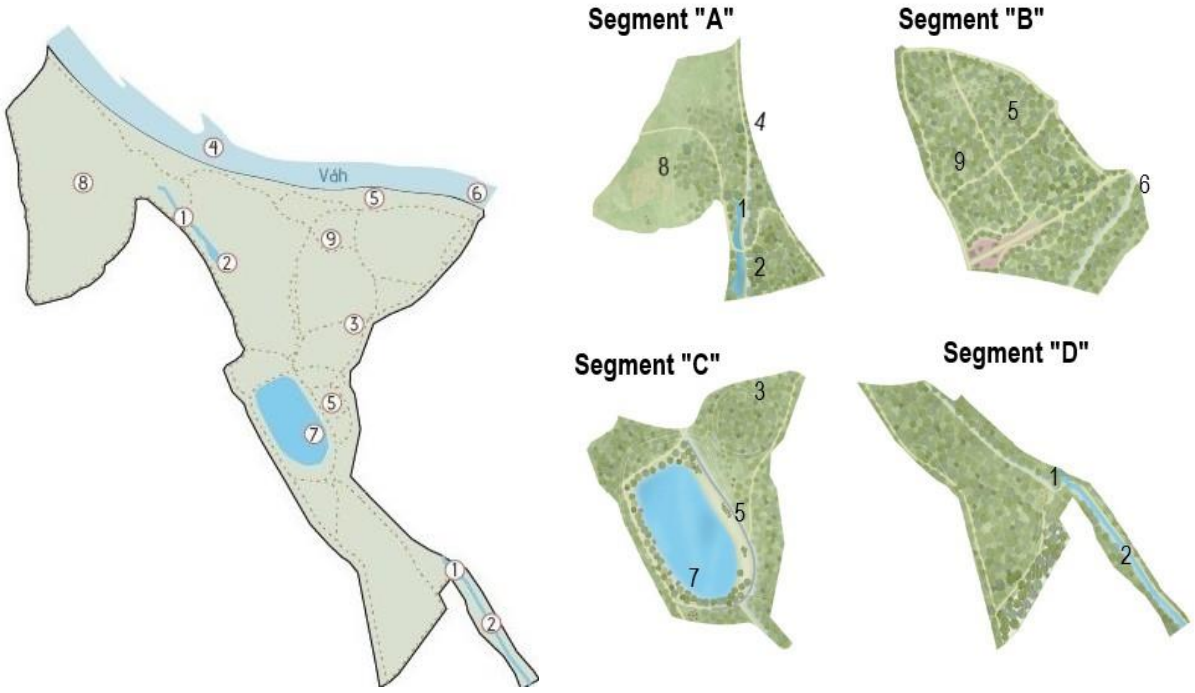

Fig 2: Situation plan of landscape architecture developed by students, redistribution of territory into segments „A – D“ according to use (Authors: Natália Molnárová, Simona Poluchová, teacher / head of the design studio: Gabriel Kuczman, Denis Bechera (1-2) reinforcement of slopes, footbridges made of natural material around the dead arms of Váh, 3) lookout tower, 4) modification of vegetation along Váh - support of biodiversity, 5) shelters for children's activities, 6) design of pier for boats and water sports, 7) piers for fishermen - fishing spots, 8) support of biodiversity in the form of meadows, 9) bicycle paths

Fig. 3 and Fig. 4 Visual connection of the space with surrounding cultural landmarks and Visualization of area 3 with an observation tower (Authors: Natália Molnárová, Simona Poluchová, teacher / head of the design studio: Gabriel Kuczman, Denis Bechera)

Conclusion

The presented landscape-architectural solutions point to the possibilities of restoration of neglected natural landscape biotopes in the contact zones of the settlement. They offer many opportunities for recreation and higher attendance of people with an urban lifestyle. The case studies were consulted through direct communications with local residents, whose requirements were incorporated into the final phase of the project and which were presented at a public event in the presence of the concerned authorities and those interested in improving this important biotope in the country.

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Souhrn
Příspěvek představuje koncepty řešení významného krajinného prostoru s důrazem zachování bioty a dotvoření prostoru pro rekreační využití. Požadavkem na revitalizaci pověřilo Slovenskou univerzitu v Nitře (ÚKA) Slovenské sdružení Příroda. Krajinný prostor se nachází na jihozápadním Slovensku, Podunajské nížině břehu řeky Váh. Z nevyužitého a zanedbaného prostoru případové studie představují různé formy krajinně-architektonická řešení k jejich zatraktivnění a obnově zanedbaných přírodních stanovišť příměstských sídel, která přinášejí řadu příležitostí k rekreačnímu využití. Představená řešení reflektují na požadavky široké veřejnosti, které byly veřejně odprezentovány na půdě městského muzea v Seredi a na SPU, ÚKA v Nitře.

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LANDSCAPE-FRIENDLY METHOD OF FOUNDING WOODEN BUILDINGS FOR RECREATIONAL USE

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Abstract
When structures in the landscape based on concrete foundations are removed, the foundations are usually left in the ground, but the environment is degraded. The article focuses on the possibilities of foundations in the natural environment nowadays, when we can found buildings on earth screws. This is a way of founding buildings that will be more environmentally friendly. Using earth screws instead of concrete is a modern and eco-friendly option for founding a building or structure. They can also be used in terrain that is difficult to access. With the help of screws we can anchor an information board, a playground, a shelter, a fence, noise barriers, as well as footbridges and bridges or other wooden structures, e.g. even a modular wooden toilet building. If we decide to demolish or move the building, the screws can be unscrewed and the environment can remain intact. Another advantage is the speed of construction, compared to concrete foundations.

Key words: buildings in the landscape, foundations, ground screws, wooden buildings

Introduction

Under normal foundation conditions, we establish wooden buildings and wooden structures for recreational use in the landscape on flat foundations. These are most often strip foundations, footings or slab foundations made of concrete or reinforced concrete. Slab foundations are structures that distribute all loads into the soil at the level of the foundation joint. They are monolithic concrete structures, often combined with the pouring of concrete mix both directly into the excavation and into the lost formwork. The dimensions of the foundations depend not only on the load but also on the foundation conditions at the site. For unblocked buildings, the depth of the foundations is usually up to a non-freezing depth, i.e. a minimum of 800 mm. These foundations are sufficiently load-bearing and are also used for anchoring columns of simple wooden structures (gazebos, benches, information boards, signposts, etc.). Anchoring footings can be then fixed into the foundation directly into the fresh concrete using a spike or using a footing with a plate designed for additional fixing to a solid base, see Figure 1. However, wooden elements do not have a long service life in the natural environment. If the wood degrades, it can be replaced with new elements. But quite often the exchange does not happen, and an unsightly block of concrete remains in the natural environment.
In some recreationally attractive locations, visitor information centres, small restaurants or toilet facilities are built for visitors. These facilities can be designed as modular structures so that the environment is not burdened by the construction in the long term. However, even these buildings require foundations. If they are founded on conventional concrete slab foundations, topsoil must be removed, excavations made, and then it is possible to pour the concrete. The upper structure is then built on top of the storage slab. Pre-finished modular houses can be brought in and fitted, so that the natural environment is not affected by the construction. However, once these structures have reached the end of their useful life, the site is usually left with an unusable concrete area, even after the entire structure has been removed. A modern alternative to concrete foundations is ground drilling. Especially timber buildings, which are lightweight structures, can be founded on ground screws.

Materials and methods

In forests today, we often encounter unsightly anchoring of wooden posts directly into concrete footings or using various metal footings or profiles, see Figs. 2 and 3, where the structural protection of the wood is not even ensured and the wood degrades quite quickly. A modern variant is anchoring with ground screws. Earth screws are conical steel screws of various lengths that can be placed in the ground by hand with a mounting rod, by a special hand-held electric drill, or by a belt machine.
Thanks to many years of development and technologically demanding testing, earth screws for larger buildings are installed with the highest demands on precision, tensile and compressive strength and stability. Installation is carried out using professional equipment developed specifically for the application of ground screws. (www.zemnivruty-krinner.cz)

The screws actually work in a similar way to concrete piles, but it is a dry process. The screws are made of steel, treated with the highest quality hot-dip galvanizing, so they do not rust.
The dimensions of the screws correspond to the load and bearing capacity of the soil. The properties of the soil are determined by tensile testing. The screws can be used in any geological conditions. With experience in this method of foundation, installation can be carried out even in winter in freezing conditions. They can also be drilled into rock but need to be pre-drilled with a diamond crown drill bit. The bearing capacity of the soil is tested using a test frame. According to this test and the calculation of the structural engineer, the type, number and positioning of the drill holes are designed. It is also possible to build on a steep slope in this way.
The only limitation in the use of ground screws is swampy soil or soil with high groundwater levels. In such a situation, the screws would not provide sufficient stability (www.drevostavitel.cz).
They are manufactured in lengths from 450 to 4000 mm as standard. Timber buildings are lightweight structures, therefore the optimal lengths of the screws are approximately 2100 mm. They can be founded on one-piece or adjustable ground screws. The adjustable ones consist of a screw, an extension and a foot. The feet have different terminations, see Figure 4. The tip of the screw is specially shaped for better ground penetration.
In the case of timber framing, timber prisms - sawn timber or BSH prisms - are attached to the foot (top of the ground screws). Larch wood is suitable. The upper structure, usually a timber building, is mounted on the grid prepared in this way, see Fig. 5. It is possible to use any type of timber construction - log, timber frame, wall panel or modular construction. This creates a free space between the ground and the massive frame on which the timber building is mounted. The building is "on legs". It is a ventilated crawl space. This ventilated space is a perfect protection against ground moisture and water penetration, but also against radon penetration. Instead of the floor of the 1st floor, we are building a ceiling structure supported in several places by a grid. It is important to slope the ground so that water does not accumulate under the building.

Fig. 1: Stud feet and plate feet for anchoring wooden elements to concrete (Patky a profily, 2023)

Fig. 2: Unsightly concrete footings for anchoring the educational board (Kotásková)

Fig. 3: Inappropriate anchoring of the wooden posts of the information board, structural protection is not ensured (Kotásková)

Fig. 4: Termination of ground screw feet (DIY vruty nastavitelné, 2023)

Fig. 5: Example of a timber building based on earth screws (Chytré základy)

Results

Modular (modular) houses can be advantageously used for buildings in the countryside for recreational purposes. These are container-type houses, which are always manufactured in a production hall in a dry environment. They are constructed including the wiring and interior fittings. The

modules are then transported to the building site and stored using a crane. In this way, e.g. sanitary facilities, ticket office buildings or information centres in attractive natural locations, as well as restaurant facilities or shelters for holidaymakers can be realised in the open air. Larger objects can also consist of several modules connected to each other. This type of building can be also mounted on ground screws. This method of construction will have minimal impact on the natural environment. The ground screw can therefore be used for simple wooden structures, but also for large buildings, especially wooden buildings.
When screwed into the ground, the conical shape of the body compacts and compresses the soil in its surroundings, thus creating a very solid foundation that can be immediately loaded thanks to the regular threaded surface of the screw body. The main advantage of this technology is that it eliminates the need for concrete foundations, as well as excavation work, including the removal of topsoil. This eliminates the cost of soil removal and other field work. In addition, it is possible to flatten minor terrain irregularities with individual drills. The speed of construction and the reduced impact on nature are therefore positive. Ground screws have the undeniable advantage that they can be used even on difficult terrain where we would not be able to reach with concrete foundation equipment. Disassembly at the end of the life of the structure is possible. The screw is easily dismantled by simply unscrewing it and there is the possibility of reusing it. A service life of up to 150 years is expected (https://www.strefa.cz).
The disadvantages may be the inexperience of the contractors and the varying quality of the earth screws.

Conclusion

We should try to put as little strain as possible on the natural environment through construction activity. The construction of simple buildings can be carried out with modular houses, which are prepared in the factory and delivered ready to the site. In this way, the environment will not be burdened by construction traffic in the long term. For the foundation of such buildings, ground screws are sufficient. It is necessary to accurately measure the position and drill them into the ground. Without excavation and concreting, the ground screws can be used to fix a bench, anchor simple structures such as signposts, information boards for nature trails, a footbridge or fences, but they can also be used for a larger wooden recreational building, an information centre, a smaller lookout tower, toilet construction, etc. This method of foundation is land friendly, there is no damage to vegetation by traffic and installation compared to conventional concrete foundations. Primarily, temporary structures, i.e. structures for which their duration is obvious in advance, should be founded on ground screws. Once the structure is removed, there is no degradation of the site by concrete. The screw is easily dismantled by simply unscrewing it and there is the possibility of reusing it. The advantage is that the screws can be used in almost all geological conditions.

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Souhrn

Přírodní prostředí se máme snažit co nejméně zatěžovat stavební činností. Výstavba jednoduchých objektů může být realizována modulovými domy, které se připraví ve výrobně a hotové přivezou na místo. Tím nebude prostředí dlouhodobě zatíženo staveništním ruchem. K založení takových staveb stačí zemní vruty. Je třeba přesně zaměřit polohu a zavrtat je do země. Bez výkopů a betonování tak lze pomocí zemních vrutů upevnit lavičku, kotvit jednoduché konstrukce jako je rozcestník, informační tabule naučné stezky, lávku nebo ploty, ale můžeme je využít i pro větší dřevostavbu rekreačního objektu, informačního centra, stavbu toalet apod. Tento způsob zakládání je šetrný k pozemku. Odpadá nutnost betonování základů, ale i náklady na odvoz zeminy a další terénní práce.

Jednotlivými vruty je navíc možné srovnat drobné terénní nerovnosti. Pozitivní je proto rychlost výstavby a menší dopad na přírodu. Zemní vruty mají tu nespornou výhodu, že se dají použít i na špatně dostupném terénu, kam bychom se s technikou pro betonové základy nedostali.
Primárně by na zemních vrutech měly být zakládány dočasné stavby, tedy stavby, u kterých je předem zřejmé jejich trvání. Po odstranění stavby nedochází ke znehodnocení pozemku betonem. Vrut se snadno demontuje pouhým vyšroubováním a je zde možnost jej opakovaně použít. Výhodou je, že lze vruty využít téměř ve všech geologických podmínkách.

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MANAGING CLOSE-TO-NATURE SHARED-USED RECREATIONAL TRAILS IN THE CZECH REPUBLIC

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Abstract
In the legislative framework of the Czech Republic there are several user groups that have right of access to forest for recreation by law. These user groups are: pedestrians, cyclists, horse riders and skiers. They differ in their characteristics of their land use, demands for recreational infrastructure, and extent of the right of access. The extent of the right of access for different user groups has implications for the user flow through the areas of interest and more importantly for the formal recreational trails products. It is also one of the sources of the potential user-conflict. The solution in the Czech Republic has been blanket and general restrictions that are gradually tightening. However, this has no basis in current legislation and may even be in direct conflict with it. From the point of view of the future of forest recreation and nature protection in the Czech Republic it is also a very short-sighted fix. From a professional point of view, it is therefore necessary to look at the problem in a more comprehensive way. It is essential to implement and start using the full breadth of recreational management tools.

Key words: right of access, user groups, restrictions, forest recreation, shared use trails

Legal user groups

The current Czech Forest Law (289/1995 Coll.) and its implementing regulations imply five particular recreational user groups that have, to some extent, legal access to forests. These are walkers (1), cyclists (2), horse riders (3), and the law also mentions skiing (4) and sledgers (5). These groups are not defined in detail in the law, which is understandable given that this legislation was drafted almost 30 years ago.
However, the concept of outdoor recreation and the means of transport - e.g. the tools that user groups use - have changed profoundly in recent decades and continue to evolve rapidly even at present. Within each particular user group, there are quite differentiated subgroups with different, sometimes conflicting, demands on recreational infrastructure. Moreover, some of these sub-groups have in fact little in common with their core group and are included only because they are not given any further legislative attention.
Understanding user groups and their structure of recreational use of forests is important for successful visitor management and recreation infrastructure planning. In the following paragraphs we briefly describe the particular user groups and outline the subgroups that are identified within them.
Readers should note two important things: Throughout our paper we write about forest areas that are not subject to any other / higher levels of protection. Our analysis is relevant only to the Czech Republic as other countries have different recreation access legislation.

Walkers (1)

Walkers are the only recreational users who can legally access forests cross-country - they are not limited to the network of forest roads and trails.
This privilege of the recreational access in the Czech Republic is valued by the general public but it has implications for visitor management and formal recreational trail products (see below).
Walkers have number of subgroups with different tendencies. The way that hikers, who tend to stick to waymarked routes, are using outdoors is quite different from mushroom pickers who tend to ramble through forest terrain. The walker category also includes recreational runners (who have a different movement dynamic due to their higher speeds) but surprisingly (implied by Czech Road Traffic Act) also riders on electric unicycles. In general walkers use of the forests year-round, although with seasonal fluctuations in intensity.

Cyclists (2)

According to prevailing current interpretations of Czech Forest Law, bicycle use is limited to forest roads designed for motororised vehicles (forest road categories 1L and 2L) and to waymarked routes.
There are different types of bicycles (road, gravel, mountain with XC, trail, enduro, freeride and downhill subgroups) designed for different uses. In addition, there are ebike versions of all these types which, if certain conditions are met, are considered to be bicycles in legal sense and have same right

of access. Whereas previously cycling recreation was more or less limited to periods without snow, in recent years ebikes, fabikes and their combinations gained in popularity in snowy conditions. Legally, scooters and electric scooters are also bicycles.

Horse riders (3)
Horse riders are subject to the same regulations as cyclists in the Czech Republic, i.e. they are allowed to ride categorry 1L and 2L forest roads and on waymarked routes. Unlike walkers, cyclists and skiers, recreational horse riders are a relatively homogeneous user group. Due to limited number of horses and their accesibility horse riders are much smaller group in numbers then walkers and cyclists. Recreational horseback riders are common only around equestrian facilities, horse farms, and ranches. Recreational horseback riding is more or less a year-round activity.

Skiers (4)
Similarly to cyclists and horse riders, skiers have legal access to category 1L and 2L forest roads and waymarked routes. Skiing is seasonally and geographically limited to conditions with a sufficient snow cover. Outside of snow, roller skis can be used only sporadically in forests due requirement of smooth asphalt surfaces.
Skiers are not a homogeneous group. Downhill skiing will not be discussed further, as it takes place mainly on ski slopes which are removed from forests by cadastre procedures. Of all the skiing options, cross-country skiing and ski-touring are the most relevant in forested landscapes. Increasingly cross-country skiing takes place only when snow surface is prepared by grooming by wide snowcat machines.
Cross-country skiing outside the groomed track is possible but less comfortable and is losing popularity to ski touring and snowshoeing. Climbing skins on touring skis allow uphill movement through terrain without a groomed track. On descents touring skis can be used similarly to downhill skis.
While narrow and fragile cross-country skis are mainly used within the scope of legal access the touring skis allow movement on open forest terrain, which is not granted by law.

Sledgers (5)
The right for access for sledging is identical to that for cycling, horse riding and skiing. Like skiing, this activity is limited to periods with sufficient snow. The law does not specify whether it relates to sledging which is usually children's pastime, or the horse-drawn sleigh rides offered by some mountain resorts, or both. Since sledging in forest usually does not make much sense and horse-drawn sleigh rides are a rather sporadic activity in Czech context we will not discuss it further in this article.

User conflict
The above user groups do not use forests (and its recreational infrastructure) separately, but rather simultaneously both in time and space. There are various interactions among them, which may (or may not) take on the form of user conflict of varying intensity. Probably the most common (or most perceivable) user conflict is between walkers and cyclists. Walkers may experience encounters with cyclists as conflict on a whole range from feelings of indignation, to varying degrees of threat, potentially resulting in injury.
Cyclists may perceive walkers as annoying obstacles to their rides, but walkers can also pose a real safety issue to them. Meanwhile, walkers cannot be legally excluded from any official waymarked cycling trail due to extend of their right of access.
User conflicts often also occur on groomed cross-country ski routes where walkers or fatbikers damage tracks (and can also obstruct skiers and cause dangerous situations). Skiers often feel superior since the track has been specifically groomed for them and can usually only operate only for a limited period of the year and the grooming requires considerable resources. Legally however skiers do not have an exclusive access.
From the perspective of user conflict recreational riding is perceived by a large part of the public and experts as an environmentally friendly activity. Horse is perceived as majestic, virtually untouchable animals. However any encounter with a horse requires slowing down from other users, which can also be perceived as detrimental to their recreational experience.
Horses have another, indirect impact on other recreational users: heavily used trails around horse ranches often show significant wear and damage. This makes their use by pedestrians or cyclists from difficult to impossible, leading to mutual hostility, as well as potentially causing secondary environmental damage (erosion, trampling and widening).
The public (and some experts) tend to label user groups according to what they consider morally right

or natural. However, it is evident from the above simple analysis that all user groups cause user conflict. The same applies to their environmental impacts, although this is not the primary focus of this paper.

Restrictive management on new trails

User conflict is one of the consequences of the democratic right to recreation and is, to some extent, inevitable. Recreational infrastructure operators and land managers must take this into account and deal with it by active management tools. Although there are several legal recreational user groups, the relationship between walkers and cyclists has attracted the most attention, and the following recommendations in this paper will therefore focus mainly on the coexistence of these two user groups. Unfortunally at the moment Czech autorities and experts alike tend separate these recreational groups by access restrictions. It is one conclusion of this paper that such practice is illegal. Also if used as template solution it puts the tradition of shared-use into question. Contrary to such approach we propose deploying softer and more differentiated managment tools.

This is illustrated, for example, by the public administration's requirements to post operation regulations ("provozní řád") and to install signs prohibiting walker access on new MTB trails. Both the signs and the rules are illegal in current Czech legal framework. Walkers who by law have an unrestricted access cannot be prohibited from entering the trail by a sign. From a practical point of view, this is neither a reliable nor an enforceable solution. Moreover, walkers can access the trail from virtually anywhere on the forest terrain, so the restriction may be completely missed them by.

Well designed trails are the most effective management tool

As trail designers with years of experience, we argue that when designing and permitting nature-based forest trails for MTB, the walker user group, given its size, should be actively reflected in the design and subsequent use regime. Mandatory separation of recreational groups and restriction on access tend to arouse public resentment, pit user groups against each other and contribute to the division of society. They also provoke resentment against the authorities, land owners and managers, and politicians. Such restrictive tools should only be used as a last resort. Before that, range of more sophisticated tools should be applied, tailored to the specific conditions.

The most effective tools for preventing user conflict is creating a recreation infrastructure by applying design and engineering principles of the half rule and the 10% rule.

Consistent adherence to moderate trail grade does not allow cyclists to pick up speeds and therefore will effectively limit user conflict. Strict adherence to sight lines (removing lower tree branches and overgrown vegetation), not only during construction but also further maintenance also helps. Users must be able to see each other at a sufficient distance.

In addition to this, trail parameters (especially width, vertical and horizontal undulations and anchoring) are also a very useful tool. As an example, consider grade reversals. They are very popular with more advanced off-road cyclists, but walking on them is not very pleasant - they feel tiring and inefficient. A trail designed with pronounced grade reversals eliminates most walkers just by making them prefer different route. It also eliminates other users, such as horseback riders, who find it impassable, and illegal users, such as motorcyclists, who find it unpleasant to the point of impassable. Even on such trails pedestrian use cannot be completely eliminated and the design must take that into account, especially in relation to lines of sight.

In addition to design and engineering measures, there are other non-restrictive tools to minimise user conflict. Trails in close proximity to settlements should automatically be considered to be shared-use and should be designated and promoted as such. Of course, structural qualities such as a very gentle grades and long sight must be applied.

In all information materials on site and elsewhere users should be actively encouraged to be considerate and friendly to other users and other user groups. While such soft management tool never works 100% it's more civilized and democratic than restrictions (even more so illegal restrictions as pointed out).

Our long experience at a destination MTB trail system Singltrek pod Smrkem also shows that a certain regime of trail use will eventually establish itself on the trails. Local people like to use some parts of the trail system for walking and already know on which days there will be minimal cyclist traffic on the trails and on which days it is better to avoid them. It is also extremely important for formal trail products to have well-developed formalised risk management and consistent and transparent administration.

Conclusion - Shared use needs to be taken into account

Finally, we would like to point out that concerns about shared-use paths and user conflict are quite understandable. User conflict should not be taken lightly. In the legislative framework of the Czech republic it really is not easy to develop formal recreational infrastructure products targeted to non-walking user groups. Walkers always need to be taken into account.

On the other hand the trend of growing visitor numbers, mainly in non-walking users groups is evident. If the authorities, land owners and managers do not start acting either by offering formal products or by more nuanced management measures, users will always find their own ways (both figuratively and literally). This will brings with it problems that can be even more difficult to respond to.

Souhrn

V legislativním rámci ČR má ze zákona určitou míru práva na rekreaci na lesních pozemcích několik (dále dělitelných) uživatelských skupin: pěší, cyklisté, jezdci na koních a lyžaři. Tyto skupiny se liší svými charakteristikami, nároky na rekreační infrastrukturu, tendencemi i mírou práva přístupu. Různá míra práva přístupu pro různé uživatelské skupiny má implikace na formální produkty rekreačních stezek a také je jedním ze zdrojů potenciálního vzniku uživatelského konfliktu. V Česku se často přistupuje k zbytečně obecným, zbytečně tvrdým, či postupně se zpřísňujícím restrikcím. To však v českém kontextu nemá oporu v legislativě či dokonce s ní může být v rozporu. Na situaci je nutné nahlížet komplexněji a je nezbytné zavést a začít používat celou šíři nástrojů managementu návštěvnosti. Domníváme se, že základním předpokladem těchto opatření je odborné inženýrské řešení infrastruktury stezek, tras a jejich sítí. Na ně by měly navazovat cílené, sofistikované nástroje.

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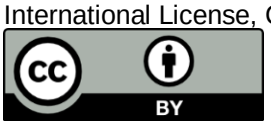

METEOROLOGICAL ACTIVITIES OF J. G: MENDEL AS PART OF A TOUR OF THE AUGUSTINIAN ABBEY

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Abstract
Gregor Johann Mendel is known worldwide for establishing the genetic laws. What is less well known is that during his life he devoted far more time to meteorology. He started as an assistant to Dr. Olexíka, who performed meteorological measurements on the premises of the Hospital at St. Anna in Brno. G.J. Mendel independently carried out his measurements in the grounds of the Augustinian Abbey in Staré Brno from July 1878 to July 1883 as a meteorological observer of the Austrian Meteorological Services. He studied at the University of Vienna and used his knowledge of physics to process meteorological data, which was unusually extensive and graphically expressed for that time. His physically very expertly described tornado that occurred in Brno on October 10, 1870 is very well known. He supported the development of weather forecasts and and forecasts with specifically focused on agriculture. Part of the exposition in the Mendel Museum of the Masaryk University in Brno is dedicated to his meteorological activities. Visitors to the Abbey can familiarize themselves with the meteorological instruments located in the meteorological booth on the terrace. In the courtyard, there is a replica of the tin meteorological booth from the period of Mendel's measurements in its original place.

Keywords: meteorological observations, weather forecast, wind storm, data processing

Introduction

Part of recreation in cities are visits to museums, important buildings and the like. On July 20, 2022, 200 years have passed since the birth of the world-renowned scientist Gregor Johann Mendel. He went down in the history of science as a genius geneticist. However, the fact that this abbot of the Augustinian monastery in Brno called himself a meteorologist at the time of his fruitful scientific research still arouses great astonishment and surprise.
This fact is evidenced by the records of his meteorological observations, which he not only wrote down by hand, but also evaluated and published. Considering the extent of his meteorological activities, one can say quite responsibly that he devoted a significant part of his other scientific activities to meteorology. A visit to the grounds of the Augustinian Abbey, including the Mendel Museum, gives an opportunity to get to know and learn about his meteorological activities as well as genetics.

Meteorological measurements

On the petition of the Naturalist Association in Brno from 1870, in the proposal for the establishment of the Moravian University, Mendel's expertise was listed as a meteorologist (Kříženecký, 1965). Quite realistically, one can state that unlike his genetic knowledge, where he did not receive recognition during his lifetime, his meteorological background and studies were known and his opinions were sought after. To the question of what Mendel's activities were in meteorology, one can answer that they were very diverse, corresponding to his style of scientific work, i.e. from basic observation and measurement, through data processing to the publication of his results (Seiner, 1965). Nowadays, his handwritten records of meteorological measurements (Fig. 1) are safely stored in the archives of the Brno regional office of the Czech Hydrometeorological Institute.
They form part of the continuous meteorological observations and measurements within the data series of the Brno city (Štěpánek 1998). The longest period of meteorological measurements in the Czech Republic is that of Klementinum (Prague), which has a continuous temperature series since 1775. In Brno, continuous meteorological data has been available since January 1, 1848, thanks to meteorological measurements conducted by dr. Paul Olexík in the general hospital of St. Anna (Vitasek, 1952). G. J. Mendel was a close friend of dr. Oleksík and helped him with meteorological measurements at his station.
It is assumed that G. J. Mendel already during the collaboration with dr. Oleksík performed simultaneous measurements in the monastery, according to some opinions, as early as 1857 (Orel, 1965). Mendel's separate measurements are from January 1, 1879 to July 1883 (Liznar, 1886). As

part of the exposition in the Mendel Museum, we can find a monthly report filled out by Mendel (Fig. 1).

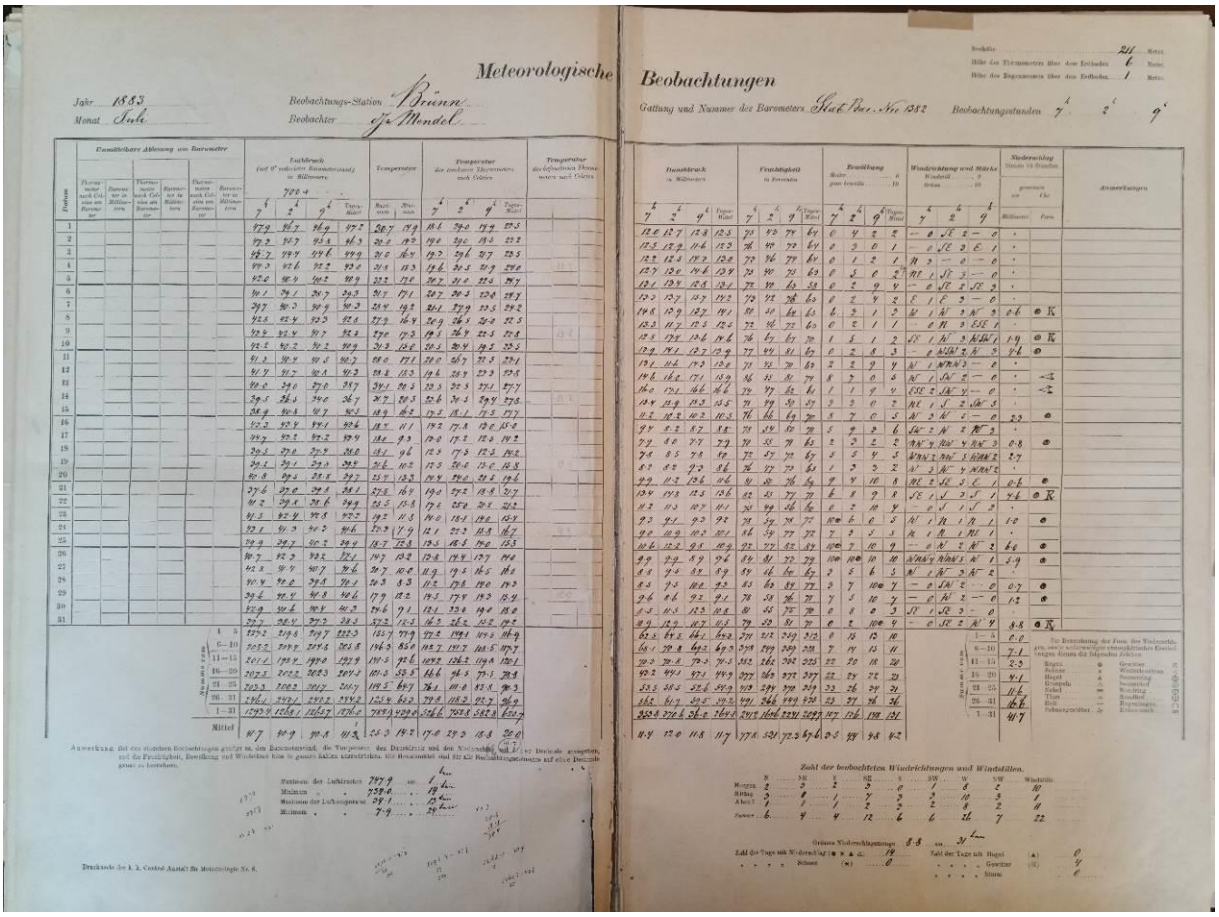

Fig. 1: Monthly report of meteorological observation written by G. J. Mendel

Apparently, we also have a preserved tin meteorological booth and thermometers from the period of his measurements. During renovations on the grounds of the Abbey, a partially damaged booth was found in which the mercury thermometers were preserved, which were also undamaged, and the mercury column was completely clear, i.e. the capillary was not contaminated by mercury, as is common with meteorological thermometers after prolonged use. Visitors can find a replica of the tin meteorological booth as part of the exhibition in the museum, but also in the courtyard on the wall at the place of Mendel's probable observations (Fig. 2).

Visitors to the abbey can learn more about meteorological measurements thanks to the installed meteorological booth and rain gauge on the terrace (Fig. 3).

In the 1862 annual report of the Society of Natural Sciences in Brno, he mentions the publication "Bemerkungen zu der graphisch-tabellarischen Ubersicht der meteorologischen Verhaltnisse von Brünn" (Notes on the graphical and tabular overview of meteorological conditions in Brno). His remark that air temperatures are higher in the city center compared to its outskirts is significant. It is a warning about a phenomenon that we study extensively today and call it the urban heat island. Only after more than twenty years has this knowledge become the subject of interest of meteorologists and climatologists (Dobrovolný et al. 2012, Litschmann and Rožnovský, 2012).

Fig. 2: A replica of the tin meteorological booth in the Mendel Museum exposition

Fig. 3: Meteorological booth and rain gauge on the terrace in the abbey grounds

Experiments with weather forecasting

G. J. Mendel was an active meteorologist, he had a physics education, so he knew the essence of many processes in the atmosphere. He also perceived the influence of the course of the weather on nature and, given his agricultural roots, was aware of the importance of weather forecasting. What still applies today - our effort to use the knowledge of meteorology in various fields of human activity.

It is therefore logical that G. J. Mendel perceived all this and was not only interested in the possibility of predictions, but also tried to make predictions himself. He was aware of the importance of weather in agriculture and supported the issuing of weather forecasts for farmers. He therefore supported the publication of short-term weather forecasts by the then Central Institute for Meteorology and Earth Magnetism in Vienna. These predictions were telegraphed to subscribers, who then passed them on further.
The Ministry of Plowing at the time set up a kind of institute of local forecasters, who edited the general forecast and sent it out in the form of telegrams to individual interested parties. In the villages, simple signaling was introduced, e.g. by hanging flags or baskets. G. Mendel tried to compile his own weather forecasts for three days, but essentially unsuccessfully. If we imagine the information he had at his disposal and compare it with today's, there is a big disparity. When evaluating this activity, we must realize that he was clear about the physical nature of weather forecasting, that he was aware of the scope and importance of this newly emerging part of meteorology, which today we call synoptics.

Professional activities

As noted, G. J. Mendel's meteorological work was extensive. He was also interested in the use of meteorology in other fields, as evidenced by his activities in professional societies. As early as 1851, on 7/23, he joined the natural science section of the Moravian-Silesian Society for the Improvement of Plowing, Natural Science and Homeland Studies (abbreviated Moravian-Silesian Economic Society). A year later, he becomes a member of the fruit-growing, wine-growing and horticultural section of this company. His esteem is evidenced by the fact that in 1871 he was elected to the committee of the Moravian-Silesian Economic Society and in 1882.
He was accepted as a member of the Zoological and Botanical Society in Vienna on January 5, 1853. He is a co-founder of the Natural History Society in Brno, which was established on 21st December 1861, in which he presents himself as a meteorologist. He is known for his activity in the Beekeeping Association in Brno, in which he later held the position of deputy mayor and was nominated for the post of mayor. G. J. Mendel was one of the important personalities of the Austro-Hungarian meteorology of that time. He was a founding member of the Austrian Meteorological Society.

Conclusion

The meteorological activities of Gregor Johann Mendel contributed significantly to the development of meteorology in several directions. His personal measurements became part of a long-term series of meteorological data from the territory of the city of Brno. As part of a visit to the Starobrněnské Abbey, it is possible to get acquainted with the entire breadth of Mendel's activities at the exposition in the Mendel Museum. The installed meteorological booth gives the opportunity to get closer to the basics of meteorological measurements, as they were performed prior to them being fully automated. In the courtyard it is then possible to see a replica of the tin meteorological booth, which was most likely used by G. J. Mendel. This review of meteorological documents gives visitors the opportunity to assess how technical conditions and methods are progressing even in meteorology.
However, the legacy of G. J. Mendel is not only in professional activities, but also in the overall approach to science. When evaluating his legacy, one must always remember that he was an abbot of the Augustinian order, i.e. a scientist and a Christian at the same time. As a representative of orders and a scientist, he proved his not only managerial but also financial abilities. The proof is that, among other things, he was also the chairman of the bank board.
In order not to forget Mendel's meteorological activities, meteorological measurements were provided on the grounds of the Abbey outside the event for his significant anniversaries. Evidence of his meteorological measurements is also part of the exhibition in the Mendel Museum.

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Souhrn
Gregor Johann Mendel je celosvětově znám stanovením genetických zákonitostí. Méně známé však je, že během svého života daleko více času věnoval meteorologii. Začínal jako pomocník dr. Olexíka při měřeních v areálu Nemocnice u sv. Anny v Brně. Svá měření samostatně prováděl v areálu Augustiniánského opatství na Starém Brně od července 1878 do července1883 jako meteorologický pozorovatel Rakouské meteorologické služby. Studoval na vídeňské univerzitě a svých znalostí fyziky využil pro zpracování meteorologických dat, která byla na tehdejší dobu neobyčejně rozsáhlá a graficky vyjádřená. Známá je jeho fyzikálně velmi odborně popsaná smršť, která se vyskytla v Brně 10. října 1870. Zasloužil se také o rozšíření meteorologických stanic na Moravě. Podporoval rozvoj předpovědí počasí a jejich specifikaci pro zemědělce. Sám se o předpovědi pokoušel, ale ne úspěšně. Z jeho uváděných 13 publikací je 9 věnováno meteorologii. Byl také aktivní v odborných spolcích. Meteorologickým aktivitám je věnována část expozice v Mendelově muzeu Masarykovy univerzity v Brně, které je umístěno v areálu Starobrněnského opatství. Návštěvníci Opatství se mohou seznámit s meteorologickými přístroji umístěnými v meteorologické budce na terase V nádvoří je na původním místě umístěna replika plechové meteorologické budky z období Mendelových měření.

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MID-FIELD WOODLOTS AS A SUBSTITUTE FOR FORESTS IN AGRICULTURAL AREAS - THE IMPACT ON ENVIRONMENT AND TOURISM

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Abstract
In vast agricultural areas, afforestation systems - mid-field, roadside, waterside and others - are a necessary "substitute" for former natural forest complexes. They contributed to preserving the ecological balance in areas intensely anthropogenically transformed centuries ago. Systemically introduced and constantly maintained, they bring many benefits for people and the environment - they fulfil several diverse functions - from biological and technical to aesthetic and social. Afforestation strongly impacts the climate, translating into economic efficiency in agricultural areas; it significantly reduces environmental pollution (phytoremediation); they have a biocenosis function (shaping specific biotopes); they positively affect landscape physiognomy. In Europe, the protection of landscape and natural resources is implemented through several legal acts at the level of EU legislation and individual countries. In 2020, the European Commission published a biodiversity strategy for protecting and restoring nature in the European Union by 2030. The document also refers to mid-field plantings because this issue remains at a different level in individual countries.

Key words: Mid-field afforestation, ecological corridors, environmental impact, rural areas, recreation and tourism values, woodlots

Introduction

A necessary "substitute" for former natural forest complexes in vast agricultural areas are the systems of plantings - mid-field, roadside, waterside and others. Afforestation contributed to preserving the ecological balance in areas heavily transformed by man centuries ago. Systemically introduced and constantly maintained, they bring many benefits for people and the environment - they fulfil several diverse functions, closely related to each other - from biological, technical, aesthetic, and social [e.g. Hejmanowski et al. 1964; Niemirski 1973]. Afforestation strongly impacts the climate and contributes to limiting wind erosion, translating into economic efficiency in agricultural areas (Hejmanowski et al. 1964; Strzelecki, Sobczak 1972; Niemirski 1973; Karg 2003). Afforestation improves the water balance - increasing air and soil humidity (by limiting evaporation and surface runoff) and water storage (increasing soil retention). It is estimated that thanks to a properly shaped network of woodlots, Poland's so-called available water resources increased by approx. 3 km^3 (Karg, Karlik 1993), essential in the face of existing deficits. They significantly contribute to reducing environmental pollution (phytoremediation), e.g. by reducing dust concentrations and gaseous air pollutants, e.g. CO, NO_2, NH_3 (Niemirski 1973; Bell, Treshow 2004; Sadowiec, Gawroński 2013). In agricultural areas, the biocenotic function (forming specific biotopes) is marked, contributing to maintaining the ecological balance in a given area (Karg 2003). The fragmentation of the natural environment is one of the greatest threats to many plant and animal species (isolation of plant and animal habitats). Woodlots, planted in a system, play the role of ecological corridors that enable the connection between populations (free migration of animals). Skillfully laid out in the landscape, midfield woodlots significantly affect its physiognomy (Łuczyńska-Bruzda 1995; Bogdanowski et al. 1979; Fortuna-Antoszkiewicz, Łukaszkiewicz 2016, 2017, 2018; Fortuna-Antoszkiewicz et al. 2018). Midfield woodlots' aesthetic (landscape) function becomes particularly important in flat, extensive areas with little forest cover. The monotony of fields is not a pleasant and exciting sight for everyone, which is especially important in developing agritourism. Appropriately shaped trees allow for the formation of clear landscape interiors or for, covering unattractive objects and views or exposing an attractive landscape. The change and variety of planting forms along the roads counteract the monotony and weariness of driving (Graffstein 1989).

In Europe, the protection of landscape and natural resources is implemented through several legal acts at the level of EU legislation (e.g. the European Landscape Convention, Journal of Laws of 2006 No. 14, item 98) and individual countries (e.g. in Poland: Act of April 16, 2004, on nature protection, Journal of Laws 2018, item 1614, as amended). In 2020, the European Commission published a biodiversity strategy for protecting and restoring nature in the European Union by 2030 (EU Biodiversity Strategy 2030: Bringing nature back to our lives [COM(2020)0380], of May 20, 2020). This

document also refers to mid-field plantings, e.g. by introducing and protecting landscape elements characterized by rich biodiversity on agricultural land, stopping and reversing the decline in pollinating insects, and planting 3 billion trees by 2030 (Resolution 2021). As of today, the situation in different countries is different.

Material and methods

In 2015-2022 (in continuation), the authors researched selected agricultural areas in central Poland (main research ground: Mazovia region). Afforestation of various types (including roadside, mid-field, mid-meadow, and waterside) was observed in terms of their distribution, spatial structure, and functioning - as an independent element or part of a more extensive area system. Observation of woodlots in a given area was used to assess their condition and the current structure of overall systems. At the same time, the history and tradition of introducing systemic afforestation in Poland were investigated - achievements, research facilities, and methods of implementation (archival query, literature review). It made it possible to identify the origin of the existing woodlots.

Results

The History. The establishment of protective midfield woodlots within the present borders of Poland dates back to the 16th century, when they appeared, for example, in Żuławy Wiślane (northern Poland) together with Dutch immigrants (Olędrzy) who settled there. Windbreak belts in the form of rows of willows by the ditches and among the fields, planted by the Olęders and their successors, were an inseparable element of the landscape of Żuławy until World War II. In other areas, documented tree planting on wastelands has been carried out since the 18th century, e.g. in 1768, the Gdańsk Nature Society announced a competition for the afforestation of shifting dunes that covered the Vistula estuary near Gdańsk and the surrounding settlements and forests. Intensive work was carried out in this area at the end of the 18th century. Inland dunes in Galicia (southern Poland) were afforested at a similar time. In Mazovia, the fixation of volatile sands was carried out throughout the 19th century (Strzelecki, Sobczak 1972). In Poland, the establishment of mid-field shelterbelts - as a panacea for stepping down deforested lowland areas and the low efficiency of agricultural crops - began at the beginning of the 19th century. It was initiated by General Dezydery Chłapowski, a Napoleonic officer, a pioneer of modern agriculture in Wielkopolska region - he developed and implemented in practice the principles of shaping the agricultural landscape. The general, after he practised in England (1818-1819), became a promoter of mid-field plantings, which contributed to the economic success of his estate in Turew and, this day, conducive to agriculture in this area (1954 - a research station of the Polish Academy of Sciences was established in Turew, where the focus was on issues concerning the role of midfield woodlots in the agricultural landscape and the assessment of their impact on the adjacent areas, 1992 - the Gen. D. Chłapowski Landscape Park was established in order to preserve the agricultural and natural heritage, including the system of mid-field woodlots).

Many publications on this subject were published in the 19th century and at the beginning of the 20th century. Appropriate species of trees and shrubs, including valuable fruit trees for roadside plantings, were widely promoted (Fortuna-Antoszkiewicz, Łukaszkiewicz 2012, 2017). The 20th century is a time of extensive actions to plant protective midfield woodlots (in the wasteland) and mid-field (agricultural areas) nationwide. In the 1920s, public space was regulated and beautified, including planting trees in cities, towns, villages and agricultural areas. In the 1930s, Prof. Adam Wodiczko, chairman of the State Council for Nature Conservation branch in Poznań, postulated the so-called “landscape cultivation” with woodlots as the ultimate goal of practical nature conservation. In the interwar period, one of Poland's most significant actions was organized in 1920-1930, "Days of the forest and afforestation" - about 5.5 million trees were planted at that time, i.e. about 1/3 of today's afforestation resources (excluding poplars). The years after World War II saw massive planting of agricultural land and urbanized areas (e.g. industrial zones and housing estates). In Poland, from 1945-1966, afforestation and artificial regeneration were carried out on an area of 2,860.5 ha (Statistical Yearbook of Forestry and Wood Industry 1966). In the first period, the works were carried out without adequate support (material, equipment and financial), resulting in losses in plantings or poor quality. From the 1960s to the 1980s, woodlots were established methodically throughout the country, based on developed research and material facilities (fig 1, fig. 2) (e.g. Industry standard (BN-76) 9212-02; Strzelecki, Sobczak 1972; Hejmanowski 1975; Zajączkowski, Górka 1979).

Fig. 1: A plantation of trees intended for roadside, mid-field and other afforestation

Fig. 2: An example of a young tree stand: a regular, 1-row, 1-storey form

(source: Album on the occasion of the National Tree Arrangement Meeting, Kielce, September 14-15, 1964)

Field research. The following were identified at the research grounds (agricultural areas of Mazowsze): various types of afforestation - waterside, mid-field, roadside, mid-meadow-pasture, homestead; various forms of afforestation - single, group, row, strip and surface. In general, gradual degradation of the existing resources of mid-field woodlots is observed - these are mainly projects from the 1960s and 1970s, occasionally older (age: 100 years and more). Particular structures (so-called afforestation complex) in many locations are characterized by ageing plant material (trees and shrubs in the mature and senile stages, e.g. *Populus* x*canadensis* 'Marilandica' *Populus* x*euroamericana* Guiner, *Populus* x*berolinensis* (K. Koch) Dippel 'Berlin', *Malus sp., Pyrus sp*.) and apparent defects in plantings (loss of continuity) and lack of additions. In the first place, trees built of short-lived species and varieties (e.g. *Populus nigra* L. 'Italica', *Populus simonii* Carrière 'Fastigiata', *Populus* x*canadencis* Moench, fruit trees) disappear. There is an evident fragmentation of the tree system, often by cutting/removing subsequent sections (the most common reason: lack of maintenance, change of land function, new investments). In larger areas, there is a lack of continuation of systemic afforestation. New plantings are introduced sporadically, mainly in sectional roadside plantings. In the case of this form, additions are made (e.g. with *Tilia sp*.), but only locally and object-wise (e.g. selected historic alleys). A similar problem appears in other regions of the country.

Discussion

The situation is different in other European countries. England, which has been a leader in this field since the 17th century (Fortuna-Antoszkiewicz, Łukaszkiewicz 2016), represents a model level of development and permanent maintenance of comprehensive, coherent systems of mid-field woodlots (Fig. 3). Looking at the resources of other countries, such as the Czech Republic, Denmark, Germany, it can be concluded that the maintenance of mid-field, roadside and other woodlots is a standard for shaping and using rural areas. There is a constant presence of mature and older woodlots, which are controlled and protected, as well as activities consisting of their supplementation and renewal and the successive introduction of new plantings (Fig. 4) (Fortuna-Antoszkiewicz et al. 2019).

Fig. 3: A developed system of mid-field shelterbelts, southern England, county Surrey - west from Crawley, 2012 (source: GoogleEarth, height: 4,0 km)

Fig. 4: Renewal and establishment of new mid-field shelterbelts, Moravia (photo B. Fortuna-Antoszkiewicz, 2019)

Conclusion

- Historically - agricultural areas in Poland are characterized by a high level of implementation of mid-field planting systems. Documented origins date back to the 16th century; the first major comprehensive implementations took place in the first half of the 19th century; The 19th/20th century and the first decades of the 20th century were a time of intensification of activities; the period after World War II until the 1980s - planned planting of trees in the country.
- The end of the 20th century (economic crisis, political changes) and the beginning of the 21st century brought an evident slowdown in activities in this area.
- Author's research has shown that in selected areas (agricultural areas of Mazovia), gradual degradation of the existing resources of mid-field woodlots is observed (ageing of trees and shrubs, planting losses and lack of supplementation; cutting/removal of individual structures), and above all, the lack of systemic continuation (no new plantings). A similar problem appears in other regions of the country.
- Meanwhile, the lack of action may lead to the **disappearance of systemic midfield woodlots** in a given area, which results in an imbalance in ecological balance and a reduction in biodiversity (environmental aspect) and a decrease in agricultural production efficiency (economic aspect).
- **Disappearance of systemic midfield woodlots** also leads to the deformation of cultural landscapes, i.e., lowering their physiognomic value and, thus, the tourist attractiveness of a given region (social and economic aspects).

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Souhrn

V rozsáhlých zemědělských oblastech jsou systémy zalesnění - středoplošné, silniční, vodní a další - nezbytnou "náhradou" za bývalé přirozené lesní komplexy. Přispěly k zachování ekologické rovnováhy v oblastech intenzivně antropogenně přeměněných před staletími. Systematicky zaváděné a trvale udržované přinášejí lidem a životnímu prostředí řadu výhod - plní několik rozmanitých funkcí - od biologických a technických až po estetické a sociální. Zalesňování silně ovlivňuje klima, což se promítá do ekonomické efektivnosti zemědělských oblastí; významně snižuje znečištění životního prostředí (fytoremediace); plní funkci biocenózy (utváření specifických biotopů); pozitivně ovlivňují

fyziognomii krajiny. V Evropě je ochrana krajiny a přírodních zdrojů realizována prostřednictvím několika právních předpisů na úrovni legislativy EU i jednotlivých zemí. V roce 2020 zveřejnila Evropská komise strategii ochrany a obnovy biodiverzity v Evropské unii do roku 2030. V dokumentu se hovoří i o střednědobých výsadbách, protože tato problematika zůstává v jednotlivých zemích na různé úrovni.

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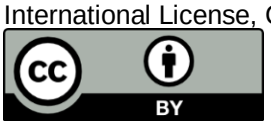

MONITORING THE MOVEMENT OF VISITORS IN THE TATRA NATIONAL PARK USING BATTERY-POWERED ONLINE COUNTERS

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Abstract
Mapotic, in collaboration with Hardwario, has developed an innovative device for monitoring the movement of tourists and tracking environmental factors in the natural environment. The battery-powered, long-life devices are connected to the internet and allow for easy and quick collection, including in mountain locations and during extreme weather conditions. IoT (internet of things devices) can be connected via NB-IoT or satellite network and are capable of providing real-time data. It has been developed with low acquisition cost in mind and easy integration into various projects where there is a need to collect visitor or environmental data from natural sites. As a result, this allows for data driven decision making by operators to better manage tourism in the area, plan the development of hiking trails and overall help conservation.

Key words: Tourism monitoring and visitor measurement in nature, outdoor movement counters, outdoor battery counters, monitoring of protected areas and national parks, monitoring of public spaces

Introduction

The Tatra National Park (TANAP) team has long struggled with insufficient information on the number of visitors to the Tatras. Insufficient statistics and inaccurate ways of measuring visitor numbers made it impossible to plan new investments and made tourism management difficult. As they were already using the Mapotic platform to visualize tourism-related maps, they turned to us for flexible monitoring of tourist movements. In collaboration with Hardwario, we developed a system based on battery-powered online connected counters that can be freely deployed in the countryside to collect near real-time data on passageways in a given location. The technology uses connectivity over the now widespread NB-IoT "internet of things" networks and an optimised configuration that ensures battery life for up to several years, including deployment in mountains and freezing temperatures. Existing software tools were then used for data visualization and processing, thus achieving the optimal combination of operating costs and flexibility in processing and visualizing the measured values to provide the operators with the greatest benefit by providing clear visualizations of site utilization during the day but also summary reports during the season or over any time period.

Materials and methods

The universal hardware platform Chester was selected as the optimal technology for the enumerators. This has been developed by Hardwario for a long time and has been proven in hundreds of implementations in the last few years, both domestically and abroad on several continents, including for example shot detection during poaching in the Sahara desert. Chester was conceived to be widely used for telemetry and online transmission of measured data, whether in industry or the environment. During the testing and pilot period, the device was calibrated primarily in terms of the field of view of the newly installed sensor and the range and distance that the sensor is able to monitor. The latter can be adjusted using several types of sensor occlusion and a software adjustable passage period of the moving object. The sensor itself works on the principle of detecting major thermal changes in the monitored perimeter of the environment - in outdoor the risk of false totals is eliminated, e.g. when branches move during wind etc. The device itself is equipped with a robust, waterproof housing with IP67 rating for harsh conditions and optimized for long-term battery operation. The latter is related to the specific needs of the project, where data can be sent at daily or hourly or even smaller intervals - in the case of Tatra Park, the period was set to 15min, which allows monitoring of trends during the day, but also more detailed reports on the utilization of footpaths or forest paths during the busiest hours.

The NB-IoT network is used for data transmission, which has more than 90% signal coverage of the Tatra National Park. The individual devices send data packets with newly measured values at set intervals, which provides both a real-time view of the occupancy of the sites, but also reduces the risk of data loss if the devices are damaged or stolen. The device measures the number of new passes from the sensor, temperature and instantaneous position - thanks to a microcomputer inside the

device, this data can be further calibrated or processed directly by the device. For example, the number of new movements and their total can be sent and the number of necessary operations can be optimised in the statistics processing itself.
For maximum versatility, Google sheets are used, which add another level of versatility with their high compatibility and ease of use. In addition to the map display, the data is also used in Google Looker studio, which generates tailored charts and reports with the possibility of filtering by date and time, device groups, etc.

Results
In the first phase, 15 devices were installed in the Tatra Park in July 2021. Some installations were made on official hiking trails, others in the deep forest to monitor the frequency of use of unofficial paths and shortcuts. Several devices were also installed on cycle paths to monitor the frequency of their use at different times of the day and according to the season.

Tab. 1: General overview of most important figures

15 installed devices in the first phase (2021)	**10** in the second phase (2023)	**+1.5M** data points sent by telemetry during 2 years	**60.000** number of people counted in single month on most frequent place

- The data and results are provided to other organizations and help to better plan sustainable tourism in the Tatras, with the maintenance of hiking trails, planning of new ones and nature conservation.
- Tourist information offices - can inform visitors about less or more visited places and use this data to evaluate which trips they can take.
- Nature conservation - the TANAP administration carries out a visitor count once a year at the most visited places, but this way we have a year-round overview of visitor movements
- It is a good argumentative tool in cases where there are disputes about how many people visit which places. This way it's in black and white.
- Also, in view of rising electricity prices, it is a good tool for evaluating where the municipality can switch off or regulate public lighting according to the density of visitors.
- In winter, counters are also placed on cross-country ski trails, which is important for monitoring which sections are visited, which is also related to the evaluation of the maintenance of trails for which we receive subsidies from the Ministry of Transport.

Fig. 1: Sample installation

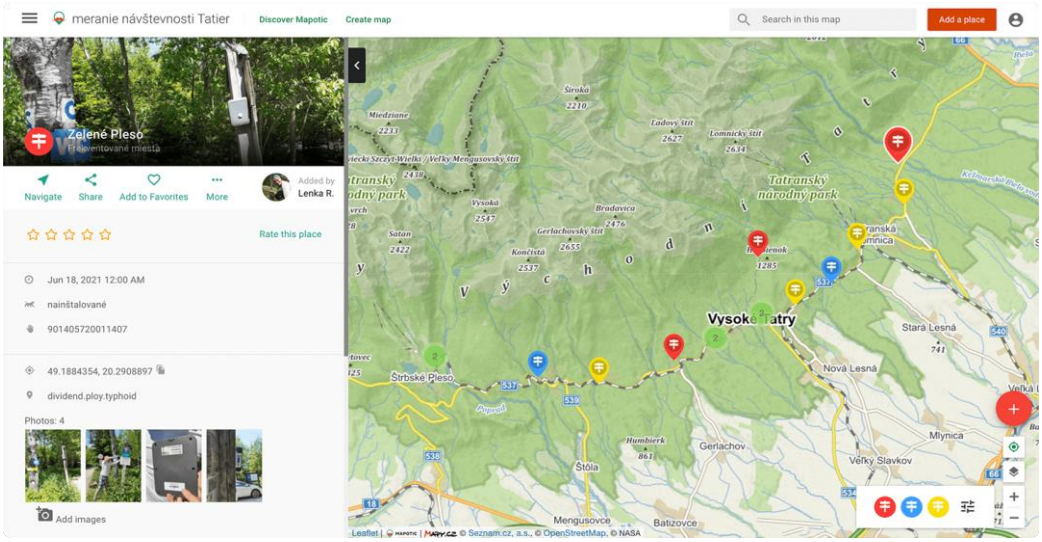


Fig. 2: Map with placements during the pilot phase

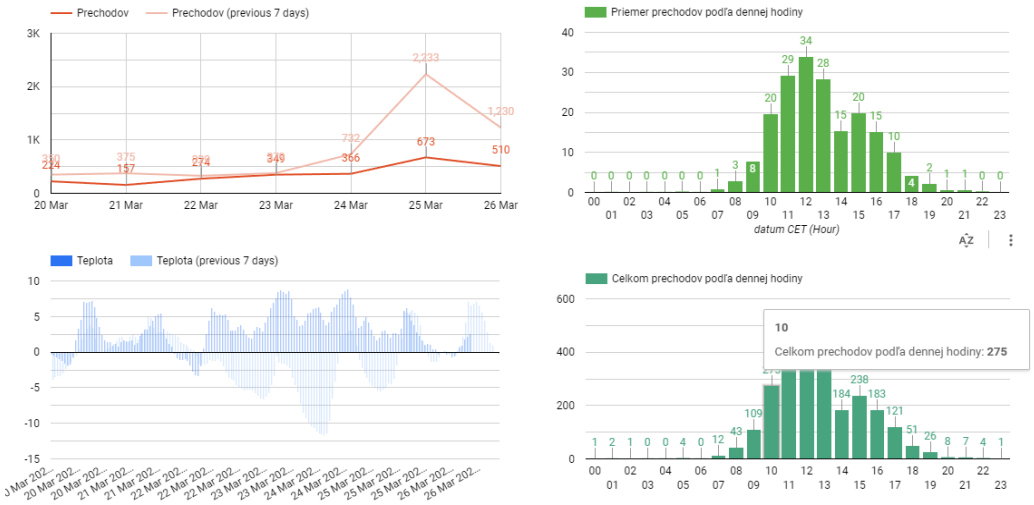


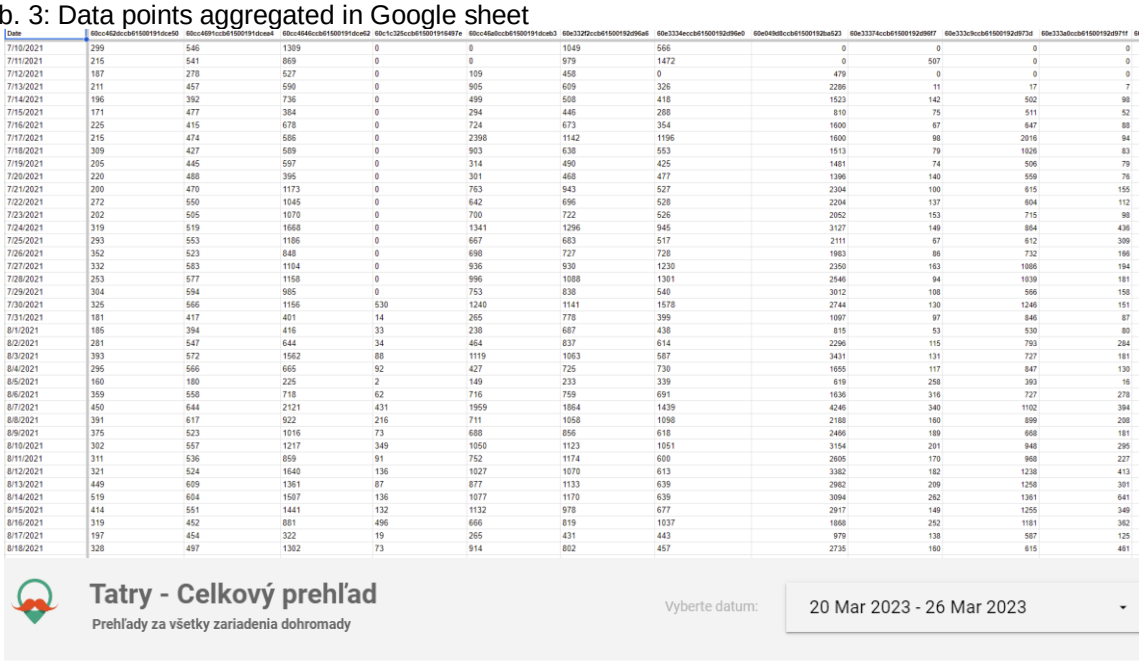
Fig. 3: Sample of report from one place

Tab. 2: Sample of data automatically collected in Google sheet middleware

1	datum (utc)	teplota	počet pohybů	přírůstek	day
29855	2023-03-25 16:10:17+00:00	8.18	48430	5	3/25/2023
29856	2023-03-25 16:40:20+00:00	7.25	48432	2	3/25/2023
29857	2023-03-25 17:10:12+00:00	5.68	48432	0	3/25/2023
29858	2023-03-25 17:40:08+00:00	5.12	48432	0	3/25/2023
29859	2023-03-25 18:10:12+00:00	5	48432	0	3/25/2023
29860	2023-03-25 18:40:13+00:00	4.75	48432	0	3/25/2023
29861	2023-03-25 19:10:15+00:00	4.12	48432	0	3/25/2023
29862	2023-03-25 19:40:17+00:00	3.5	48434	2	3/25/2023

Tab. 3: Data points aggregated in Google sheet

Date	60cc462dccb61500191dce50	60cc4691ccb61500191dcea4	60cc4646ccb61500191dce62	60c1c325ccb61500191649fe	60cc46a0ccb61500191dceb3	60e332f2ccb61500192d96a6	60e3334eccb61500192d96e0	60e049d8ccb61500192ba523	60e33374ccb61500192d9bf7	60e333c9ccb61500192d973d	60e333a0ccb61500192d971f	6
7/10/2021	299	546	1309	0	0	1049	566	0	0	0	0	
7/11/2021	215	541	869	0	0	979	1472	0	507	0	0	
7/12/2021	187	278	527	0	109	458	0	479	0	0	0	
7/13/2021	211	457	590	0	905	609	326	2286	11	17	7	
7/14/2021	196	392	736	0	499	508	418	1523	142	502	98	
7/15/2021	171	477	384	0	294	446	288	810	75	511	52	
7/16/2021	225	415	678	0	724	673	354	1600	67	647	88	
7/17/2021	215	474	586	0	2398	1142	1196	1600	98	2016	94	
7/18/2021	309	427	589	0	903	638	553	1513	79	1026	83	
7/19/2021	205	445	597	0	314	490	425	1481	74	506	79	
7/20/2021	220	488	395	0	301	468	477	1396	140	559	76	
7/21/2021	200	470	1173	0	763	943	527	2304	100	615	155	
7/22/2021	272	550	1045	0	642	696	528	2204	137	604	112	
7/23/2021	202	595	1070	0	700	722	526	2052	153	715	98	
7/24/2021	319	519	1668	0	1341	1296	945	3127	149	864	436	
7/25/2021	293	553	1186	0	667	683	517	2111	67	612	309	
7/26/2021	352	523	848	0	698	727	728	1983	86	732	166	
7/27/2021	332	583	1104	0	936	930	1230	2350	163	1086	194	
7/28/2021	253	577	1158	0	996	1088	1301	2546	94	1039	181	
7/29/2021	304	594	985	0	753	838	540	3012	108	566	158	
7/30/2021	326	566	1156	530	1240	1141	1578	2744	130	1246	151	
7/31/2021	181	417	401	14	265	778	399	1097	97	846	87	
8/1/2021	185	394	416	33	238	687	438	815	53	530	80	
8/2/2021	281	547	644	34	464	837	614	2296	115	793	284	
8/3/2021	393	572	1562	88	1119	1063	587	3431	131	727	181	
8/4/2021	295	566	665	92	427	725	730	1655	117	847	130	
8/5/2021	160	180	225	2	149	233	339	619	258	393	16	
8/6/2021	359	558	718	62	716	759	691	1636	316	727	278	
8/7/2021	450	644	2121	431	1959	1864	1439	4246	340	1102	394	
8/8/2021	391	617	922	216	711	1058	1098	2188	160	899	208	
8/9/2021	375	523	1016	73	688	856	618	2466	189	668	181	
8/10/2021	302	557	1217	349	1050	1123	1051	3154	201	948	295	
8/11/2021	311	536	859	91	752	1174	600	2605	170	968	227	
8/12/2021	321	524	1640	136	1027	1070	613	3382	182	1238	413	
8/13/2021	449	609	1361	87	877	1133	639	2982	209	1258	301	
8/14/2021	519	604	1587	136	1077	1170	639	3094	262	1361	641	
8/15/2021	414	551	1441	132	1132	978	677	2917	149	1255	349	
8/16/2021	319	452	881	496	666	819	1037	1868	252	1181	362	
8/17/2021	197	454	322	19	265	431	443	979	138	587	125	
8/18/2021	328	497	1302	73	914	802	457	2735	160	615	461	



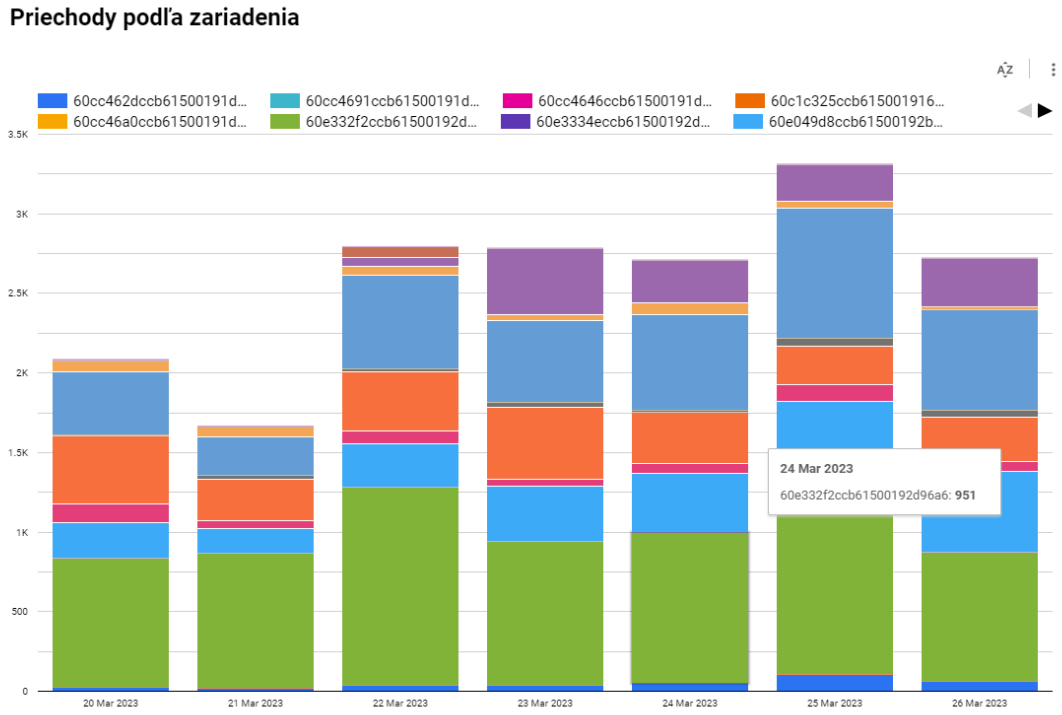


Fig. 4: Overview dashboard automatically generated by Google looker studio

Discussion

- The price and operating costs are significantly lower than those of refurbished EcoCounter manufacturers. However, a more in-depth comparison of the total volume of functions and the accuracy of the counting itself needs to be worked out, where in basic tests we are at the level of lower or medium class but the quality of measurement under different conditions is lower than manufacturers specializing in this type of equipment for decades.
- We will continue to work on improving the device in terms of measurement technology (direction, calibration capability by location, etc.), measurement technology (infrared vs. laser, etc.).

- With reputable long-standing suppliers we want to improve the process of installation and placement of the equipment in the field, as well as the operation and maintenance of the equipment - e.g. reset or adjustment when changing location, etc.

Conclusion

Looking back on the project, we can say that the concept of Hardwario's innovative Chester hardware combined with Mapotic's data processing and visualization has been proven to work. It thus represents an interesting and affordable alternative for monitoring and counting the movements of hikers on conventional trails and in the wild. The main advantage is the mix of acquisition and operating costs with continuously uploaded data and the longevity of the equipment.
The reports were modified several times during the project for better usability by the operator. Some complications arise from moving equipment, where it is advisable to reset the equipment in question and create a new report to separate the historically measured data - which is not always possible due to processes and changes in personnel etc.
More information at www.mapotic.com

References

Hardwario, s.r.o.
Mapotic, s.r.o.
Telecom SK
Google data studio / Looker

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- The Mapotic development team for their indomitability and creativity

Souhrn

Mapotic ve spolupráci s Hardwario vyvinul inovativní zařízení pro monitoring pohybu turistů a sledování environmentálních faktorů v přírodním prostředí. Bateriová zařízení s dlouhou životností jsou připojena k internetu a umožňují snadný a rychlý sběru včetně umístění v horách a během extrémních klimatických podmínek. Zařízení poskytují data téměř v reálném čase a jsou snadno integrovatelná do různých projektů, kde je potřeba získávat údaje o návštěvnosti či environmentálních datech z přírodních lokalit a možnost efektivně řídit turistiku v dané oblasti, plánovat rozvoj turistických stezek a celkově pomáhat ochraně přírody v národním parku.

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MOUNTAIN RESCUE SERVICE - INEVITABLE HELP AT RECREATIONAL AND SPORT ACTIVITIES IN MOUNTAINOUS AREAS IN SLOVAKIA

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Abstract
The article points out the importance of the activities of the Mountain Rescue Service (MRS) in cases of aid provision, which is necessary at recreational, tourist and various sports activities in the mountainous areas of the Slovak Republic. MRS as a national rescue organization was established on 1.12.1954. From 1 January 2003, the Mountain Rescue Service was established as a state budget organization, which, based on Act no. 577/2002 on MRS, is managed by the Ministry of the Interior of the Slovak Republic. MRS is a part of the Integrated Rescue Systém of the SR. Due to the increasing number of visitors to the mountains and the development of recreational and sports activities in these areas, the number of accidents that require the intervention of the MRS is also increasing. Currently, MRS performs more than 2000 interventions annually. A large part of MRS interventions is carried out mainly in connection with difficult terrain and a high number of visitors. Currently, the MRS has a headquarters in Horný Smokovec in the High Tatras, 8 regional centers, an Avalanche Prevention Center in Liptovský Hrádok, an MRS Training Center in Liptovský Hrádok and an Information Center in Starý Smokovec (High Tatras). In 2022, MRS had 178 employees, of which 148 were rescuers.

Key words: Leisure interests, tourism, injuries, medical assistance

Introduction

In a direct connection with the ever increasing attendance and development of recreational, tourist and sporting activities in mountain areas, the number of those who need help to save their health or life is also increasing. In the Slovak Republic, as in other countries of the world, this assistance is provided by mountain rescue service (MRS). MRS as a national rescue organization was in SR established on 1.12.1954. From 1 January 2003, the MRS was established as a state budget organization, which, based on Act no. 577/2002 on MRS, is managed by the Ministry of the Interior of the Slovak Republic. Rescuers from MRS are ready to help save health and lives continuously 24 hours a day and 7 days a week. In 2022, MRS in SR had 178 employees, of which 148 were rescuers. Currently, the MRS has a headquarters in Horný Smokovec in the High Tatras and 8 regional centers (RC):
RC MRS Vysoké Tatry - Starý Smokovec in High Tatras
RC MRS Nízke Tatry – Jasná in Otupné - Liptovský Mikuláš
RC MRS Nízke Tatry – Bystrá in Bystrá
RC MRS Západné Tatry - Žiarska dolina in Smrečany
RC MRS Západné Tatry – Zverovka in Zuberec
RC MRS Malá Fatra – Štefanová in Terchová
RC MRS Veľká Fatra – Donovaly in Mišúty - Donovaly
OS HZS Slovenský raj – Čingov – in Čingov - Spišská Nová Ves
An indispensable part of the MRS structure are an Avalanche Prevention Center in Liptovský Hrádok, an MRS Training Center in Liptovský Hrádok and an Information Center in Starý Smokovec (High Tatras).
The organizational structure of the MRS and a wide range of its activities within the Integrated Rescue System of the Slovak Republic were elaborated by Kubas et al. (2021). Ganoczy (2015) divided the activities of the MRS in Slovakia into four basic groups:
- monitoring,
- rescue activity,
- preventive activity,
- training activity.

Material

Based on the Annual Reports of the MRS from 2008 to 2022 (freely available on the site: https://hzs.sk), we have prepared a statistical overview of interventions performed by rescuers over

the last 15 years. Due to the restrictions related to the COVID-19 pandemic, the year 2021 was atypical in relation to the visitation of mountain recreation areas (small numbers of visitors). Due to the possible distortion of the results, the calculations were performed without taking into account the mentioned year.

Results

The processed data contains Tables 1-3. In Tab. 1, the data on interventions according to regional centers and NACA Location are processed. Of the total number of 32,107 MRS interventions in the years 2008-2022, most (13,247, i.e. 41.26%) were carried out in the Low Tatras area. We assume that this high number of interventions is primarily related to the number of visitors in this area. Relatively large numbers of interventions were also in the area of the High Tatras (5,609, i.e. 17.47%) and Veľká Fatra (5,595, i.e. 17.43%).

In Tab. 2, the data on the total number of MRS interventions by individual years are processed. These data are subsequently divided according to whether interventions were carried out in mountainous areas or on ski tracks. Out of the total number of interventions of 32,107; 10,405 (32.58%) were carried out in mountain areas and 21,662 (67.47%) on ski tracks. Due to the significant restriction of attendance in the mentioned recreational areas in 2021 (in connection with the COVID-19 pandemic), we have processed in Tab. 2 also the data without the indicated year. Annually, MRS rescuers perform an average of 2232 interventions, of which an average of 697 (31.2%) interventions in mountainous areas and an average of 1,535 (68.8%) interventions on ski tracks.

In Tab. 3, the data on the number of MRS interventions (2008-2022) according to the nationalities of the affected persons are processed. From the overview, it can be seen that Slovaks required the most interventions (16,516 persons, i.e. 51.44%). Visitors of Polish nationality were helped by rescuers a total of 5,461 times (17.01%), and visitors of Czech nationality 3,198 times (9.96%).

Tab. 1: Interventions of MRS by Regional centers and NACA[(x] Location 2008-2022

Year	Regional center						∑
	High Tatras	West Tatras	Low Tatras	Veľká Fatra	Malá Fatra	Slovenský raj	
2008	269	93	762	356	205	50	1735
2009	232	75	682	345	187	66	1587
2010	237	98	704	324	211	51	1625
2011	410	93	790	347	193	90	1923
2012	444	96	795	378	309	92	2114
2013	372	118	999	421	273	76	2259
2014	309	62	893	303	254	93	1914
2015	455	152	889	397	247	89	2229
2016	444	136	1158	381	242	84	2445
2017	481	164	1048	431	468	81	2673
2018	471	173	1136	460	444	76	2760
2019	451	216	1161	491	494	75	2888
2020	352	235	1027	385	388	71	2458
2021[(xx]	224[(xx]	91[(xx]	183[(xx]	165[(xx]	132[(xx]	71[(xx]	866[(xx]
2022	458	219	1020	411	451	72	2631
∑	5,609	2,021	13,247	5,595	4,498	1,137	32,107
%	17.47	6.29	41.26	17.43	14.01	3.54	100
φ [(xx]	373.9[(xx]	134.7[(xx]	883.1[(xx]	373[(xx]	299.9[(xx]	75.8[(xx]	-
φ [(xxx]	384.6[(xxx]	137.9[(xxx]	933.1[(xxx]	387.9[(xxx]	311.9[(xxx]	76.1[(xxx]	-

Notes to Tab. 1: [(x] NACA - National Care & Control Assotiation; [(xx] Data affected by restrictions in 2021 in connection with the COVID-19 pandemic; [(xxx] Data without 2021

Tab. 2: The number of MRS interventions 2008-2022

Year	Mountainous areas	(%)	Ski tracks	(%)	Together
2008	536	30.89	1,199	69.11	1,735
2009	548	34.53	1,039	65.47	1,587
2010	543	33.42	1,082	66.58	1,625
2011	588	30.58	1,335	69.42	1,923

2012	713	33.73	1,401	66.27	2,114
2013	566	25.06	1,693	74.94	2,259
2014	646	33.75	1,268	66.25	1,914
2015	673	30.19	1,556	69.81	2,229
2016	786	32.15	1,659	67.85	2,445
2017	757	28.32	1,916	71.68	2,673
2018	746	27.23	2,014	72.97	2,760
2019	910	31.51	1,978	68.49	2,888
2020	795	32.34	1,663	67.66	2,458
2021(x	686(x	79.21(x	180(x	20.79(x	866(x
2022	952	36.18	1,679	63.82	2,631
∑	10,445	32.53	21,662	67.47	32,107
φ	696.3	34.60	1,444.1	65.40	2,140.5
φ (xx	697.1(xx	31.42(xx	1,534.4(xx	68.58(xx	2,231.5

Note to Tab.1: (x Data affected by restrictions in 2021 in connection with the COVID-19 pandemic; (xx Data without 2021

Tab. 3: The number of MRS interventions by the nationality of the disabled person 2008-2022

Nationality	Number	%
Slovakia	16,516	51.44
Poland	5,461	17.01
Czechia	3,198	9.96
Hungary	1,386	4.32
Ukraine	855	2.67
Lithuania	709	2.21
Russia	367	1.15
Germany	287	0.89
United Kingdom	263	0.82
Romania	235	0.73
Belarus	157	0.49
Estonia	155	0.48
Israel	126	0.39
Latvia	124	0.39
Belgium	87	0.27
Netherlands	76	0.24
France	62	0.19
Denmark	56	0.17
Ireland	51	0.16
Austria	46	0.14
Italy	30	0.09
Spain	24	0.07
Finland	19	0.06
Serbia	12	0.04
Other and unkn.	1,805	5.62
∑	32,107	100

Conclusion

- MRS as an important part of the Integrated Rescue System of the SR and actively cooperates with other rescue services – Fire and Rescue Service, Emergency Medical Service, Police of the Slovak Republic, etc.

In addition to direct rescue interventions, MRS workers also perform other important activities that are indispensable for visitors in mountainous areas. They are mainly:

- In cooperation with the Slovak Hydrometeorological Institute, it conveys the data on the current weather and short- and long-term forecasts, issues warnings in connection with the weather;
- processes data on avalanche danger, informs about the avalanche situation and determines the degree of avalanche danger, etc.

The work of rescuers in difficult conditions is dangerous and extremely demanding both mentally and physically. It requires a wide range of knowledge and skills in various specialties on which the health and life of disabled persons depend (Fig. 1, Fig. 2).

Fig. 1: MRS rescuers are looking for a person buried by an avalanche (photo by P. Beťko)

Fig. 2: Transport of the injured person to the ambulance (photo by P. Beťko)

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Souhrn
Článek poukazuje na význam činnosti Horské záchranné služby (HZS) v případech poskytování pomoci, která je nezbytná při rekreačních, turistických a různých sportovních aktivitách v horských oblastech Slovenské republiky. HZS jako národní záchranná organizace vznikla 1.12.1954. Od 1. ledna 2003 byla zřízena Horská služba jako státní rozpočtová organizace, která na základě zákona 577/2002 o HZS, spravuje Ministerstvo vnitra Slovenské republiky. HZS je součástí Integrovaného záchranného systému SR. Vzhledem ke zvyšující se návštěvnosti hor a rozvoji rekreačních a sportovních aktivit v těchto oblastech se zvyšuje i počet úrazů, které vyžadují zásah HZS. V současné době HZS provádí více než 2000 zásahů ročně. Velká část zásahů HZS je prováděna především v souvislosti s náročným terénem a vysokou návštěvností jednotlivých oblastí. V současné době má ředitelství HZS sídlo v Horném Smokovci ve Vysokých Tatrách, 8 regionálních středisek, Středisko lavinové prevence v Liptovském Hrádku, Výcvikové středisko HZS v Liptovském Hrádku a Informační středisko ve Starém Smokovci (Vysoké Tatry). V roce 2022 měla HZS 178 zaměstnanců, z toho 148 záchranářů. V článku jsou zpracovány údaje o zásazích MRS za posledních 15 let (2008-2022) podle jednotlivých regionálních center, resp. lokalit-NACA Location (Tab. 1), údaje o počtu zásahů v horských oblastech a na lyžařských tratích (Tab. 2) a podle národnosti postižených osob (Tab. 3).

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NON-WOOD FOREST PRODUCTS: “CULTURE” + “TRADITION” = EDUCATIONAL POSSIBILITIES”. DOES IT MAKE SENSE?

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Abstract
Before man learned how to use wood as fuel, weapon or building material, he had used forest goods such as fruit, herbs, mushrooms etc. In the scientific literature, we can find many reports on their importance in culture and tradition. Their significance of forest goods in folk medicine is indisputable, but many of them, according to contemporary beliefs, had magical properties. People believed they were supposed to ensure happiness, prosperity, protect against diseases or even bring misfortune to another being. Many historical uses of these goods have been forgotten. The interest of societies in their history is currently increasing and they want to feel a connection with ancestors. They want to find out where superstitions and traditions prevailing in their country or family come from. Knowledge about non-wood forest products is a great opportunity to increase the awareness of societies about their history, but also to build awareness about the forest and nature. This paper presents an overview of selected non-wood forest products, highlighting their relationship with the folk tradition, but mainly in the context of forestry promotion - they can be an excellent element of forest education, and should also be included in the recreational management of the forest.

Key words: forest utilisation, forest education, forestry in culture, traditional forest use

The importance of non-wood forest products use in historical and contemporary aspects

FAO defines non-wood forest products (NWFPs) as goods of biological origin other than wood, derived from forests, other wooded lands and trees outside forests [Dembner, Perlis (ed.) 1999]. In Poland, it is customary to still refer to these goods as “secondary” or “minor”, however, due to proper communication at the international level, this should be unified. The use of NWFPs can be considered on many levels; these include the field of forest sciences, a branch of economy, but also tradition or spontaneous activity. NWFPs utilisation as a scientific discipline and a field of forest management is carried out to a limited extent and in a limited geographical area [Staniszewski 2018]. In many European countries, we can observe less interest in non-wood products than in wood raw material [Pettenella et al. 2019]. It should be noted, however, that NWFPs use is still important in many countries, mainly in the form of uncontrolled gathering, and not as a thriving branch of sustainable forest management. It exists outside the structures and control of the forest owner, who does not benefit from sharing his goods [Staniszewski 2018]. NWFPs use is also a spontaneous activity. In many European countries - e.g. in Poland - it is allowed to collect undergrowth products for one's own needs [Ustawa... 1991]. Collecting of forest floor resources is of great importance, both historically and contemporary - after all, it was carried out before the start of using timber. Before man learned to use wood as fuel, weapon or building material, he used the edible resources of undergrowth, mainly fruits and mushrooms. The population of many European countries still benefits from NWFPs use, just as their ancestors did [Seeland, Staniszewski 2007].
Interest in the culture of our ancestors is constantly growing. It seems extremely important to use the potential of this interest to promote sustainable forestry. This gives the opportunity to present the forest to the public as not only a place of occurrence of many species of plants or animals and a place of recreation, but also as something deeper - and even mystical. Below, an overview of selected forest resources (or more precisely, their use) is presented, highlighting their relationship with culture, but also with folk tradition in the context of forestry promotion and forest education. As it has already been mentioned, they can be an excellent element of forest education and should be included in the recreational management of the forest.

Forest benefits in tradition and culture

Historically, NWFPs play a huge role in tradition and culture. In the literature, both scientific and popular, and even in fiction, we can find a lot of information on this matter. These products were used in folk medicine, where in many cases they were treated as a panacea. Many of them, according to the beliefs of the time, had magical properties. They were supposed to ensure happiness, prosperity or protect against diseases. On the other hand, they were also supposed to bring misfortune to

another person or other living creature or even cause their death. The links between NWFPs and tradition and culture can be seen, for example, by analyzing the names of many plants. It is worth noting the connection between the Latin names of plants and products obtained from them, and mythological heroes and deities [Antkowiak 1998], e.g.: *Artemisia* - from Artemis, the goddess of fertility, helping with childbirth; *asklepios* (milk) - from Asklepios, the god of medicine; *Centaurium* - from the centaur Chiron with medical skills; *Achillea* - from Achilles, the hero of the Trojan War - many similar examples could be cited. It is not certain when for the first time man - accidentally or consciously - collected and ate mushrooms in the forest. Through trial and error, he got to know edible and poisonous mushrooms, but he did so with fear, because they were considered mysterious organisms, unfriendly, dangerous and magical creatures - he often referred to the interference of unclean forces. Even in contemporary folk nomenclature we can find “devil's mushrooms”, and even those growing in “devil's circles” [Grzywacz, Staniszewski 2003]. In the case of mushrooms, however, tradition sometimes has a serious negative connotation. There are different views - local and regional - regarding their usefulness. Myths that, for example, a silver spoon turns black when placed in a dish containing poisonous mushrooms have terrifying consequences [Staniszewski et al. 2017].

Non-wood forest products in beliefs and superstitions

The development of human civilization is inextricably linked to various beliefs and religions. Our ancestors had a rich imagination, which was reflected in fairy tales and legends as well as pantheons of deities, idols and demons. People, trying to explain incomprehensible phenomena, attributed magical and supernatural powers to the surrounding events, things, plants or animals. Forest areas were no exception, with many beliefs and superstitions associated with them, and forest resources, which today are classified as “non-wood”, were their integral part. Selected examples of NWFPs associated with beliefs, legends and magical properties are presented below. It is worth mentioning that many of these beliefs are still cultivated not only in Poland. NWFPs were used e.g. during religious ceremonies. One of them is the custom of decorating houses with green branches before the Christian feast of *Corpus Christi*. This tradition comes from pre-Christian times and is associated with the Slavic holiday of Pentecost and is still practiced in some regions of Poland [Śliwowski 2016]. The most common plants used for this purpose are young calamus leaves (*Acorus calamus* L.) and twigs with young leaves of birch (*Betula sp*.), oak (*Quercus sp*.) or elderberry inflorescences (*Sambucus nigra* L.) [Śliwowski 2016]. Another custom is tying wreaths, which are blessed in the church during *Corpus Christi*. In order to make them, mainly thyme (*Thymus sp*.), sedum (*Sedum sp*.) and linden (*Tillia* sp.) are used, less often chamomile (*Matricaria sp*.), mint (Mentha sp.), cornflower (*Centaurea sp*.), oak (*Quercus sp*.), robinia (*Robinia pseudoacacia* L.), helichrysum (*Helichrysum* sp.), lady's mantle (*Alchemilla sp*.), rose (Rosa sp.) and horsetail (*Equisetum sp*.). Associated with this rite is the incense of apartments, animals and people. Last year's wreaths were usually used for this purpose. This was to drive away all evil and ensure prosperity on the farm [Śliwowski 2016]. According to beliefs, some plants have the power to protect against something specific or are used regardless of holidays. One of them is birch. Its branches hidden under the doormat are supposed to scare away demons causing harm in the house [Śliwowski 2017]. In addition, swallowed willow flowers (*Salix sp*.), consecrated during the Christian holiday of *Palm Sunday*, protect against diseases [Śliwowski 2017]. There were also herbs designed to produce the intended effect. One example is lovage herb (*Levisticum* L.). An elixir made from this plant was supposed to induce love. If a woman gave a man a lovage infusion and looked him in the eye - without blinking - while he was drinking, the man should fall in love with her [Śliwowski 2017]. There are also known beliefs that certain plants have the power to negatively influence human life. One of the misfortune plants is common heather (*Calluna vulgaris* (L.) Hull). A bouquet of heather brought home could even cause the death of a household member [Śliwowski 2017]. There are also known magical uses of plants that are cultivated today. Such examples include lupine (*Lupinus sp*.) or common rue (*Ruta graveolens* L.). According to beliefs, one should not fall asleep with blooming lupine, because one may never wake up again [Śliwowski 2017]. Common rue, on the other hand, was credited with a broad anti-magical effect: it had the power to reverse spells and drive away evil [Wielgosz 2008]. One example would be a way to get rid of a monster called a “basilisk”. As reported by Vargas and Zych [2018], the inhabitants of Vilnius, wanting to get rid of the problem, and who could not afford the expensive solution of mirrors (it was believed that the basilisk dies seeing its reflection in the mirror), they got rid of it by throwing bundles of rue into the basilisk's habitat. In addition, in Lithuania and Poland, rue was considered a symbol of purity and virginity. In the Middle Ages, it was believed that the smell of rue sexually excites and attracts men, and wreaths of this plant were worn by young women who wanted to get married. There was a proverb according to which a woman who sowed rue risked becoming an unmarried woman [Mazerant 1990]. The ability to protect against evil powers was also attributed to St. John's wort (*Hypericum*

perforatum L.): the juice of its herb was used to exorcise demons [http://www.czytelniamedyczna...]. It is also impossible to forget about a plant such as wormwood (*Artemisia absinthium* L.), which, in addition to repelling evil spirits, preserving, abortive or increasing the appetite, also had a hallucinogenic effect, and infusions from it were used to "contact with the ancestors". Wormwood leaves were used to incense the homes of the dead after the corpses had been removed, and to decorate the coffins of the dead to “protect the deceased” [Paluch 1985]. In Slavic mythology, there are also many monsters, monstrosities and other beings closely related to the forest. Vargas and Zych [2018] give examples such as the “blueberry old woman”, who, wearing a dress made of forest plants and herbs, roaming the forests and picking berries or mushrooms, scared or suffocated unwary children. Other example is the “forest aunt”, who, being the guardian of the forest and the animals living in it, was unkind to adult people. She killed hunters, put poisonous mushrooms in baskets for mushroom pickers, kidnapped girls picking berries. However, she was kind to children: she showed them the best places to pick fruits, protected them from the attacks of wild animals, and escorted them home. The scientists point to the growing trend of society returning to pagan beliefs (so-called neo-paganism) in recent years. People from European countries are moving away from the prevailing Christian faith in their countries to look for other alternatives. According to Bukowska-Pastwa [2011], “society is fascinated by magic, divination, runes, astrology, parapsychology, psychotronics, etc. In Poland, courses teaching the basics of witchcraft have been conducted for several years.”

Educational potential of non-wood forest products

The previously described examples of using various types of NWFPs are only part of a broad knowledge base. There are a number of publications about the beliefs and superstitions that our ancestors believed in, although this knowledge is certainly incomplete and in many cases ambiguous. The use of these knowledge seems to have an extraordinary educational potential. You could call it building the future by familiarizing people with the past. Through lectures, educational activities or educational boards, information on the beliefs of ancestors and the NWFPs used by them can be communicated to the public, while building people's sensitivity to the forest and the environment. Getting to know the whole range of species used by the society can make them aware of the diversity of the world, nature and the surrounding environment. Knowledge about the use of many species of plants or fungi may also persuade society to care more about the natural environment in the future. Appropriate education in this area can also encourage people to share this information with others in the form of “trivia” or “fun facts”, e.g. on the occasion of social gatherings. If this knowledge is to be effective in the field of education, attention should also be paid to education in terms of recognizing individual species of forest fruits, herbs and mushrooms. A plant or mushroom they meet and correctly recognize in the forest will no longer be just “some plant” and “some mushroom” for them, but also an element of tradition, culture and heritage that is worth taking care of [Kopeć and Staniszewski 2022; Staniszewski et al. 2016a; 2016b].

Conclusions

The examples cited above lead to some generalizations. Certainly, the forest should be perceived as a source of goods and benefits, important both historically and nowadays. In this context, it is reasonable to cultivate traditional forms of forest use as an element of the culture of our ancestors. Modern scientific knowledge should, however, verify traditional knowledge, especially if the results of current research contradict tradition. Harmful substances may be emitted from plants used for religious ceremonies, e.g. incense. Regardless of the above, the use of forest goods other than wood, especially those that are available to everyone with only minor limitations, should be increasingly considered in the recreational and especially educational aspect. After all, it is the possibility of using the resources of the undergrowth that attracts people to the forest. This should be used when designing all kinds of activities aimed at educating and making the public aware of responsibility for the forest environment and its own history.

Summary

Before man learned how to use wood as fuel, weapon or building material, he had used forest goods such as fruit, herbs, mushrooms etc. In the scientific literature, we can find many reports on their importance in culture and tradition. Their significance of forest goods in folk medicine is indisputable, but many of them, according to contemporary beliefs, had magical properties. People believed they were supposed to ensure happiness, prosperity, protect against diseases or even bring misfortune to another being. Many historical uses of these goods have been forgotten. It should be mentioned that the interest of societies in their history is currently increasing and they want to feel a connection with ancestors. They want to find out where superstitions and traditions prevailing in their country or family

come from. Knowledge about non-wood forest products is a great opportunity to increase the awareness of societies about their history, but also to build awareness about the forest and nature. This paper presents an overview of selected non-wood forest products, highlighting their relationship with the folk tradition, but mainly in the context of forestry promotion - they can be an excellent element of forest education, and should also be included in the recreational management of the forest. The forest should be perceived as a source of goods and benefits, important both historically and nowadays. In this context, it is reasonable to cultivate traditional forms of forest use as an element of the culture of our ancestors. Modern scientific knowledge should, however, verify traditional knowledge, especially if the results of current research contradict tradition. Harmful substances may be emitted from plants used for religious ceremonies, e.g. incense. Regardless of the above, the use of forest goods other than wood, especially those that are available to everyone with only minor limitations, should be increasingly considered in the recreational and especially educational aspect. After all, it is the possibility of using the resources of the undergrowth that attracts people to the forest.

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Souhrn

Než se člověk naučil používat dřevo jako palivo, zbraň nebo stavební materiál, používal lesní plody, jako jsou ovoce, byliny, houby atd. V odborné literatuře můžeme najít mnoho zpráv o jejich významu

v kultuře a tradici. Význam lesních statků v lidovém léčitelství je nesporný, ale mnohé z nich měly podle dobových představ magické vlastnosti. Lidé věřili, že mají zajistit štěstí, prosperitu, chránit před nemocemi nebo dokonce přivolat neštěstí jiné bytosti. Mnohé historické využití tohoto zboží bylo zapomenuto. Je třeba zmínit, že v současné době roste zájem společností o jejich historii a chtějí cítit spojení s předky. Chtějí zjistit, odkud pocházejí pověry a tradice panující v jejich zemi nebo rodině. Znalost nedřevních lesních produktů je velkou příležitostí, jak zvýšit povědomí společností o jejich historii, ale také budovat povědomí o lese a přírodě. Tento příspěvek přináší přehled vybraných nedřevních lesních produktů, přičemž zdůrazňuje jejich vztah k lidové tradici, ale především v kontextu propagace lesnictví - mohou být výborným prvkem lesní pedagogiky a měly by být zahrnuty i do rekreačního obhospodařování lesa. Les by měl být vnímán jako zdroj statků a užitků, důležitý jak z historického hlediska, tak i v současnosti. V této souvislosti je rozumné pěstovat tradiční formy využívání lesa jako prvek kultury našich předků. Moderní vědecké poznatky by však měly tradiční znalosti ověřovat, zejména pokud jsou výsledky současného výzkumu v rozporu s tradicí. Z rostlin používaných k náboženským obřadům, např. z kadidla, se mohou uvolňovat škodlivé látky. Bez ohledu na výše uvedené by se mělo stále více uvažovat o využití jiných lesních statků než dřeva, zejména těch, které jsou s drobnými omezeními dostupné každému, a to z hlediska rekreačního a zejména vzdělávacího. Koneckonců je to právě možnost využití zdrojů porostů, která lidi do lesa láká.

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OLDER ADULTS AS A TARGET GROUP OF USERS OF GREEN AREAS IN PROJECTS OF THE WARSAW PARTICIPATORY BUDGET

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Abstract
Urban green areas, ensuring relaxation, contact with nature and social integration, play a key role in the health and well-being of people aged 60+. Older adults are one of the target groups of the Warsaw Participatory Budget (WPB) – a program under which city residents submit and vote for projects that improve the functioning of urban spaces. The study covered projects from 8 editions implemented in the years 2015-2022 in the Śródmieście district inhabited by many people aged 60+. The aim was to determine how often the submitted projects are addressed to these people as a target group in the urban greenery category in relation to other categories, both in the case of projects qualified for voting and winning projects. The results show that out of all 284 projects addressed to older adults qualified for voting, more than half (150) were selected. Among these projects, the urban greenery category accounted for 29.58%, and as much as 71.43% of the winning projects. This indicates the real needs of voters, including a significant need to take action to increase the availability and attractiveness of urban green areas for older adults.

Key words: urban green spaces, inclusiveness, age-friendly initiatives, senior age, placemaking

Introduction

Older adults are a social group with special requirements for the use of public spaces. Due to the potentially large number of architectural barriers and mobility restrictions, they are at risk of exclusion. In Poland, as in the rest of the world, the number of people aged 60+ is steadily growing; at the end of 2021, it amounted to 9.7 million (25.7% of the population). According to the forecast, this number is to increase to 10.8 million in 2030, and to 13.7 million in 2050, which will constitute as much as 40% of the total population. Most senior Poles live in cities and only 28.8% of people from this group assess their physical condition as very good or good, with only 1.4% assessing their physical condition as 'very good' (Sytuacja osób starszych w Polsce w 2021 r., 2022). Meanwhile, good health enables independent functioning and increases the possibility of spending time actively outdoors, including in green areas, which brings many benefits. It improves physical and mental health and is the basis of well-being (Bedimo-Rung et al., 2005; Rappe et al., 2006; Van Hoof et al., 2018; Gikwad, Shinde, 2019; Cunningham et al., 2020). Therefore, creating the conditions for active ageing is a global health priority (Global Age-Friendly Cities: A Guide, 2007).
Warsaw – the capital of Poland – is inhabited by many older adults. In 2021 they accounted for 25% of the population, and a significant number of them live in the Śródmieście district (Rocznik Statystyczny Warszawy, 2022). Walking and resting in green areas are popular forms of activity for people aged 60+ (Jakość życia osób starszych w Polsce, 2020). However, many of these spaces are not friendly enough for older adults, lowering their sense of security (Kimic, Polko, 2021, 2022), and the needs of this social group are often overlooked (Błaszczyk et al., 2019).
The Warsaw Participatory Budget (WPB) is one of the publicly available programs that have been used to support activities aimed at improving the accessibility and attractiveness of the city for its residents since 2014. Through it, they decide on what activities to allocate part of public funds (0.5% of the city's budget of the previous year) – amenities in the immediate vicinity, district or in the entire city. Each edition is based on a fixed scheme: establishing and announcing the rules of the program, submitting projects, verifying them, voting and announcing the winning projects that will be implemented. Older adults are one of the social groups to whom projects can be dedicated.

Material and methods

The subject of the study are older adults as the target group of the Warsaw Participatory Budget. The aim was to determine how often people aged 60+ are indicated as the main beneficiaries of projects in the **urban greenery** category in relation to the other 8 categories (public space, transport and roads, environmental protection, education, culture, sport, health, social assistance), both in the case of projects qualified for voting and winning projects.

The scope of the study covered projects from eight editions of the WPB implemented in the years 2015-2022 in the Śródmieście district. It concerned all levels of projects: citywide and district projects jointly. The category of **urban greenery,** which involves projects that increase accessibility and ensure relaxation in urban green areas and other spaces related to nature, was considered crucial for improving the psycho-physical health of older adults.

Results

The analysis of WPB projects addressed to older adults and qualified for voting in the period 2015-2022 for the Śródmieście district (Table 1) shows that, apart from the first edition in 2017, their share remained at a level close to 50% (between 43.30% and 49.12%) in four years (2016-2019). During the covid-19 pandemic and after its end, a significant increase in the share of projects addressed to older adults was observed – close to 90% (between 88.00% and 93.55%) – with a decreasing number of projects. This shows that there is a growing awareness of the need to shape more inclusive urban spaces.

Tab. 1: Projects qualified for voting and winning projects in the Śródmieście district in the 2015-2022 editions of the Warsaw Participatory Budget (Budżet Obywatelski Warszawy. Archiwum wyników, 2023).

Edition	Projects qualified for voting			Winning projects dedicated to older adults	
	Total	Dedicated to older adults		Total	% of qualified for voting
		total	%		
2022	31	29	93,55	17	58,62
2021	50	44	88,00	28	63,64
2020	38	35	92,11	20	57,14
2019	57	28	49,12	22	78,57
2018	92	44	47,83	25	56,82
2017	97	42	43,30	14	33,33
2016	49	24	48,98	13	54,17
2015	50	38	76,00	11	28,95
Total	**464**	**284**		**150**	

With regard to the winning projects dedicated to older adults, these differences are not so significant. After a period of a gradual increase in the first editions (2015-2019), during the covid-19 pandemic and after its end, the share of these projects stabilised at around 60% (between 57.14% and 63.64%).
Significant differences can be observed when we link projects addressed to older adults with individual categories. The results show that 29.58% of projects qualified for implementation fall into the **urban greenery** category (Table 2). The number of these projects puts this category in 4th place out of 9 available. **Public space** (61.27%) was ranked first among the categories of projects dedicated to people aged 60+, which results from the specificity of the WPB focused on activities in public spaces. **Education** (42.96%) and **culture** (38.03%) were also popular categories, which in the case of older adults indicates the need to broaden their knowledge and access to cultural events. The degree of association of people aged 60+ with projects in the category of **environmental protection** (22.54%), as well as **transport and roads** (21.13%) was low. The latter result may translate into a limited number of projects aimed at improving accessibility and eliminating architectural barriers from urban roads, thus causing the exclusion of older adults with limited mobility. The degree of linking this social group with projects in the category of **social assistance** and **sport** (13.03%) and **health** (9.51%) is surprisingly low.

Tab. 2: Projects addressed to older adults qualified for voting, divided into categories (Budżet Obywatelski Warszawy. Archiwum wyników, 2023).

Category	Projects qualified for voting	
	Total	% of all qualified for voting (284)
Urban greenery	84	29,58
Environmental protection	64	22,54
Public space	174	61,27
Transport and roads	60	21,13

Sport	37	13,03
Education	122	42,96
Culture	108	38,03
Social welfare	37	13,03
Health	27	9,51

More optimistic in the context of the implementation of measures to improve the accessibility and attractiveness of urban green areas are the results of voting in the analysed editions of the WPB (Table 3).

Tab. 3: Winning projects addressed to older adults in individual categories (Budżet Obywatelski Warszawy. Archiwum wyników, 2023).

Category	**Winning projects**	
	Total	**% of projects qualified for voting in a given category**
Urban greenery	60	71,43
Environmental protection	50	78,12
Public space	96	55,17
Transport and roads	35	58,33
Sport	15	40,54
Education	53	43,44
Culture	45	41,66
Social welfare	19	51,35
Health	14	51,85

Projects in the **urban greenery** category were among the most frequently selected of those qualified for voting (71.43%) and ranked just behind those in the **environmental protection** category (78.12%). This proves the real need to improve the functioning of urban areas providing people aged 60+ with contact with nature and rest among greenery. Projects linking older adults with the category of **transport and roads** (58.33%) and **public space** (55.17%) were also often chosen. This confirms the general need to improve the accessibility of these areas and increase the comfort of moving around them for people aged 60+. Slightly more than 50% of the winning projects were in the **social welfare** and **health** categories. The least popular categories were: **education** (43.44%), **culture** (41.66%) and **sport** (40.54%).

Discussion and Conclusions

The number of older adults in the population of Warsaw is growing (Rocznik Statystyczny Warszawy, 2022), so activities in the field of shaping more inclusive spaces in the city that are tailored to their needs should be increasingly promoted. The Warsaw Participatory Budget is a program that can support this. People aged 60+ are one of the target groups that can be assigned to the submitted projects, but their activity in the WPB is very low (Seniorze - działaj i zmieniaj swoje miasto, 2023). As a result, they have little impact on shaping urban spaces with this tool. Recognising the extent to which both qualified for voting and winning WPB projects are addressed to older adults is the first step to identifying the expectations of these people in terms of shaping urban spaces. The analysis of the winning WPB projects in the **urban greenery** category dedicated to people aged 60+ indicates the increasing importance of activities improving the accessibility and attractiveness of urban green areas for this group of city residents. This observation should be taken into account not only in subsequent editions of WPB, the scope of which is quite limited but also when creating and modernising urban green areas in other programs and activities of municipal authorities. The knowledge obtained from the study may therefore contribute to the direction of social initiatives to create a more age-friendly city.

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Souhrn
Městská zeleň, která zajišťuje relaxaci, kontakt s přírodou a sociální integraci, hraje klíčovou roli pro zdraví a pohodu lidí ve věku 60+. Starší lidé jsou jednou z cílových skupin varšavského participativního rozpočtu (WPB) - programu, v jehož rámci obyvatelé města předkládají a hlasují pro projekty, které zlepšují fungování městských prostor. Studie zahrnovala projekty z 8 edic realizovaných v letech 2015-2022 ve čtvrti Śródmieście, kterou obývá mnoho lidí ve věku 60+. Cílem bylo zjistit, jak často jsou předkládané projekty v kategorii městská zeleň adresovány těmto lidem jako cílové skupině ve vztahu k ostatním kategoriím, a to jak v případě projektů kvalifikovaných do hlasování, tak v případě vítězných projektů. Z výsledků vyplývá, že ze všech 284 projektů určených starším lidem, které byly kvalifikovány do hlasování, byla vybrána více než polovina (150). Mezi těmito projekty tvořila kategorie městské zeleně 29,58 % a kategorie vítězných projektů dokonce 71,43 %. To svědčí o skutečných potřebách hlasujících, včetně významné potřeby přijmout opatření ke zvýšení dostupnosti a atraktivity městské zeleně pro starší dospělé.

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PLANNING THROUGH A GIS THE POTENTIAL RECOVERY OF RURAL BUILDINGS FOR THE DEVELOPMENT OF NEW FORMS OF TOURISM HOSPITALITY

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Abstract
The results of the territorial analysis on an agricultural area located in the Province of Matera (Southern Italy) with significant historical and natural interest, (*i.e.*, the "*San Giuliano*" protected area) are here reported. The study has been focused on the census of farm buildings and related rural infrastructures in this area, even though most of them are currently in a state of abandonment. Indeed, through their potential static and functional recovery - which appears technically feasible, given their intrinsic architectural and structural attributes – they would be re-considered, even owing to the progressively growing tourist vocation of this area, leaded by the attractive role that the City of Matera is currently playing. This analysis has been conducted through the implementation of a Geographical Information System (GIS), associated with detailed survey techniques and dendrochronology analysis of the existing wooden construction elements. Thus, it has been possible to conclude how an adequately supported process of analysis and planning of territory can reveal as a valid tool to be used in decision-making dynamics. This recovery and reuse process would be especially valuable, if conceived in a perspective of new fruition purposes, such as those leading to the achievement of an increased diffused tourist hospitality.

Key words: Rural tourism; Landscape planning; Built heritage; Tourist offer; Scattered Hotel

Introduction
Many Italian regions have a considerable heritage of rural dwellings distributed throughout their territories, built during the last centuries, but now often abandoned (Statuto & Picuno, 2015; Picuno P., 2022). If individually considered, these buildings don't appear to be in a suitable condition to be reconverted to mass rural tourism. However, if suitably connected to an adequate network of tourist facilities, completed with meeting centers and connecting infrastructures, they could ensure a level of hospitality comparable to that of the major seaside resorts, and thus be part of possible specialized tourist circuits. In this paper, a study has been conducted, in order to highlight the aspects, construction types and possible recovery systems of disused rural buildings in one rural area ("*San Giuliano*" protected area) of the Municipality of Matera (Southern Italy).

Material and methods
The study area occupies a central-southern position in the Region of Basilicata (fig. 1). It is characterized by extensive agricultural areas devoted almost exclusively to cereal cultivation, olive growing and sheep farming. These places, although scarcely profitable, intrinsically preserve a marked naturalness, within which typical landscape elements, such as the bright edges of the ravines and gullies, merge with more rounded and harmonious forms, typical of the low hills. Considering the large extension of this area, and in function of the purposes of this work, the analysis was conducted on a limited area capable of collecting and synthesizing in a significant manner a good part of the typical elements of local architecture and landscape, involving 6,324 Ha, within which there is the S. Giuliano Dam and a SCI-SPA area extended on 2,200 Ha.
The survey of rural buildings in the study area (Picuno C.A. et al., 2017; Cillis et al., 2020) has been carried out by means of remote sensing operations (fig. 2), using colour aerial photographs that allow the identification of building number and planimetric projection, associated with field surveys. This latter operation was carried out on holdings selected according to a systematic sampling, for each of which a datasheet was drawn up, containing information on the coverage, the presumed or verified age of the building, the materials used, the dimensions, the types of internal rooms and the state of maintenance.

Fig. 1: The study area ("*San Giuliano*" protected area – Province of Matera).

A dendrochronological study of the building beams, compared with the surviving specimens of the tree species (holly oak - *Quercus Ilex*), allowed to date the investigated artefacts. For this analysis, a *Pressler's* sucker, capable of drilling cores on beams and plants with a radius of up to 15 cm, has been used as a probing tool.

Fig. 2: Survey of farm buildings through remote sensing.

All information has been implemented into a Geographical Information System (GIS), aimed at identifying the areas characterized by a greater suitability to host a system of diffuse tourist residences, through the recovery of rural dwellings and connecting road infrastructures (Statuto et al., 2013; Picuno C. et al., 2019). The information layers were first converted to Grid (raster images), then weighted and finally interpolated with the 'Sum' function using a Spatial Analysis procedure. All the information levels were grouped by typology, in order to create intermediate analysis maps, useful for highlighting the suitability related to the infrastructure network and rural building morphology and land use (fig. 3). The morphological suitability map was obtained with the Spatial Analysis procedure of slopes, slope exposures and elevation bands (Statuto et al., 2019; Picuno C. et al., 2020). The construction of the GIS was completed with the creation of the infrastructural suitability information layer, obtained by spatial processing of the buffers pertaining to the different types of elements surveyed on the territory.

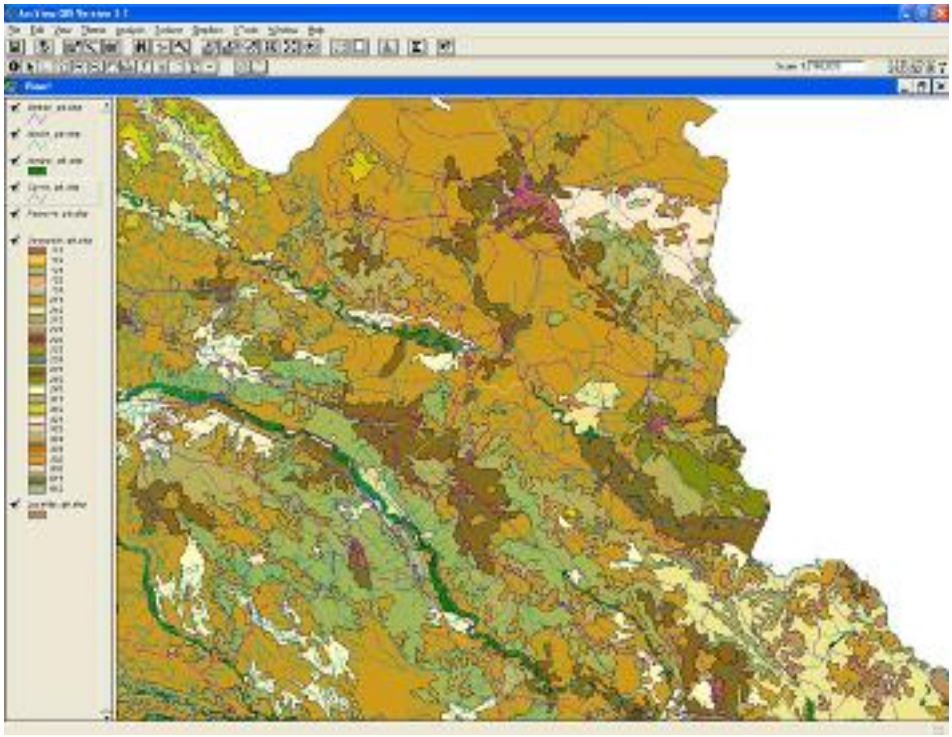

Fig. 3: Processing stage of information layers in the GIS.

Results

The final database of the GIS made it possible to interrogate the system so as to highlight, farm by farm, the degree of specific aptitude that each rural building intrinsically possesses to allow the reception of rural tourism, organized through a system of diffuse residency in association with other farms. The rural buildings detected in the study area (fig. 4) have been then classified into three orders of suitability: high, medium and low. Specifically, 22 rural buildings fall in the high-suitability class (characterized by a high potential to be converted and recovered for tourism purposes), while 42 rural in medium class and 71 in low-suitability class (non-typical constructions, or far from valuable environmental and social components, or absence of infrastructures, *etc.*) were found.

Fig. 4: Rural dwellings examined in the study area

Finally, three larger rural constructions, having the minimum dimensional and architectural characteristics to be recovered as potential Management Center for a "*Scattered Hotel*" (fig. 5) – *i.e.*, a system based on accommodations typically spread throughout the countryside, where proprietors refurbish them, as short-term rentals for travelers - have been identified as well.

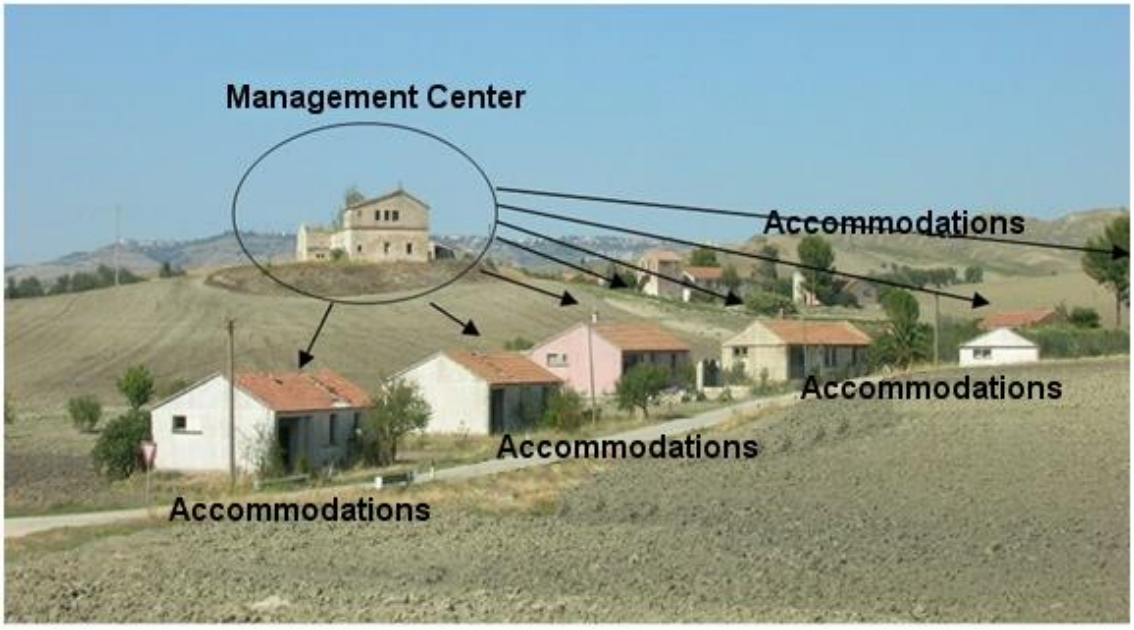

Fig. 5: Diffused rural hospitality (*"Scattered Hotel"*) system.

Discussion

The analysis which has been conducted would contribute to ensure:
- a recovery of abandoned rural buildings;
- the repopulation and rediscovery of inland rural landscapes and villages;
- new economic revenues and new jobs for landowners in marginal areas, by virtue of a new multifunctionality of farms;
- a new tool for enhancing the regional tourist offer;
- the strengthening of existing accommodation facilities;
- the valorization of the historical/environmental identity heritage of agriculture;
- a more effective land protection function.

The weaknesses of the intervention seem to be:
- difficulty in finding credit and/or financing for interventions to restore farm buildings and relevant infrastructures;
- difficulty in developing new forms of cooperation and associationism of farms;
- inability to use facilities for agricultural purposes at certain times of the year;
- current lack of suitable specific tools for planning the necessary interventions.

Conclusion

The creation of an analysis and planning tool aimed at the identification of interventions for the geographical location, organizational and procedural methodology and aesthetic/functional recovery of farm buildings and infrastructures is expected to significantly contribute to the rediscovery of new ways of experiencing rural tourism. It would also offer a decisive contribution to the positive development processes of degraded and abandoned agricultural areas, through new ways of public recreation in the rural landscape.

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Souhrn
Tento článek uvádí výsledky územní analýzy zemědělské oblasti v chráněné oáze "S. Giuliano" (provincie Matera - jižní Itálie), která je významná z historického a přírodního hlediska. Studie se zaměřila na soupis budov a souvisejících venkovských infrastruktur v oblasti, přestože jsou převážně ve stavu opuštěnosti, u nichž se však vzhledem k jejich vnitřním architektonicko-strukturálním atributům jeví jako proveditelná statická a funkční obnova. Analýza byla strukturována na základě GIS spojeného s podrobnými průzkumnými technikami a dendrochronologickou analýzou dřevěných konstrukčních prvků. Pro zajištění integrované konstrukční a architektonické kvality zaměřené na potvrzení kulturní identity při respektování symbolických, estetických a tradičních hodnot je třeba hledat a definovat určité vhodné technické normy pro obnovu venkovských staveb a infrastruktury. Taková místa, která se vyznačují definovanou identitou, lze obnovit tak, aby se posílila jejich vlastní výrazová síla, tvořená pravidly a stavebními prvky schopnými konotovat místa, materiály a tradiční techniky. Cíle, které by tato iniciativa mohla realizovat, lze vysledovat v následujících strategických liniích:
- podpořit vazbu mezi zemědělstvím, venkovem a společností, posílit jejich vztahy a poskytnout nezbytné záruky udržitelnosti;
- dále snižovat zaostalost zemědělských podniků v nejvíce znevýhodněných (zejména horských) oblastech;
- posílení a zvýšení zemědělsko-potravinářského potenciálu se zvláštním důrazem na kvalitní produkty, a to i prostřednictvím vhodných marketingových kampaní;
- podporovat součinnost mezi různými subjekty, a to jak na úrovni sdružení, tak na úrovni integrace dodavatelského řetězce, a upřednostňovat vytvoření "regionálního systému", a to i pro jednotlivé organizace producentů;
- podporovat a posilovat rozvoj zemědělských postupů šetrných k životnímu prostředí a v jejich rámci postupů prováděných ekologickými metodami, se zaměřením na několik důrazných opatření s prokázanou účinností z hlediska dopadu na životní prostředí;
- motivovat k produkci kvalitních a široce konzumovaných potravin (také zavedením specifických opatření na podporu sledovatelnosti produktů), aby si je spotřebitelé mohli koupit za přijatelnou cenu.
Závěrem lze říci, že vytvoření analytického a plánovacího nástroje pro identifikaci zásahů do geografické polohy, organizační a procesní metodiky a estetické/funkční obnovy zemědělských budov a infrastruktury může významně přispět ke znovuobjevení nového způsobu prožívání venkovského cestovního ruchu a odhalit jej jako příspěvek k procesům rozvoje degradovaných a opuštěných zemědělských oblastí.

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POSSIBILITIES AND ADVANTAGES OF INDIVIDUAL RECREATION IN THE TOPOĽČANY DISTRICT

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Abstract
The individual form of recreation and spending free time individually came to the fore during the COVID-19 pandemic. In the area – the Topoľčany district, there are several alternatives for individual recreation, which are provided by natural ecosystems, cultural-historical, sacral and architectural monuments. In research connection with the aesthetics of the landscape, they provide several opportunities for recreational activities: hiking and cycling, camping, fishing, swimming, observing plants and animals, the ever-expanding use of agrotourism in a rural environment. Locations with such a focus are part of the Regional Territorial System of Ecological Stability – 21 biocenters, 27 biocorridors and 41 ecostabilization elements with total area 18,271.25 ha. In recent years, in connection with recreation, the concept of "ecotourism" has come to the fore as a sustainable form of recreation based on natural wealth, primarily focused on experiences and the study of nature. It is associated with minimal waste production and almost no consumption, protects the landscape, the environment and biodiversity, improves the prosperity of local people and should be economically viable, ecologically sensitive, and culturally appropriate. The main aim of the contribution is to point out the possibilities of individual recreation for residents in the Topoľčany district with the criterion of ecotourism.

Key words: Ecotourism Individual free time Landscape protection Recreational activities

Introduction

We got used to an individual form of recreation during the COVID-19 pandemic, which was also associated with strict blocking measures and restrictions on the movement of people tied to the place of permanent residence. Staying in nature is associated with relaxation, regeneration of forces and experiential activities.

The natural environment becomes the focus of nature tourism, which is especially suitable for protected areas and is a form of sustainable tourism. It supports the harmony between natural, socioeconomic, and cultural conditions. In Anglo-Saxon literature, nature tourism or wildlife tourism is used for nature tourism. A common feature is getting to know nature and gaining new experiences and knowledge about living and non-living nature. It is also usually referred to by the term „green tourism“(Kurek et al. 2007). It is defined as a summary of tourist routes with the primary goal of visiting and learning about naturally valuable areas through activities that do not (or only minimally) disturb its integrity and character (Matlovičová et al. 2015). Terminologically, ecotourism is considered synonymous with nature tourism, while in this approach it loses an important cultural aspect. In 1996, the International Union for Conservation of Nature adopted the broader meaning of ecotourism as: ecologically responsible travel to areas that have not been transformed by humans with the aim of learning about nature and all the accompanying elements of culture (past and present), routes promoting nature conservation with minimal negative impact and helping development of the local community in socioeconomics (Ceballos-Lescuráin 1996). Ecotourism has many forms, there is an intersection of traditional tourism and ecological alternatives (Zaręba 2010), basically it is one of the forms of nature tourism. Nature tourism has a great potential in areas without the influence of mass tourism, as well as in less developed regions. It naturally creates conditions for the development of local communities and the preservation of their traditions and culture. It is based on a vision of long-term sustainability, the development of the territory is based on the principle of actively contributing to the preservation of natural and cultural heritage, with the involvement of local communities in planning the development of the given territory and interpreting the natural and cultural heritage for visitors (Koščová, Koščová 2013).

The main aim of the contribution is to point out the possibilities of individual recreation for residents in the Topoľčany district with the criterion of ecotourism.

Materials and methods

The research area is the Topoľčany district in the western part of Slovakia, administratively included in the Nitra self-governing region. In this district there are 53 municipalities and 1 with the status of town: Topoľčany (also a district town), as of 1 January 2022 total 24 804 inhabitants. The Topoľčany district has an area of 59 763.37 ha and as of 1 January 2022 it has 70 877 inhabitants with an average population density of 117.04 inhabitants per km^2 (http://datacube.statistics.sk/).

Within each the municipalities we focused on areas with the potential recreational use for residents. We used the processed documents within the Regional Territorial System of Ecological Stability (RTSES) of the Topoľčany district (Kočický et al. 2019). According to the RTSES creation methodology, recreational elements in the structure have the character of biocentres (supraregional and regional), biocorridors (supraregional and regional) and other ecostabilization elements (gene pool localities and ecologically important landscape segments). These elements were supplemented by small protected areas III. – V. degree of protection (zone A, B, C), Protected Landscape Area Ponitrie, NATURA 2000 sites and protected trees (circular sites with a radius of 10 m and an area of 314 m^2). In the environment of geographic information systems (GIS) in the QGIS 10.1 program, a polygon layer was processed with the occurrence of RTSES elements – their location within municipalities, calculated their area and share in the structure of the research area.

Results

The elements belonging to the RTSES of Topoľčany district (Kočický et al., 2019) with the potential recreational use include (Pic. 1) **2 supra-regional biocentres** Hrdovická (2380.33 ha) and Havran (1111.83 ha), **19 regional biocentres** in 35 municipalities of district mainly representing forest communities, which contribute to increasing ecological stability in a heavily urbanized and intensively agricultural landscape. The largest biocenters by area are Hontová (682.85 ha), Hraškove lúky meadows – Drža (614.94 ha) and Bear Hill (567.36 ha), the smallest biocenter is Oxbow of Nitra River (23.2 ha). Recreation options and the network of protected areas are complemented by **27 biocorridors** – 2 supra-regional (Nitra and Horňany rivers) and 25 regional (16 hydric and 11 terrestrial) as a part of the 40 municipalities. The longest biocorridor is the Nitra River (23.44 km) and Chotina stream (19.95 km). Territorial smaller are ecostabilization elements – gene pool localities – GL (6 in total) representing smaller territories with the occurrence of rare and protected species of flora and fauna, or rare plant communities, and ecologically significant landscape segments – ESLS (37 in total), which include rare natural habitats close to nature from the point of view of the protection of the gene pool and the territory with a balancing function (they dampen the negative consequences of human activity), by protecting important components of the country and the landscape system against negative degradation and destabilization processes (Ružička, Ružičková 1973).

Both GL and ESLS are mostly part of protected areas. In total, there are 6 nature reserves and 1 national nature reserve (4th and 5th level of protection), 4 protected areas (3rd level of protection) and 3 natural monuments (4th level of protection) in the district. ESLS mainly consists of preserved forest complexes, forest stands of soft alluvial forest, accompanying tree and shrub vegetation along water courses and areas, parks and historical parks, areas with a wetland character with admixture of woody soft alluvial forest, remnants of oxbow of the Nitra River, herbaceous and scrubland, water reservoirs and, in the city of Topoľčany, also areas of urban public green.

The Topoľčany district is locally connected with traditional forms of land use with a historical aspect. In addition to fields, the structure of the territory includes hop farms (34 ha), vineyards (248 ha), gardens (1462 ha), orchards (330 ha).

Residents of the district can use for individual recreation (sports tourism or cycling) mainly forest stands, for walks and cycling accompanying linear vegetation along the Nitra (including dead branches) and Bebrava rivers, water bodies – water reservoirs (6 in total) with a multi-purpose system uses – also recreational (swimming, fishing, hiking, and cycling). The most famous is Duchonka on the middle course of the Železnica stream with an area of approx. 60 ha (in the municipality of Prašice) with cottage settlements (49.1 ha). Individual recreation is complemented by recreational and sports facilities, gardening, and cottage settlements. Every village has football or multifunctional fields, gardening settlements are mainly located in the town of Topoľčany (8.5 ha) and the neighboring village of Tovarníky (5.6 ha).

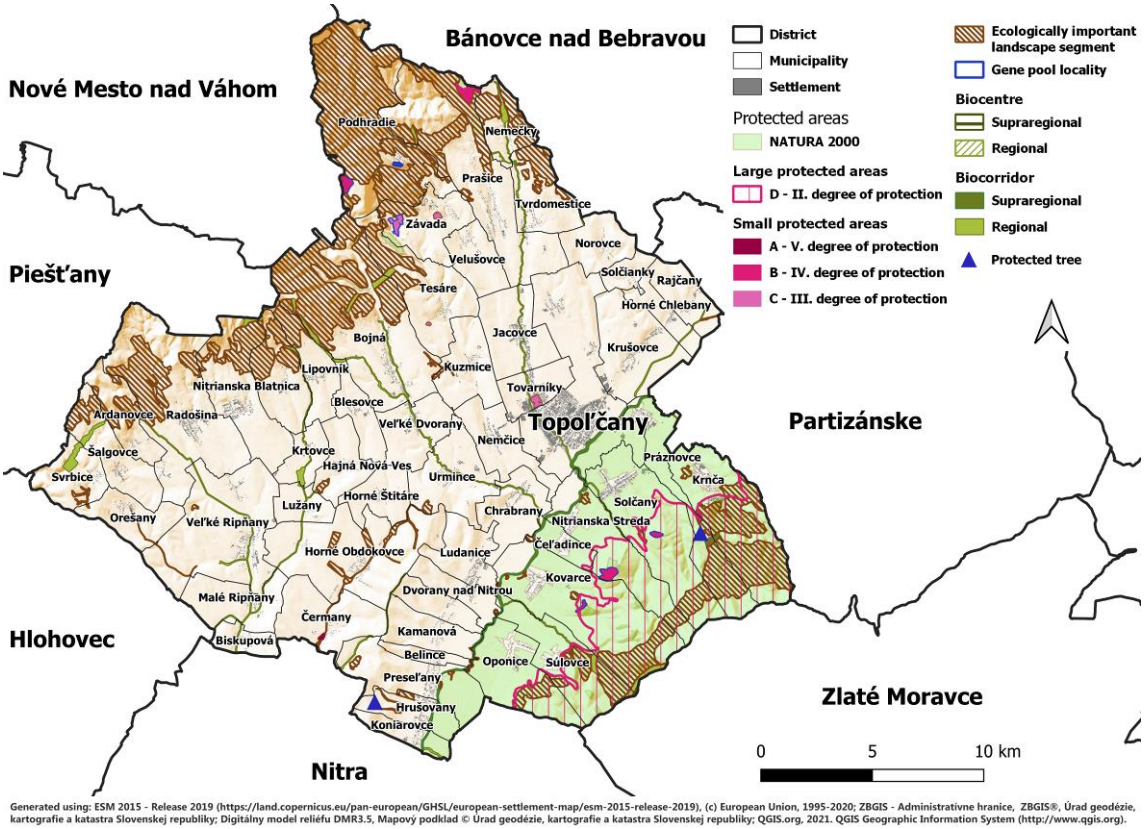

Fig. 1: Occurence of elements with potential recreational usage in Nitra District (Grežo, 2021)

Cultural-historical, archaeological and sacred objects also have recreational potential, e.g. castles and castle ruins (6 in total) – the most famous in the villages of Podhradie (Topoľčiansky Castle) and Oponice, the Bojná castle with the archaeological site of Valy and an archery range, castles and mansions (17 in total, of which 7 are national cultural monuments) – the most famous is the mansion in Oponice, churches and religious monuments (a total of 11, of which 10 are national cultural monuments), a ranch in Bojná village and a network of existing cycle paths – a total of 34 marked cycle paths with a length of 294 km (https://okres-topolcany.oma.sk/cykloatlas). There are also lookouts in two villages of the district – on Marhát in the village of Nitrianska Blatnica and on Panská Javorina in the village of Podhradie.

All types of protected areas have a total area of 18,271.25 ha (30.82%) in the Topoľčany district. There was no protected area in only two municipalities of the district (Velušovce, Nemčice), in 9 municipalities there is 1 type of protected area. The greatest diversity of protected areas is in the municipalities of Kovarce – 10, Nitrianska Streda – 9, Solčany – 9 and Podhradie – 7. The municipalities in which the share of protected areas from their total area is greater than 50% include: Podhradie (94.55%), Krnča (70.95%), Ardanovce (62.67%), Nemečky (62.27%), Bojná (58.98%), Súlovce (58.15%), Nitrianska Streda (57.86%), Solčany (56.47%), Práznovce (56.17%), Kovarce (55.81%). On the contrary, the smallest share of protected areas from the area of the municipality has: Belince (0.87%), Orešany (0.55%), Ludanice (0.46%), Horné Štitáre (0.07%). Municipalities with the smallest areas (up to 100 ha) and 1 type of protected area are Biskupová (10.28 ha), Blesovce (7.13 ha), Horné Štitáre (0.38 ha), Krtovce (30.18 ha), Kuzmice (13.85 ha), Lužany (12.85 ha), Solčianky (10.12 ha) and Veľké Dvorany (15.2 ha). As a regional or supra-regional biocorridor and parts of accompanying vegetation along waterways or oxbows are used for recreation in the municipalities Oponice (31.02 ha), Nitrianska Streda (66.35 ha), Hrušovany (13.97 ha), Koniarovce (11.64 ha) and Topoľčany (63.52 ha).

Discussion and conclusion

For the regeneration of physical and mental strength during the week (year), the environment tied to permanent residence or border of the district is mainly used, as well as for active leisure time in the natural environment. For this are used well-known localities of a natural character, but also new ones, or lesser-known localities. Continuous forest stands, smaller woods, dams of the Nitra, Chotina, Hlavinka waterways or the banks of water bodies can be used for hiking or cycling. The dominant

geomorphological unit in the territory of the Topoľčany district is the Danube Upland bordered by a pair of mountains – Považský Inovec in the west and Tribeč in the east.
All types of protected areas occupy 30.82% of the Topoľčany district. Except for 2 municipalities, there was at least 1 type of protected area in the other municipalities of the district. Potentially can be at risk from the point of view of visitors' sites that are part of the PLA Ponitrie (15 sites) and their protection zones (the 4th level of protection – 8 sites, the 3rd level – 1 site), NATURA 2000 sites (total of 9).
In case of increased concentration of people, conflicts may occur between different types of recreational visitors (e.g., hikers, mountain bikers and equestrians), between motorized and non-motorized users, and between visitors with different social norms and arrangements (e.g., group size and commercially run groups) and ethics (e.g., noise levels and waste disposal). High levels of traffic may reduce the quality of the visitor experience for those seeking solitude or whose use of the natural area conflicts with others (Shin et al. 2010).
The concept of "sustainability" has been resonating in the international environment for several decades, but in Slovakia it has so far only received marginal or theoretical attention in the development of tourism. The spectrum of activities carried out in nature tourism is wide, its development is less investment-intensive, less developed areas have the potential to appeal to visitors, in this case rural municipalities with potential for the development of nature tourism. Nature tourism means much more than just spending time in nature. Its key difference and feature is that it must also directly contribute to the improvement of nature protection, biodiversity, and the landscape in two ways – by developing programs and products supporting and increasing environmental awareness and by directly using the generated part of tourism income to care for this natural and cultural heritage (https://rabbsk.dobrykraj.sk/).
From the processed documents for the RTSES of the Topoľčany district results that there is at least one protected area and locality with potential recreational use in 52 municipalities. In total, the residents of the district (a total of 70,877 inhabitants) have 18,271.25 ha of protected areas at their disposal. That is 0.2578 ha (2578 m2) per inhabitant. Therefore, it would be interesting to determine the carrying capacity of protected areas for tourists according to the selected methodology. Determining the recreational carrying capacity is one of the management tools of recreational areas, which is based on knowing the preferences of the recreational user and providing quality experiences in nature while protecting the natural environment (Sayan, Atik 2011). Outdoor public infrastructure, including parks, hiking, and biking trails, is one of the few low-risk spaces that individuals have easy access to outside their homes (Doubleday et al. 2021). However, many of them belong to the system of protected areas with different degrees of protection, which should be preserved.

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Souhrn
Cílem příspěvku je poukázat na možnosti individuální rekreace obyvatel okresu Topoľčany, která splňuje podmínky přírodního cestovního ruchu. V obcích byly vytipovány plochy s potenciálním rekreačním využitím s využitím zpracovaných podkladů v rámci Regionálního územního systému ekologické stability (RÚSES) okresu Topoľčany (Kočický a kol. 2019). Prvky náležející do RÚSES s potenciálním rekreačním využitím zahrnují biocentra - 2 nadregionálního a 19 regionálního významu v 35 obcích okresu, 27 biokoridorů - 2 nadregionální a 25 regionálních (16 hydrických a 11 terestrických), které jsou součástí k.ú. Topoľčany. 40 obcí. Rozlohou menší jsou tzv. ekostabilizační prvky - genofondové lokality - GL (celkem 6) a ekologicky významné segmenty krajiny - EVKS (celkem 37). Obyvatelé okresu mají možnost využívat především lesní plochy k individuální rekreaci (sportovní turistika nebo cykloturistika), doprovodnou liniovou zeleň podél vodních toků Nitra (včetně mrtvých ramen) a Bebrava, vodní plochy - vodní nádrže (celkem 6) s víceúčelovým systémem využití - i rekreačním (koupání, rybaření, pěší turistika a cykloturistika) k vycházkám a cykloturistice. Individuální rekreaci doplňují rekreační a sportovní areály (fotbalové či multifunkční hřiště), zahrádkářské a chatové osady (zejména ve městě Topoľčany a sousední obci Tovarníky). Rekreační potenciál mají i kulturně-historické, archeologické a sakrální objekty, např. hrady a zříceniny hradů (celkem 6) - nejznámější v obcích Podhradie (hrad Topoľčany) a Oponice, hrad Bojná s archeologickým nalezištěm Valy a areálem lukostřelby, hrady a zámky (celkem 17), hrad Bojná s archeologickým nalezištěm Valy a areálem lukostřelby, z toho 7 národních kulturních památek) - nejznámější je zámek v Oponicích, kostely a sakrální památky (celkem 11, z toho 10 národních kulturních památek), ranč v Bojné a síť stávajících cyklotras (34 značených v délce 294 km. Ve dvou obcích okresu jsou také rozhledny - na Marhaté v obci Nitrianska Blatnica a na Panské Javorině v obci Podhradie. Z rozlohy okresu Topoľčany připadá na všechny typy chráněných území celkem 18 271,25 ha (30,82 %), tj. 0,2578 ha (2578 m2) na jednoho obyvatele. Řada z nich však patří do soustavy chráněných území s různým stupněm ochrany, která by měla být zachována.

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POSIBILITIES OF RECREATION IN HNILEC RIVER BASIN FROM CLIMATOLOGICAL POINT OF VIEW

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Abstract
Climate change affects the hydrological regime of the Palcmanská Maša water reservoir and the use of the water surface for recreational purposes. Within the contribution, climatological variables were analyzed, namely precipitation, temperatures and flows in the sub-basin above Stratená station in the Hnilec river basin. The results document the possibilities of recreational use of the given area.

Key words: Hnilec, climate parameters, recreation

Introduction

Climate change is already happening. I observe increased daily average temperatures, lack of water. The assessment of low flows is necessary from the point of view of water management (Junáková et al., 2020). The lack of water affects the use of the territory for recreational purposes. First, you need to define what low flow is. Low flow is between Quantile Q70 – Q90 (Smakhtin, V. U., 2001). In this study, we evaluated very low flows that did not exceed the Q20 value. Which is a very small value that we characterize as dry periods. In the recent period, the occurrence of dry periods is becoming more frequent, which affects agriculture, forestry, water management, but also nature protection and recreation (Zeleňáková, et al., 2018).

Materials and methods

Study area and data

The studied territory is located in eastern Slovakia. The Hnilca basin belongs to the Hornád basin. The Hornád River belongs to the Danube River basin. The greater part of the studied territory is located in the Slovak Paradise, which is used for recreational purposes. The Palcmanská Maša reservoir was built on the upper course of the Hnilec river. The purpose of the reservoir is to accumulate water to ensure the supply to the hydroelectric power plant in Dobšina, to balance the flows of the Hnilec and for recreational use (Mazúr, E., Lukniš, M., 2002)

In the given basin, flows were evaluated in two water measuring stations: Jaklovce and Stratená for the period 1961-2020. Sub-basins were created according to the hydrological stations, and to the given basins are area air temperatures and area precipitation. Data provided by SHMU.

Methods

The Q20 quantile for daily flows was calculated using the R programming language in the R studio program using the Stats package. The fifth type of quantile calculation was used. Based on the calculated quantile, all daily flows whose value was less than Q20 were separated. Based on these values, the days of the year that did not exceed this value were calculated. Next, a linear trend was used, with which we found out whether the given days are increasing or decreasing. (Hyndman, R. J., Fan, Y., 1996).

Results

The evaluation of the flows showed us that the daily flows, which do not exceed the value of Q20, increase in number of days. The most days where flows did not exceed the given value were in the period from 1985 to 2008 Figure 2.

On Figure 3, daily precipitation for the period 1961-2020 is evaluated, a slight increase in precipitation is observed.

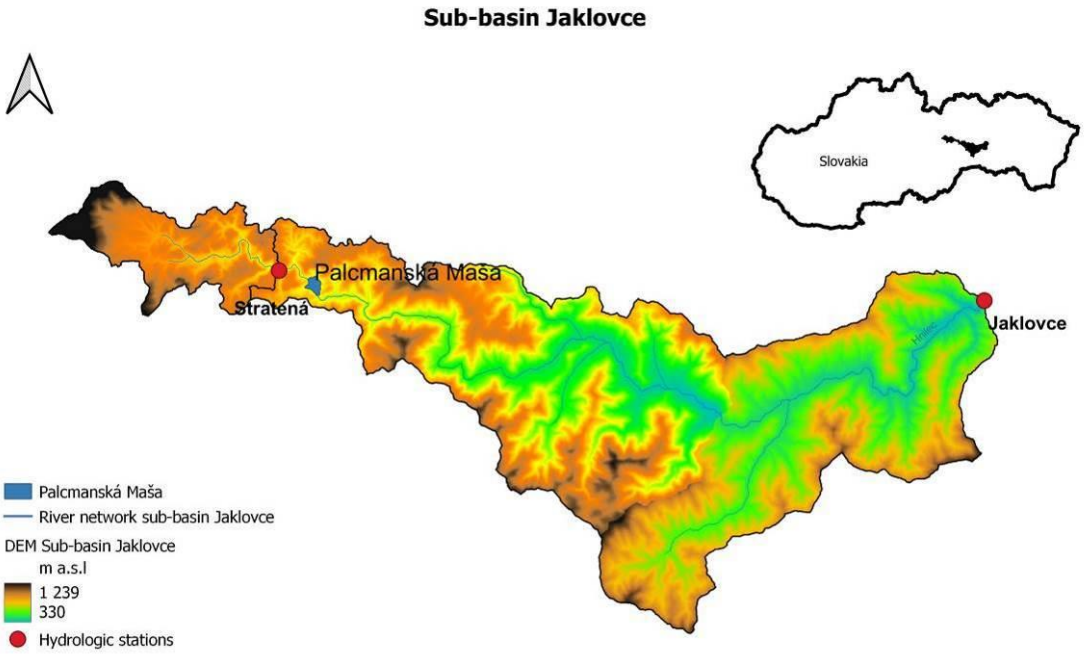
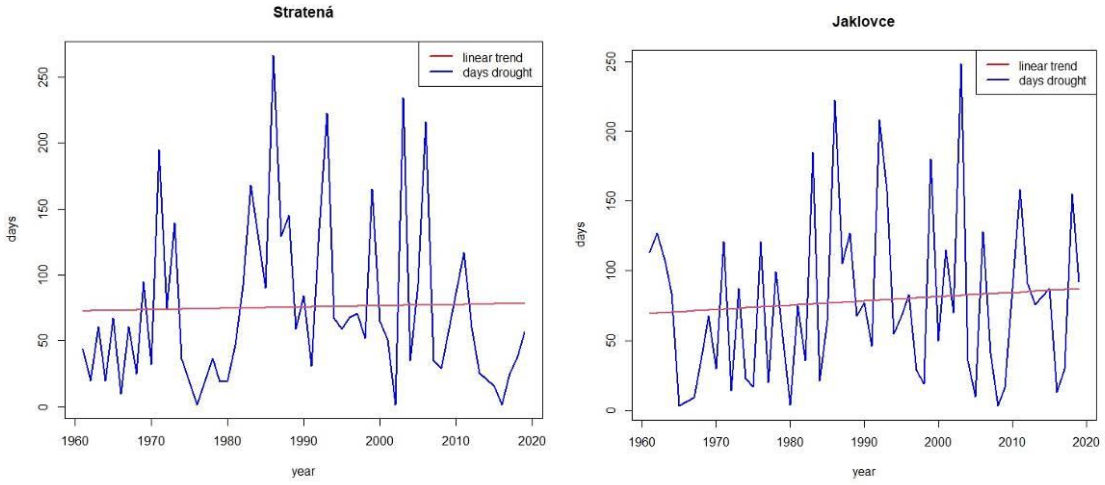
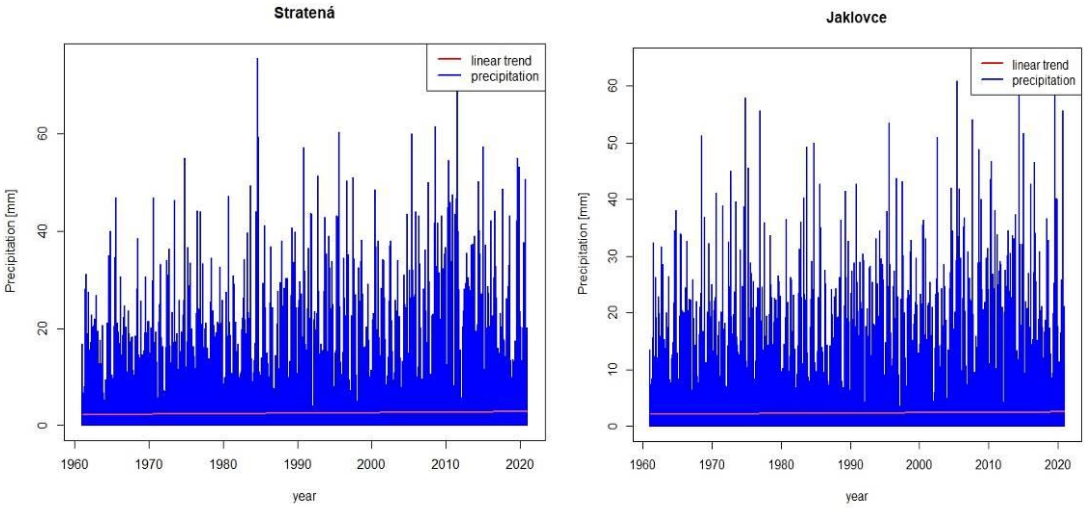


Fig.1: Basin Hnilec



a, b,

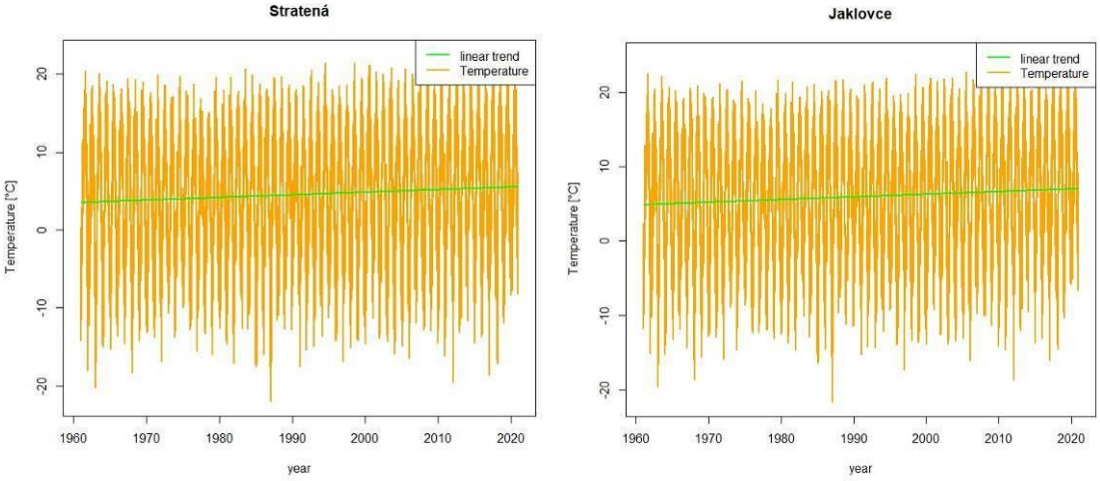
Fig. 2: a, station Stratena b,station Jaklovce dayly dry period



a, b,

Fig. 3: Daily precipitation a, station Stratená b, station Jaklovce

Daily average air temperatures have increased over the observation period 1961-2020.



a, b,

Fig. 4: Daily precipitation a, station Stratená b, station Jaklovce

The results show that there are more days in the year where the daily flows do not exceed the Q20 value. In some years, the number of days where daily flows did not exceed this value was more than 200 days. our precipitation has slightly increased, but the daily average temperature has increased, which results in higher evaporation from the given area.

Discussion

Climate change has an impact on water inflows to the Palcmanská Maša water reservoir, which is also used for recreational purposes. The decrease in flows affects the volume of water in the reservoirs and the lack of water by limiting the use of the reservoir for recreational purposes such as fishing, swimming and boating. This study can be used to adjust the operating procedure of the water tank.

Conclusion

Climate change impact on recreational use of Palcmanská Maša. It is necessary to propose adaptation measures for better retention of water in the reservoir as well as in the surroundings. An increase in the daily average temperature results in greater interest in outdoor recreation. The Hnilec basin area has great potential for recreational use of the area, from hiking in the Slovak paradise, fishing in the reservoir or evening walks by the lake.

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Souhrn
Vliv změny klimatu na rekreační využití Palcmanské Maši. Je nutné navrhnout adaptační opatření pro lepší zadržování vody v nádrži i v okolí. Nárůst průměrné denní teploty má za následek větší zájem o venkovní rekreaci. Oblast povodí Hnilce má velký potenciál pro rekreační využití oblasti, od turistiky ve Slovenském Ráji, rybaření v přehradě nebo večerních procházek u jezera.

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POSSIBILITIES OF USING NEW TECHNOLOGIES IN CULTURAL TOURISM IN THE POST COVID ERA

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Abstract
The study *"Possibilities of using new technologies in cultural tourism in the post-Covid era"* deals with the analysis of different ways of using IT technologies in cultural tourism with a special focus on the effects of Covid19. As part of the study, the method of literary research was chosen, enabling the analysis of the possibilities of using new technologies, including the assessment of their potential. Based on the study, it was confirmed that the potential for the use of new technologies in the field of cultural tourism is diverse. Due to the impact of Covid19 on global tourism, a massive development of digitization in the cultural tourism sector can be expected. The use of new technologies in cultural tourism could help make tourism accessible to a wider range of users. Based on the results, it can be concluded that the direction of the development of new technologies is influenced not only by the creators of IT technologies, but also by the demand from users and their IT skills.

Key words: Innovative, Tools, Information, IT, Big data

Introduction

New technologies represent a wide range of information technologies that can be used in the field of tourism. The development of new technologies has a significant impact on the cultural tourism sector and their potential has increased during the Covid19 epidemic, when restrictions have reduced global tourism. According to the World Travel and Tourism Council (WTTC, 2020), tourism accounted for 10.4 % of world GDP and for 334 million jobs worldwide in 2019. As a result of the Covid epidemic, global GDP fell by half to 5.5 % in 2020 and 18.5 % of jobs were lost to 272 million. Furthermore, due to restrictions on travel opportunities, there was a significant worldwide decrease in tourism expenditure by 45 % for domestic visitors and by 69.4 % for foreign visitors. Restrictions associated with Covid19 have affected cultural tourism, especially in connection with visits to cultural monuments (museums, castles, chateaux, etc.) that were closed during the state of emergency. According to United Nations Educational, Scientific and Cultural Organization (UNESCO, 2020) 90 % of museums worldwide were closed for a transitional period during Covid19-related restrictions in 2020 and it is estimated that up to 10 % of museums do not have to reopen. At the same time, these museums are less resilient to the effects of the crisis due to lower digitization rates. The effects of the crisis have increased the use of digitization, but UNESCO estimates that only 28 % of European museums have staff with digital expertise and only half of the institutions devote more than 10 % of the budget to digitization and communication. The use of new technologies in cultural tourism is closely related to the level of use of digitization.

With the development of science and research, big data about tourism participants is increasingly being used. According to Perez and Quintans (2019), big data can be defined as *"a set of data that is at a high level in terms of content, variety and speed of data, which is not processed by traditional methods".* For this reason, it would be advisable to use new technologies to simplify the process of data collection and analysis, unify metrics and provide current data that can be used in solving current problems. Big data captures the digital footprint of users. According to Naeem. et al. (2022) among the most important sources of big data are data from communication systems, global network, data generated by business processes, sensor data and sharing data.

Materials and method

In the form of a literature search, information was collected that deals with the topic of modern technologies and the possibilities of their use in the framework of cultural tourism. According to Krčál (2017), literary research can be defined as *"a written document that contains essential points of current scientific knowledge (theoretical and methodological), which is related to a specific topic".* As part of the research, the method of systematic research was used, which can be characterized as a systematic method used to identify and evaluate the results obtained from relevant sources. A comparative method was used to evaluate the data obtained through literature research. According to Lorenc (2013), the comparative method can be defined as *"the basic method used in the evaluation of*

two or more phenomena". As part of the study, the comparative method was used to compare individual ways of using modern technologies in cultural tourism.

Results

Based on this study, the possibilities of using modern technologies in the tourism industry include the use of big data for:

1) Capturing the movement of tourism participants

According to McKitrick et al. (2022), through the billions of active social network users worldwide, spatial data generated in a geographic information system (GIS) format can be used for scientific research. Within GIS, big data can be used, which can be used in the tourism industry. Tourism takes place in specific areas (tourist destinations) that have unique characteristics in GIS that distinguish them from their surroundings. The range of GIS applications is wide ranging from route planning to various types of analysis that can be used by tourism providers and participants.

2) Profiling the behavior of tourism participants

Currently, an increase in demand for specific forms of cultural tourism can be expected, which can be adapted to the psychological needs of tourists based on big data analysis. The information that can be found based on the analysis of big data sources can be used in the planning of activities related to cultural tourism. According to research by Sahebi et al. (2022), service operators in the tourism industry can use big data analysis both to verify the potential of new products, but also to evaluate customer feedback and satisfaction with already implemented products or services. Based on research by Mele et al. (2022) found differences in the understanding of culture in different countries and that universal advertising aimed at a broad spectrum is not as effective as specific advertising aimed at a specific target group. This knowledge can be used in the creation of advertising on social networks aimed at specific target groups, whose characteristics must be determined and analyzed in advance in order for the advertising to be effective.

3) Measuring tourists' satisfaction with visiting a destination

According to Chang et al. (2022), big data can be used as a tool to analyze the perceptions of tourism participants, which can help to better understand their behavior and needs. According to (Lopes et. Al. 2022), tourists' satisfaction with visiting a destination plays a key role in the destination decision-making process. Through digital technologies, it is possible to share visit experiences, including texts, photos, videos, with a wide range of IT technology users through websites, social networks. This makes it possible to raise awareness of the cultural attractions in the tourist destination. Based on the Cuomo study. et al. (2021) it was confirmed that the sharing of photos, videos and posts on social networks has a massive impact on readers, which can be used to effectively promote a tourist destination through the promotion of influencers. According to Coves-Martinez et al. (2022) results show that the level of cultural intelligence is directly related to the way of perceived satisfaction with travel applications. The higher the level of cultural intelligence, the higher the motivation, flexibility and adaptability of users when using applications.

4) Monitoring the costs of visiting the destination

According to the Global Digital Yearbook (Digital 2020), smartphone users accounted for more than half of the world's population in 2020. Mobile applications in the tourism industry offer a wide range of uses, from the possibility of providing complete travel agency services to the provision of individual services: transport (Lufthansa, Uber: tickets, bus, train, taxi), accommodation (Booking, Airbnb), catering and leisure activities (Tripadvisor), travel guides (Lonely planet), translators (Google translator) and map geolocators (Google maps). Data obtained from mobile application providers could be used to monitor costs associated with visiting a tourist destination. However, it is necessary to ensure the protection of the privacy of their users.

5) Support for connecting tourism participants

According to Tang (2022), the popularity of self-help tourism has recently been growing, in which tourists can use freely available data that provide them with information about the possibilities of visiting interesting tourist destinations in the researched location. The integration of online and offline resources and the possibility of using big data will be essential for the future development of sustainable rural tourism, providing more opportunities for tourism operators and users for meaningful and sustainable cultural tourism.

6) Prediction of visitors behavior
Based on research by Kalvet et al. (2020), big data can be used as a key source for configuring the tourist experience. In the process of deciding to visit a destination, tourists have the opportunity to use a wide range of information that is available online. Whether it's about offering culture, tourist experiences or sharing photos, videos and articles about the destination. According to Bizirgianni and Dionysopoulou (2013) since 2010, social media have played an increasingly important role in promoting cultural tourism especially among young users (16-29 years). This data can be characterized as big social data that is available online through popular social networks such as Instagram, Facebook, YouTube, Twitter, Internet blogs and discussion forums. Through online interaction in discussions and reviews, tourists actively participate in the process of co-designing travel experiences.

7) The use of digital technologies in the indirect mediation of culture
According to Richards (2018) the development of new technologies offers opportunities to consume culture indirectly in the form of images, videos and sounds using appropriate technologies almost anywhere in the world. While some cultural services: music, films, musicals are protected by copyright, most of the intellectual property contained in creative products is highly mobile and difficult to protect. According to Çakici, Yildirim (2022), the growing importance of digitization, which enables tourists to provide the widest possible cultural opportunities, is related to this. The use of digital technologies can have a positive impact on increasing competitiveness in the tourism industry. Through the digitization of archival materials, the collections of museums and cultural performances preserve cultural heritage and ensure accessibility to a wide spectrum of the population.

Discussion
According to Richards (2018) the need for up-to-date data continues to grow, as do the possibilities of obtaining and using it. The lack of data can also appear problematic in the case of cultural tourism. According to Kalvet et al. (2020) the sensitivity of personal data, including privacy, may be an issue when using this data. The potential is primarily data freely available from social networks, web searches and website visits. GIS data containing the location of social network users appears as a promising alternative to the localization of tourism participants. The use of new technologies appears as an alternative to the traditional methods of obtaining data (national statistics, questionnaires, individual interviews). According to Coves-Martinez et al. (2022) differences in the cultural intelligence of users of tourism applications may be a barrier to their use. For that reason, in the future, the way and frequency of using modern technologies in cultural tourism will be closely related to the ability and interest of users to use them.

Conclusion
Based on the results of the study, it was found that the potential for the use of new technologies in the field of cultural tourism is diverse. The use of new technologies in cultural tourism could help make tourism accessible to a wider range of users. The direction of development and use of new technologies is influenced not only by the creators of IT technologies, but also by the demand from users and their IT skills. What will be the direction of the development of new technologies in cultural tourism can only be estimated, but due to the effects of Covid19 on tourism, a significant development of digitization in the cultural tourism sector can be expected.

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Souhrn
Studie *„Možnosti využití nových technologií v kulturním cestovním ruchu v post Covidové éře“* se zabývá analýzou odlišných způsobů využití IT technologií v kulturním cestovním ruchu se zvláštním zaměřením na dopady Covid19 na cestovní ruch. V rámci studie byla zvolena metoda literární rešerše umožňující analýzu možností využití nových technologií, včetně posouzení jejich potenciálu. Na základě studie se potvrdilo, že potenciál pro využití nových technologií v oblasti kulturní turistiky je různorodý. Vzhledem k dopadu Covid19 na globální cestovní ruch lze očekávat masivní rozvoj digitalizace v sektoru kulturní turistiky. Využití nových technologií v kulturní turistice by mohlo pomoci zpřístupnit cestovní ruch širšímu okruhu uživatelů. Na základě výsledků lze konstatovat, že směr vývoje nových technologií ovlivňují nejen tvůrci IT technologií, ale také poptávka ze strany uživatelů a jejich IT dovednosti.

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PROBLEMS OF RURAL LANDSCAPE‘S PROTECTION VS ANTHROPOPRESSURE AND RECREATION MOVEMENT - THE EXAMPLE OF THE NATURE RESERVE "STAWY RASZYŃSKIE" NEAR WARSAW

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Abstract
The paper refers to a case study of the nature reserve "Stawy Raszyńskie", with surrounding areas featuring broad natural and cultural values. Together with its buffer zone, it's one of the most valuable natural parts of Warsaw's Protected Landscape Area (Poland), being under the management of I.T.-P. - the Institute of Technology and Life Sciences in Falenty (Polish Ministry of Agriculture). The legal protection includes a wetland biotope - a rich ecosystem for waterfowl, marsh birds and many species of plants and animals (a system of several ponds with adjacent areas - a buffer zone of approx. 100 ha). For many reasons, existing precautions are inadequate, leading to the steady degradation of the site. Concerning the protection of opened landscapes, the publication aims to present the problems and possible solutions related to the valuable natural landscape of the rural regions exposed to strong anthropopressure.
In recent years, the social importance of these legally protected open areas of outstanding natural, landscape and cultural significance has been increasing due to the progressing intensive urbanization of the southern suburbs of Warsaw. In the case of such anthropogenic (human-transformed) ecosystems, the authors wonder whether achieving a certain balance between the objectives of nature and landscape protection and social needs in the future is possible. One of the best options is to perform specific natural self-regulation - while shaping the landscape and maintaining pervasive agriculture for educational and demonstration purposes; the controlled admission of sustainable tourism and recreation is possible - which, left without any surveillance, may lead to the devastation of these valuable areas.

Key words: Anthtopopression, open landscape protection, urbanization, rural landscape, recreation movement, woodlots, views' protection

Introduction

Nature conservation in the 21st century is a highly complex and multi-faceted problem that goes beyond the scope of this publication. The growing social costs resulting from the civilizational attitude towards exploiting the environment must eventually transform into a more sustainable social life, respecting nature and other beings. Thus, it seems that we are currently witnessing a slow transition to the era of the "Symbiocene" - the opposite of the "Anthropocene". However, this requires a huge mental change on a mass scale, which happens very gradually.

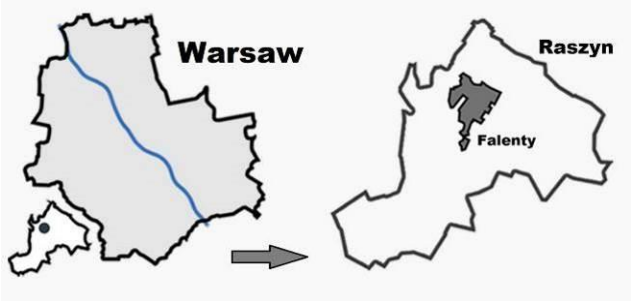

Fig. 1: Location of the study area - the "Raszyn's Ponds" Nature Reserve with its buffer zone within the boundaries of the rural commune of Raszyn, near Warsaw. Eds.: Authors, 2022.

In Poland, the landscape of rural areas is subject to a robust anthropogenic transformation in places, bringing irreversible and often adverse effects. **The research aims** to show selected problems of open landscape protection on the example of a case study of the areas around the "Raszyn's Ponds" (Stawy Raszyńskie) Nature Reserve, which nicely illustrates the phenomena above. The reserve is located in the rural commune of Raszyn - but close to Warsaw [Fig. 1]. Forecasts from half a century ago predicted that the city would surround this reserve, and its ecological and social importance would

significantly increase due to the urbanization of the surrounding areas and better transport accessibility. We are dealing with the culmination of these processes today.

The "Raszyn's Ponds" Natural Reserve was established in the mid-1970s. Even then, the area was covered by specific bans to protect the natural values, especially the fauna (birds, amphibians, insects). The "Raszyn's Ponds" Faunistic Nature Reserve is a priceless area of living wild nature, constituting a rich ecosystem of wetlands essential for waterfowl, marsh birds and many species of plants and animals, and of great climatic and hydrological importance [Ramsar]. It consists of several ponds with adjacent areas (lagging). It is one of the most valuable natural parts of the Warsaw Protected Landscape Area, within a radius of many kilometers in the suburbs of Warsaw [RDOŚ, 2021]. An essential factor in maintaining the reserve was the extensive fishing economy - ecological carp farming, which is now profitable and effective (results of the I.T.-P. study of 2014). The area of the Natural Reserve has great landscape values - natural, still undisturbed interior scenery and views referring to the style of an English park [Fig. 2.].

Fig. 2: Ponds in Falnety, in Raszyn Commune - the scenery of the English park;
Fig. 3: The palace in Falenty. Photo. J. Łukaszkiewicz, 07 2021.

Since the 1990s, the reserve and its buffer zone areas - being the communal property of the Raszyn Commune - have been in perpetual use by I.T.-P. (Institute of Technology and Life Sciences in Falenty) in connection with its scientific activity. Fish farming and the development of a complex system of fish ponds carried out for over 200 years have become the factor that has the most significant impact on the physiognomy and natural values of the local cultural landscape.

The tourist attractiveness of this region, apart from the natural values, results from the exciting history of these areas. There are remains of a palace and park complex (beginnings as early as in the 17th century), near which the well-known Polish sculptor Magdalena Abakanowicz was born at the beginning of the 20th century [Fig. 3.]. The landscape around of the Raszyn's ponds has been immortalized in the paintings of Wojciech and Jerzy Kossak and the writings of Stefan Żeromski. It is where an important battle of the Napoleonic era took place on April 19, 1809 [Fig. 4. and 5.].

Fig. 4: The battle of Raszyn - the Polish troops of the Duchy of Warsaw led by Prince Józef Poniatowski repelling the Austrian attack, April 19, 1809. Painted by Wojciech Kossak, 1913 [Wikimedia]

Fig. 5: The present state of the former battlefield captured in the painting by Wojciech Kossak in 1913 -. Photo. J. Łukaszkiewicz, 04 2022.

Material and methods

Since 2018, the authors have conducted regular, annual observations of the area within the boundaries administered by I.T.-P. (Institute of Technology and Life Sciences in Falenty). Since 2022, research has been carried out in cooperation with SKOF (Social Committee for the Protection of Falenty) - an independent, apolitical, open civic organization to preserve the values of The "Raszyn's Ponds" Natural Reserve. Field research includes, in particular, the registration of scenic connections, environmental monitoring, and monitoring of traffic and tourist use. An assessment of anthropopressure factors that threaten the site's natural and cultural values is being carried out, taking into account internal and external conditions.

As part of the studies carried out annually for five years under the direction of the authors, variant scenarios for the development and protection of the areas of the Natural Reserve and its vicinity are created. They have the character of landscape studies made on maps on the scale of 1:5000, with particular emphasis on nature protection, the possibility of introducing mid-field and waterside plantations, shaping landscape scenery, emphasizing the direction of tourist traffic, and others. Additionally, visualizations, cross-sections of the landscape and model solutions for midfield woodlots are developed as additional studies.

Results

Based on the research results, it can be concluded that the legal protection of The "Raszyn's Ponds" Natural Reserve does not, unfortunately, prevent significant adverse changes in the natural environment. One of the critical factors was the cessation of carp breeding in 2016, a kind of symbiosis between man and nature, ending this region's more than 200-year-old cultural tradition. Abandonment of fish farming calls into question the purpose of reserve protection, which is the protection of biotopes - more and more valuable every decade. Lack of breeding can directly limit the food base of piscivorous birds. Resignation from mowing rushes or collecting too little water in reservoirs may intensify succession processes, gradually reducing the water table and worsening the habitat conditions of many animals. Scientists have long emphasized that the most important cause of species extinction today is the loss of habitats [S.K.O.F., 2023].

Another threat to the protection of these areas is anthropogenic pressure. Anthropopressure is currently growing due to the construction boom in the surrounding areas. Several thousand apartments are being built here, mainly in terraced houses and low-rise multi-storey buildings. The conditions of the Covid-19 pandemic have increased tourist traffic in the Reserve. Regarding that fact, there is a lack of sufficient infrastructure that I.T.-P. should provide in the form of providing car parks, fencing off-field roads leading to the Reserve, setting up garbage containers, information boards and others.

There is also a clear threat to the integrity of the reserve area, which is the trend of disposal of invaluable natural areas by I.T.-P., which are the communal property of the Raszyn Commune only in perpetual usufruct of the Institute in connection with its scientific activity. These actions are protested against and blocked by local social organizations [S.K.O.F., 2023].

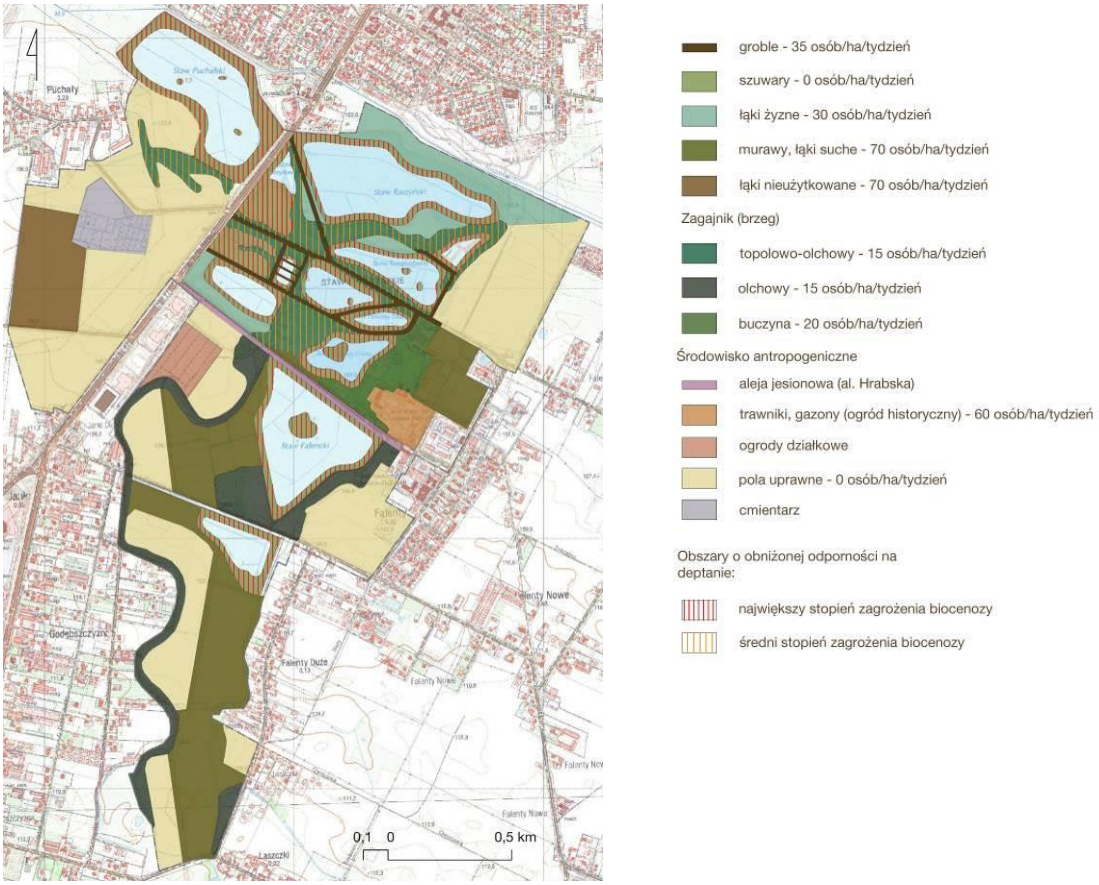

Fig. 6: Delimitation of the natural recreational absorption of the areas around The "Raszyn's Ponds" Natural Reserve, depending on the form of development. Eds.: Authors, 2022.

As a result of the research, it was found that the intensity of recreational attendance in the areas around the Reserve (especially on non-working days and in good weather) significantly exceeds the permissible thresholds of natural recreational absorption (max. 70 people/ha/week), consequently resulting in their natural degradation [Fig. 6.]. As a consequence, apart from the passive formal protection of the reserve areas, active protection is also necessary. This goal can be achieved by creating three primary functional and spatial zones with different purposes:

Zone 1. - external (buffer), not continuous ("mosaic pattern") in the form of scattered selected areas located on the outskirts of the buffer zone of the Reserve, close to the main directions of recreational flow (car, bicycle, pedestrian traffic). The proposed intensive recreation and leisure program must be adapted to the natural and cultural conditions of the study area, ensuring periodic high recreational absorption. The zone is designed to relieve the buffer zone and the interior of the Reserve from excessive recreational traffic. The natural and technical investment in this zone assumes the introduction of places for parking cars, sanitary facilities and places optimalfor various people and social groups for games, play, leisure of a free choice, such as picnicking, physical games, etc.

Zone 2. - the buffer zone of the natural Reserve is distinguished by high natural and humanistic values with minimal technical investment. An important function is assigned to intentionally shaped mid-field woodlots, model crops, orchards, apiaries and grasslands, enriching the ecosystem and shaping scenic scenery. Technical equipment includes the auxiliary form of gazebos and benches, along with the optimal number of roads and paths. This area should be used for general environmental education and shaping the ecological culture of people and social groups visiting it. It would include a training ground for popularising ecological knowledge by schools and universities among students and all users.

Zone 3 - the area of a strict reserve with a compact and dominant surface concerning zones 1 and 2, without the possibility of mass recreation. It is a sanctuary for birds and animals - the most valuable natural part of the local landscape requiring complete protection.

Discussion

The "Raszyn's Ponds" Natural Reserve case study illustrates a broader problem of shaping and protecting the open landscape of rural areas in Poland and beyond. There are new challenges and

related opportunities and threats. Currently, society is looking for new spaces for tourism and recreation. It can be ensured by cultural landscapes - mainly rural landscapes - primarily located on the outskirts of cities, in areas with high natural and cultural values, present a tourist attractiveness, and still have relatively high actual and potential values. However, the problem arises of how to designate and arrange tourism space in the rural landscape not to initiate natural, social, economic and aesthetic dysfunctions [Bartman and Bartman, 1996].

The above issue is also related to the progressive blurring of the classical, dual form: city-village, progressing in urbanized zones. Despite all connections and interdependencies, it usually leads to a significant disintegration of the landscape, in which development elements have different functions, forms and standards right next to each other [Bogdanowski, et al., 1979]. New spatial structures and new landforms are created, in which the functions and forms of the city and the countryside appear right next to each other in a mix.

The presented case study of the "Raszyn's Ponds" Natural Reserve shows that alongside the objectives of nature and landscape protection, social needs of recreation must be provided. One of the best options is to achieve specific natural self-regulation based on so-called "re-wilding". While shaping the landscape and maintaining pervasive economic use (agriculture, breeding) for educational and demonstration purposes, the controlled admission of sustainable tourism and recreation is possible - which, left without any control, may lead to the devastation of these valuable areas. Active landscape cultivation must supplement passive protection (Reserve) [Bartman and Bartman, 1996]. Especially in the areas of intense anthropogenic pressure, the lack of sustainable maintenance and protection of the landscape may have led to the destabilization of the ecological system (e.g. expansion of invasive plant species etc.) [Fortuna-Antoszkiewicz, et al. 2018].

Conclusion

The results obtained during the research allow the following conclusions to be drawn:

- The example of the "Raszyn's Ponds" Natural Reserve illustrates well the broader problem of anthropopressure in the landscape of rural areas - in naturally valuable areas - legally protected;
- Anthropopression manifests itself both in the form of urbanization of open areas - so far free of development, as well as the intensity of recreational traffic, especially in the vicinity of large cities, such as Warsaw - both of these factors contribute to the degradation of environmentally valuable areas;
- Because of such high pressure in the case of the Natural Reserve in question and similar areas in various other locations, passive protective measures are not sufficient, and their implementation is usually illusory - it is necessary to immediately verify the scope of the form of protection and assess the legitimacy of the recommended protective measures;
- The natural and social significance of the "Raszyn's Ponds" Natural Reserve now goes beyond the local aspect - variant landscape studies for this area carried out under the direction of the authors inspire the local community to initiate activities aimed at developing a new formula for protecting and developing the landscape around the Reserve, e.g. in cooperation with scientists from the Warsaw University of Life Sciences (Landscape Architecture) and the Warsaw University of Technology (Faculty of Architecture).

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Souhrn
Případová studie přírodní rezervace "Rašínovy rybníky" (Stawy Raszyńskie) ilustruje širší problém utváření a ochrany volné krajiny venkovských oblastí v Polsku i mimo něj. Objevují se nové výzvy a s nimi spojené příležitosti a hrozby. ochrany těchto území je antropogenní tlak. Antropotlak v současnosti roste v důsledku stavebního boomu v okolních oblastech. Podmínky pandemie Covid-19 zvýšily turistický ruch v rezervaci. vzniká problém, jak vymezit a uspořádat turistický prostor ve venkovské krajině, aby neinicioval přírodní, sociální, ekonomické a estetické dysfunkce. Cílem výzkumu je ukázat vybrané problémy ochrany volné krajiny na příkladu případové studie území v okolí přírodní rezervace "Rašínovy rybníky". Autoři provádějí variantní scénáře rozvoje a ochrany výše uvedené lokality s naznačením některých možných řešení. Při utváření krajiny a zachování všudypřítomného hospodářského využití (zemědělství, chovatelství) pro vzdělávací a demonstrační účely je možné řízené připuštění udržitelného cestovního ruchu a rekreace - což ponecháno bez jakékoliv kontroly může vést k devastaci těchto cenných území.

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PUBLIC RECREATION AND TOURISM ARE ASPECTS THAT AFFECT NOT ONLY THE ENVIRONMENT

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Abstract
In most cases, recreation is a short-term hobby that is often associated with travel (tourism) to nearby, but also more distant and remote locations. It is often associated with rest from everyday worries and work duties, in the form of spa and beach stays, but also with active activities. Active activities can include, for example, sports activities, getting to know new territories, villages and cities, visits to various cultural and natural monuments, including mountain resorts, spa areas and water reservoirs. The increased concentration of tourists in these locations brings with it both positive and negative effects. The positive influence is mainly the economic impacts, the development of local business and the economic growth of the given locality. The negative impact of tourism is very often associated especially with pollution, i.e., the impact on the environment. The study evaluates this environmental aspect. That is, how the attractiveness of a tourist destination or the attractiveness of a vacation affects the value of residential real estate.

Key words: Environment, tourism, tourist sites, economic impacts

Introduction

The town of Vizovice, which is in the Zlín district in the Zlín region, is an important location sought after by tourists. The town of Vizovice is located 14 km east of Zlín in the foothills of the Vizovice Hills. 4,857 inhabitants live here. In terms of tourism, the Vizovice state castle, built in the middle of the 18th century, in the French Baroque style, and the Roman Catholic church of St. Lawrence from 1792. The city is famous for the annual Trnkobrani cultural festival and the annual Masters of Rock festival, which are attended by many visitors not only from the country but also from abroad. The number of visitors accommodated, not only at these festivals, is recorded by the Czech Statistical Office. Not only this database was used to create statistical modelling.

Materials and methods

The basic and most important basis for the evaluation of the research objective is the price data of realized sales of housing units and statistical data from the public database of the Czech Statistical Office on the development of tourism. As part of the research project, 5 cadastral territories in South Moravia and 5 cadastral territories in the Zlín region were examined, which were evaluated as the most visited from the point of view of tourism. The district cities, the city of Brno and the city of Zlín, with their specific market, area, and population, were not included in the research, as they require a separate study. In this contribution, only a partial part of the achieved results is presented, namely the cadastral territory of Vizovice.

A modern statistical method, dependency analysis, was used to evaluate the environmental aspect described above. The most important tools of this analysis that were used are correlation and regression analysis. The output of the correlation analysis is the correlation coefficient, which between two variables indicates the degree of their mutual correlation, positive or negative. The Pearson correlation coefficient was used to evaluate the strength of the correlation. Regression analysis is one of the most used statistical methods that can investigate the relationship between two variables. Anova results, e.g., T-test, are also used to verify the results. This simple T-test is used to determine the statistical significance of individual regression parameters and the F-test, which is used to determine the statistical significance of the entire regression model.

The basis and source of the compiled databases in each cadastral territory that were analysed, in the years 2014–2022, was the data of price data from sales that took place, i.e., realized sales prices. These prices were evaluated in each year, based on the floor area of the housing unit, as an average per m2 and subsequently tested together with data on the development of tourism in a specific location. The statistically significant abnormality of the decrease in the number of visitors (tourists) in 2020-2021, caused by the SARS-CoV-2 virus pandemic, is not suitable for statistical assessment in the model and would completely distort the results achieved in the regression and correlation analysis. For this reason, total data was evaluated only in the period from 2014 to 2019, inclusive.

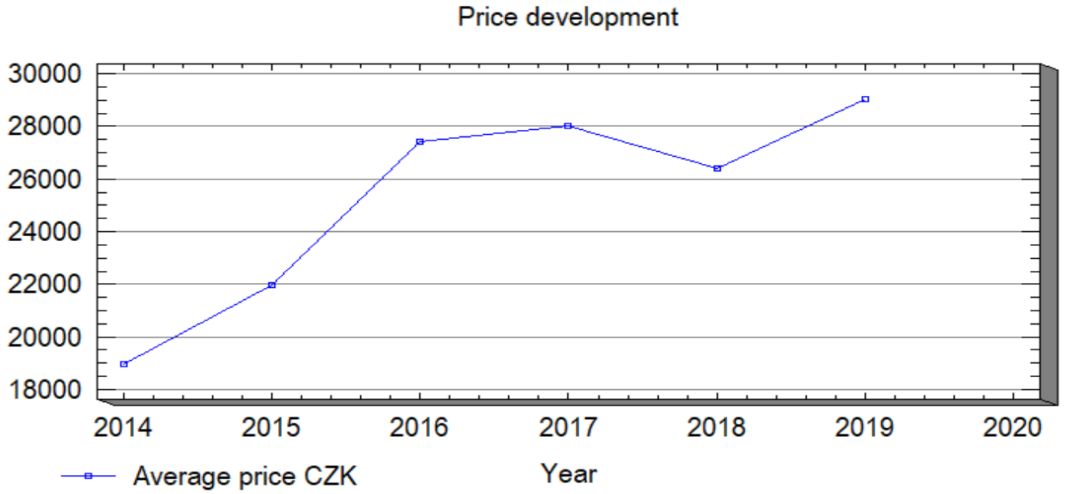
Results

Land Survey and Cadastre Office, on realized sales of housing units, a separate database was created that contained data on each housing unit. In particular: deposit number, date of deposit, price information, apartment unit number, address where the apartment unit is located, size of the apartment unit and any transferable co-ownership share. Data on the development of tourism were subsequently taken from the database of the Czech Statistical Office. The following table shows the results of the created databases.

Tab. 1: Data analysis results (Source: Own processing)

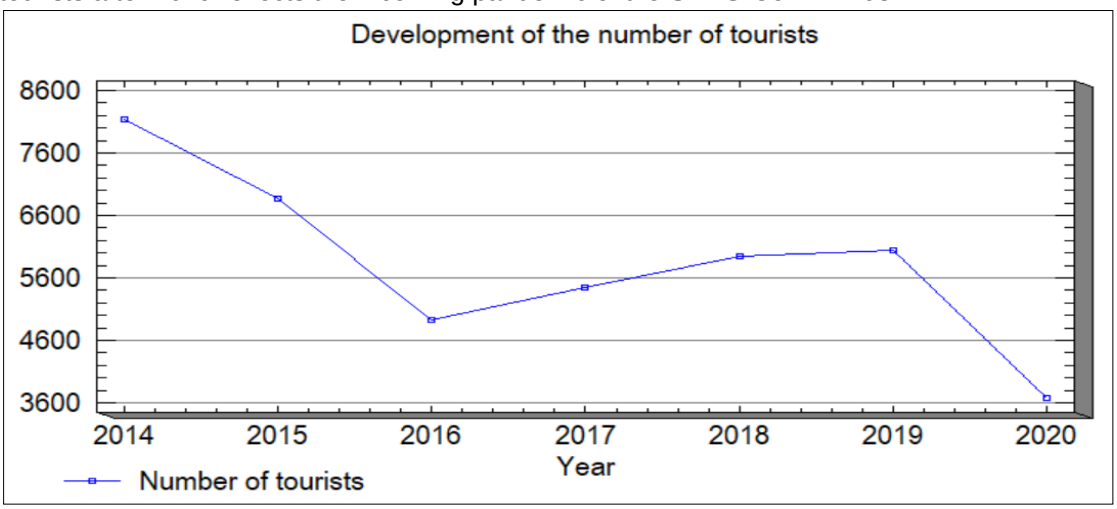
Results for testing - cadastral territory of Vizovice							
Values/year	2014	2015	2016	2017	2018	2019	2020
Total guests	8 131	6 861	4 932	5 444	5 951	6 045	3 678
Price CZK/m^2	18 948	21 992	27 420	28 000	26 393	29 009	-----

The development of the average realized (market) price of housing units (CZK/m^2) in a time series is illustrated by the graph.



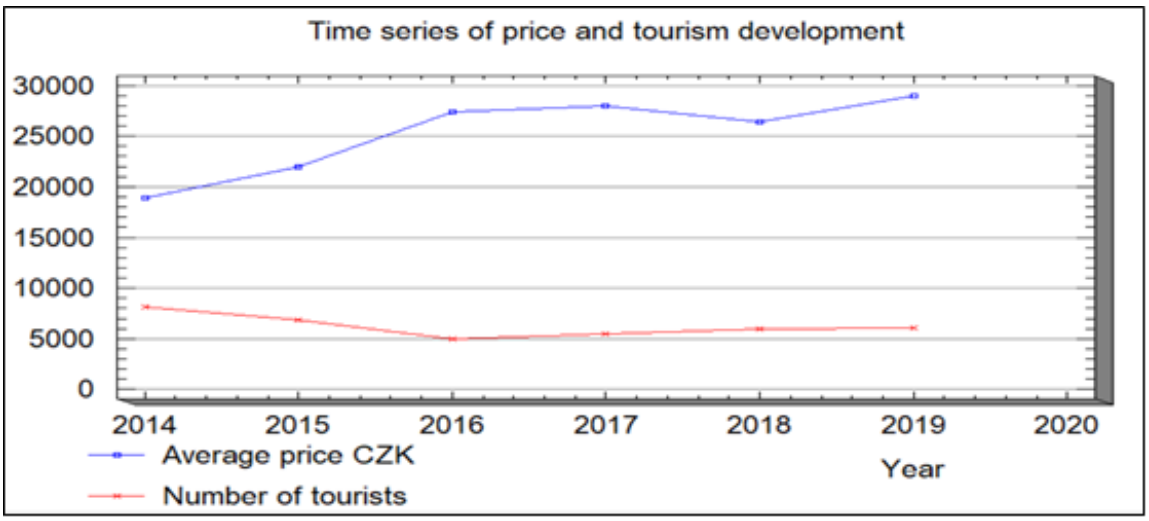
Graph 1: Development of the market price of housing units in the assessed years (Source: Own processing)

The development of tourism is also shown in the following graph. The sharp drop in the number of tourists after 2019 reflects the incoming pandemic of the SARS-CoV-2 virus.



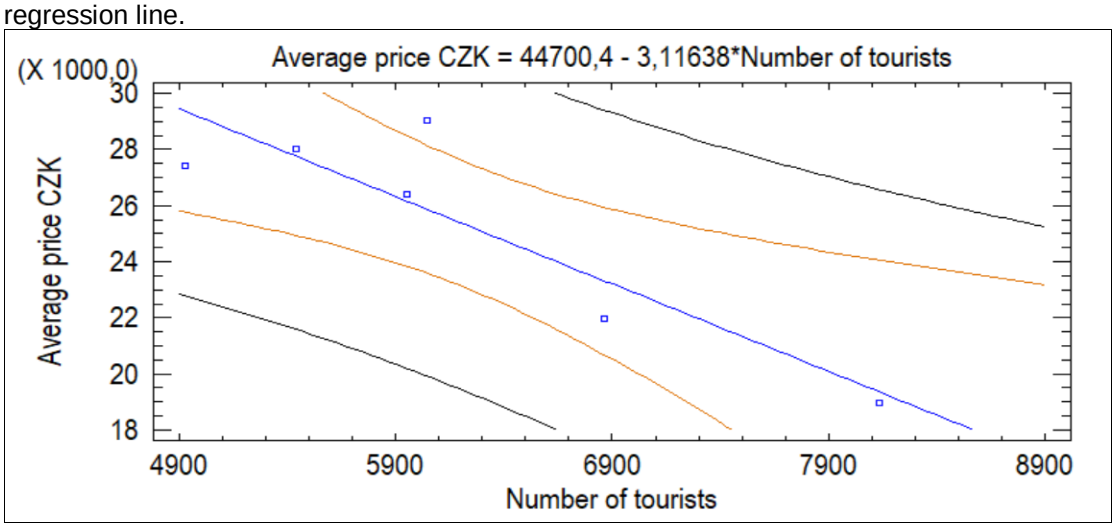
Graph 2: Tourism development (Source: Own processing)

The tools of statistical analysis of dependence, i.e. correlation and regression analysis, were used for the evaluation. The overall evaluation is done in the statistical program Statgraphics. The time series of the development of tourism as well as the realized (market) prices of housing units are shown in the next graph.



Graph 3: Time series (excluding guests in total in 2020) (Source: Own processing)

A certain correlation between the investigated variables is visually evident from the above graph. While the number of tourists decreases in 2015-2016, the price of real estate increases. In the years 2016-2018, on the contrary, the number of tourists increases and with the increasing number of tourists the price stagnates and in 2018 it decreases. On the contrary, with the decrease in the number of tourists in 2019, the price rises again. The Pearson correlation coefficient is used to determine the strength of correlation (strength of dependence). The dependence of the average market price on the number of tourists is illustrated by the next graph, together with the equation of the regression line.



Graph 4: The dependence of the average price on the number of tourists (Source: Own processing)

The graph also shows that as the number of tourists decreases, the price of housing units rises, and vice versa, if the number of tourists increases, the price decreases. A simple regression analysis is used for further evaluation. The results of regression statistics and residuals are shown in the following tables. The most important values are highlighted in bold.

Simple Regression - Average price CZK vs. Number of tourists

Dependent variable: Average price CZK
Independent variable: Number of tourists
Linear model: Y = a + b × X

Tab. 2: Regression analysis coefficients (Source: Own processing)

	Least Squares	*Standard*	*T*	
Parameter	*Estimate*	*Error*	*Statistic*	*P-Value*
Intercept	**44700,4**	4919,64	9,0861	**0,0008**
Slope	**-3,11638**	0,779319	-3,9988	**0,0161**

Tab. 3: Confidence intervals (Source: Own processing)

Confidence intervals			
Lower 95%	Upper 95%	Lower 99%	Upper 99%
31039,54	58360,35	22047,31134	67352,58397
-5,28026	-0,95238	-6,70471947	-0,4720723

Tab. 4: Analysis of Variance (Source: Own processing)

Source	*Sum of Squares*	*Df*	*Mean Square*	*F-Ratio*	*P-Value*
Model	6,24138E7	1	6,24138E7	15,99	**0,0161**
Residual	1,56124E7	4	3,90311E6		
Total (Corr.)	7,80263E7	5			

Correlation Coefficient = **-0,894376**
R-squared = **79,9908** percent
R-squared (adjusted for d.f.) = 74,9885 percent
Standard Error of Est. = **1975,63**
Mean absolute error = **1216,82**
Durbin-Watson statistic = 0,920505
Residual autocorrelation = 0,217089

The output shows the results of fitting a linear model to describe the relationship between the average price in CZK and the number of tourists. The fitted model equation is: Average price in CZK = 44700.4 - 3.11638 × Number of tourists
Since the P-value is lower than 0.05, there is a statistically significant relationship between the average price in CZK and the number of tourists, at a confidence level of 95.0% and a significance level of α= 5%. The R-Squared statistic shows that this model explains 79,9908% of the variability of the average price of CZK in the entire model. The correlation coefficient is equal to -0.894376, indicating a strong negative relationship between the variables. The standard error of the estimate shows a standard deviation of the residuals of 1975.63. This value can be used to construct prediction limits for new observations. The mean absolute error (MAE) of 1216,82 is the average value of the residuals. The Durbin-Watson (DW) statistic tests the residuals to see if there is any significant correlation based on the order in which they occur in the data set.
The P value = 0.0161 is lower than the tStat value, and at the same time it is much lower than the chosen significance level of α = 0.05. At the α = 5% significance level and 95% confidence level, tourism has been shown to have an effect on real estate prices within the set α value. The Slope value (so-called Coefficient B_1) evaluates that with each tourist the price decreases by CZK 3,11/m^2 of the housing unit. Thus, as tourism increases, the price per m^2 of floor space decreases. The upper 95% confidence interval and the lower 95% bound determine the variance. The price per m^2 is decreasing (95% confidence level) in the range of -5,28 to -0,95 CZK. The variance with 99% probability is in the range of -6,70 to -0,47 CZK. In the cadastral territory of Vizovice, the negative influence of tourism (number of tourists) on real estate prices, specifically on housing units, has been proven. Tourism reduces the market prices of housing units in this location. Here, however, it is necessary to emphasize that these results may also be subject to a so-called false correlation and that they relate only to this locality, and this compiled model. Evaluation of databases from other locations may confirm completely different conclusions.

Discussion
For a conclusive evaluation and generalization of the achieved results, a longer-term investigation would be correct, but the expected assumption of the influence of tourism on the price of real estate in Vizovice was confirmed. However, if it were possible to include in the research the number of other tourists, not captured in the database of accommodated guests, it can be argued that the dependence would probably be even more significant. More accurate results could be achieved using geolocation

data, for example from mobile operators, which are unfortunately only available for public administration or self-administration.

Conclusion
The economic benefit of local tourism is clear and proven. However, declining residential property prices may result in better housing affordability for local residents. The fact is, however, that since 2020 real estate prices have been rising steeply in almost the entire Czech Republic and are currently stagnating. In this regard, it is therefore important to consistently investigate the causes of the rise and fall of prices and correctly prove that they are caused by the number of tourists in the locality or the tourist-attractive locality.

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Acknowledgement
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Souhrn
Faktor atraktivity turistického či rekreačního cíle zcela jistě ovlivňuje hodnotu nemovitostí v této lokalitě, což je prokázáno statistickým vyhodnocením pro zkoumané období v letech 2014 až 2020. Pozitivním ekonomickým vlivem mohou být v turisticky atraktivní lokalitě rozvoj místního podnikání a s tím spojená snížená nezaměstnanost. Negativním vlivem v této lokalitě je pravděpodobně zvýšený hluk a znečištění životního prostředí, které je zde spojené s cestovním ruchem. Méně sledovaným aspektem je ovšem cenová dostupnost některých typů rezidenčních nemovitostí pro místní populaci.

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QUALITATIVE ASSESSMENT OF PREPAREDNESS AND POTENTIAL OF PROTECTED NATURAL AREAS TO SUPPORT SUSTAINABLE TOURISM

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Abstract
The paper presents the results of qualitative research focused on sustainable tourism in two protected landscape areas and a national park in the Czech Republic. It aims to determine the state of the art of sustainable tourism in these areas and to compare them from the point of view of the possibilities and potential of sustainable tourism development.
The paper uses data from structured interviews with key stakeholders (destination agencies, municipalities, regional governments and bodies offering services in tourism and mobility) and secondary data on tourism services provided in the studied areas. Using qualitative methods, we evaluate the awareness and preparedness of stakeholders and propose possible measures to strengthen sustainable tourism.
The presented research results are part of a comprehensive study to develop guidelines for the so-called "Mobility Plans for Environmentally Sensitive Areas (ESAs)".

Key words: Large-scale protected areas, sustainable tourism, destination management

Introduction

Sustainable development constitutes a big challenge in all sectors, including services. It is well documented (see, e.g., Leung et al., 2018; Marion & Reid, 2007; Pásková, 2014; Zelenka et al., 2003) that the current form of tourism has a range of negative impacts on local communities and environment. To reduce these impacts, new more sustainable services have been developing under several concepts such as sustainable tourism, green tourism, soft tourism or slow tourism. The common features of these concepts are that tourists spend more time in one destination, get to know the community, try local food, buy local goods and use local services. Regarding transportation, sustainable transport modes represented by public transport, cycling and walking are preferred (Timoftej and Brůhová Foltýnová, 2022).
Large environmentally sensitive areas such as national parks or protected landscape areas might be ideal places for these kinds of tourism. Sustainable tourism goes well with protection of nature and landscape, and for this reason it should become the basis for further development of tourism in these areas.
An important question concerns the state of the art of sustainable tourism development and the potential of these services in large environmentally sensitive areas in Czechia. To answer this question, we use data from structured interviews with representatives of different stakeholders from three case study areas.
The structure of the paper is as follows. In the next chapter we describe the methodology and data used for this study. Chapter 3 provides the results and discussion of the qualitative research and the last chapter concludes.

Materials and Methods

Our research focuses on two categories of large environmentally sensitive areas. They are defined as national parks (IUCN category II, hereinafter NP) and protected landscape areas (IUCN category V, hereinafter PLA); for categorisation, see IUCN (2021). There are 4 NPs and 26 PLAs in the Czech Republic.
Our case study areas were chosen based on their representativeness and data availability so that they represent different kinds of recreational activities, protected areas and types of ecosystems: NP České Švýcarsko + PLA Labské pískovce, PLA Jizerské hory and PLA Moravský kras (for more, see Timoftej and Brůhová Foltýnová, 2022). The main features of the case study areas are summarized in Table 1.
Key local stakeholders in each case study area were identified using questioning of local experts and the snowball approach and can be divided into three groups: state administration, destination services and service providers (local business). In total, we collected data from 45 stakeholders (see Table 2).

Tab. 1: Basic characteristics of case study areas

Protected area and year of establishment	NP České Švýcarsko and PLA Labské pískovce (2000)	PLA Jizerské hory (1967)	PLA Moravský kras (1956)
Object of protection	Sandstone rocks and surrounding biotopes	Beech forest, peat bog associations, mountain spruce forest, flowering and waterlogged meadows	Karst landscape
Area size	79.23 km^2	368 km^2	96.82 km^2
Change after 2021	Summer 2022 – large fire in NP České Švýcarsko (activities after the fire: parts of the park closed, accommodation vouchers including free transport for guests)		January 2022 – Moravský kras DMO (Destination Management Organisation) established
Type of tourism most frequently sought by clients in the area	• Rock areas • Boating (canyons) • Pravčická brána • Hiking • Wilderness, disorderliness compared to the German side of the park	• Skiing route (cross-country) • Hotel-based events (weddings, business events) • Adrenalin cycling (cycle trails, downhill) • Cycling tours • Exploitation of mountains and nature alongside accessible city tourism, e.g., swimming pools, museums, etc.	• Cave systems • Forest recreation • Cycling tours • Film tourism

Source: Web sites of protected areas, interviews with stakeholders

Tab. 2: Overview of interviewed stakeholders

	State administration / local/regional government	Destination services	Service providers	Total
NP České Švýcarsko and PLA Labské pískovce	9	3	6	18
PLA Jizerské hory	9	1	7	17
PLA Moravský kras	6	3	3	12
Total	24	7	16	47

Note: Two respondents completed the questionnaire as both destination services and service providers.

The interviews took place between October 2020 and June 2021 using face-to-face or online (videoconference) forms. The average time per interview was 60 minutes. The following topics were covered during the interviews: perception of the protected area and necessity to protect it; problems connected with tourism in the area; priorities for further development of tourism in the area; barriers and drivers of sustainable tourism development; feasibility of different regulation measures; and promotion of the area as a sustainable tourist destination.

Results and discussion

State of the art of tourism in case study areas

Stakeholders in the different areas assessed the current situation in tourism most commonly as “some things are set up well and others need changing”. Those from PLA Moravský kras expressed satisfaction with the current situation more frequently than the others. Respondents in all the case study areas agreed that current problems associated with tourism include inadequate coverage of the tourism season throughout the year (meaning, among others, concentration of tourists and associated negative impacts on the area at certain times of the year and uneven incomes for local businesses).

Stakeholders in NP České Švýcarsko and PLA Labské pískovce included among the problems concentration of tourism pressures on a few sites across the area and little use of public transport (PT) although it is provided sufficiently. Problems mentioned in PLA Jizerské hory included insufficient accommodation capacity in the high season, occasional conflicts between walkers and cyclists on the same routes, the need to set a carrying capacity for certain areas, and insufficient infrastructure in some places. Current problems in PLA Moravský kras include uneven distribution of tourism in the area, increasing one-day tourism at the expense of multiple-day trips, illegal camping and cars entering areas out of bounds. Besides, respondents mentioned lack of conceptual planning of sustainable tourism, including the need to unify its perception and content across stakeholder types so that it is provided jointly and in a coordinated fashion. Opinions of stakeholders from the different areas on how tourism affects environmental protection are summarized in Table 3.

Tab. 3: Which environmental values does tourism affect the most, and how?

České Švýcarsko + Labské pískovce			
	Public administration	Destination services	Service providers
Comments:	Transport (delineation of parking areas) Cycling trail signage and checks of movement along marked paths Possible fires (caused by tourists) Widening of paths and trampling	Interference with game Littering Cultural values should not be suppressed at the expense of nature protection	Disrespect to bird nesting Littering
Jizerské hory			
	Public administration	Destination services	Service providers
Comments:	Industrial activity on Polish side (mines, factories) Problematic area in winter – extreme traffic	Problematic area in winter – extreme traffic Parking along roads Illegal camping in the wild Most visitors act considerately, only a few cause problems, but they are highly visible (litter, wrong parking)	Advantage of paved roads (no excessive erosion) Inappropriate parking Snowmobiles / quad bikes Infringement of landscape character – lookout towers Tourism brings new services for visitors (paths, closeness to destinations, etc.)
Moravský kras			
	Public administration	Destination services	Service providers
Comments:	Problems with tourist behaviour: littering, campfires, cars entering inappropriate places	Lack of compromise between nature protection and tourism Litter	Visitors entering out of bounds endangers protected sites

Source: Data from interviews with stakeholders

When asked about their perception of the NP or PLA status of their area, the overwhelming majority of the stakeholders replied that the positive effects prevail. In their opinion, the PLA/NP establishment caused more interest in the area (prestige) and the necessary nature protection. On the other hand, it caused increased local traffic or restrictions on construction activity in some areas, which they see as negative.

Only a few stakeholders perceived the protected area status negatively, explaining it with actions of environmental protection authorities (excessively one-sided nature protection to the detriment of spatial development).

It is clear from the stakeholders' statements that aspects affecting tourism are perceived differently in the different areas, meaning that they are site-specific. There is agreement across the areas concerning transport and mobility, particularly parking (land occupation for parking areas, parking

outside designated areas, unpermitted entry) and unacceptable behaviour of visitors (littering, illegal campfires, entry out of bounds, illegal camping, fire hazard).

Potential for sustainable tourism development in case study areas

Almost all the stakeholders (across the stakeholder categories) perceive sustainable tourism as appropriate for the areas, but there are a number of factors that hinder full functioning of sustainable tourism in the area (see Table 4). There are some first heralds, however, such as the new Hřebenovka ("Ridgeway") product in České Švýcarsko (inspired by the Way of St. James – offers of accommodation and food from locals). They also include the offer of regional food and certified products from NP České Švýcarsko and free PT for multiple-day visitors. PLA Moravský kraj is perceived by its stakeholders as an area where *"a lot is now ready, and tourism could function according to the sustainable development definition after weak points of the current situation are removed"*.

Tab. 4: Stakeholders' opinions on barriers to and opportunities for sustainable tourism in case study areas

Barriers	Opportunities
České Švýcarsko + Labské pískovce	
Lack of clearly defined products and parameters Lack of good infrastructure and transport service for sustainable tourism	Current seasonality is a problem – offer of sustainable tourism has to work year-round Non-existent limits for tourism Little activity of NP administration – more support necessary
Jizerské hory	
Perception of Jizerské hory as a place for performance sports (goals and achievements) not as valuable environment for observing landscape and nature	There will always be some who seek sustainable tourism and some who consume the area; both types of tourism need to be preserved Greater role of awareness raising and education
Moravský kras	
Lack of safe cycling trails	Expansion of safe cycling trails is in progress Greater involvement of Nature House is in progress – awareness raising, information, relationship to nature

Source: Data from interviews with stakeholders

3.3 Priorities for further development of tourism in case study areas

In addition, we inquired about priorities for further development of the areas in relation to tourism. The respondents were asked to order defined priorities (nature protection, economic development, tourism distribution in space and time, development of soft tourism, information and awareness and environmental education) by importance from the greatest (1) to the least (6). The responses indicate (see Figure 1) that nature and its protection is perceived as important (especially in small and busy areas such as PLA Moravský kras), but distribution of activity in space and time is regarded as the most important (more than half the stakeholders in all the case study areas ranked it as most important = 1, or very important = 2). There is thus a clear effort to mitigate the greatest stress on the area and distribute the tourism more evenly rather than restrict it.

Conversely, economic development is perceived by local players as unimportant – in fact, 80% of the stakeholders in PLA Moravský kras ranked it as the least important (6), while only 10% regarded it as the most important (1). Even if some other development priorities received fewer marks 1, they were also less frequently assessed as the least important. For example, the priority "information and awareness" was regarded as important and unimportant by the same proportions of respondents. Another interesting assessment was that of "environmental education, behaviour" – 40% of respondents in NP České Švýcarsko ranked it the least important.

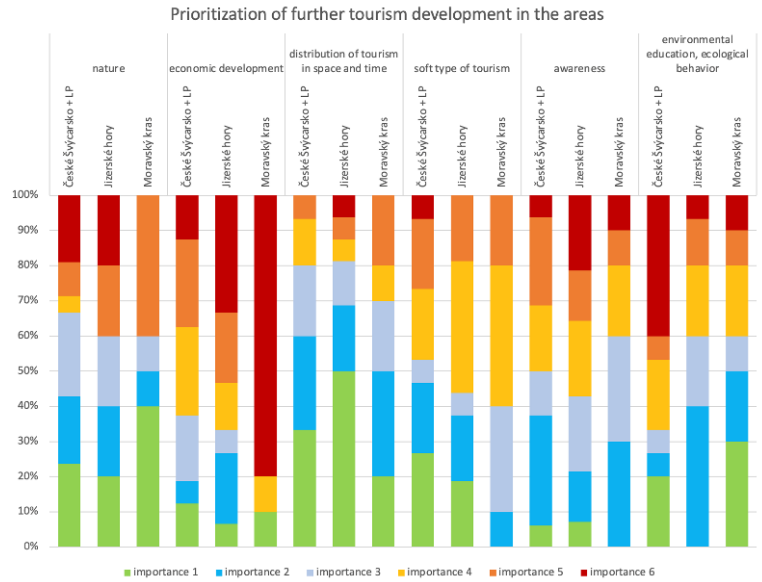

Fig. 1: Prioritization of further tourism development in the areas
Source: Data from interviews with stakeholders

Possible implementation of measures to support sustainable tourism in case study areas
The respondents were presented with 5 categories of measures (adopted from Milano, 2018) as follows: (i) extended seasonality in the area; (ii) promotion of less visited sites (better distribution of visitors in space); (iii) stricter regulation of car traffic (restricted access to cars, e.g., by reducing parking places or better alternatives to the car); (iv) more diversified services; (v) visitor regulation by introducing fees for entering the most tourist-important parts of the PLA/NP. The respondents were asked to assess the possibility of implementation of each category of measures in their area. Figure 2 summarizes their answers.

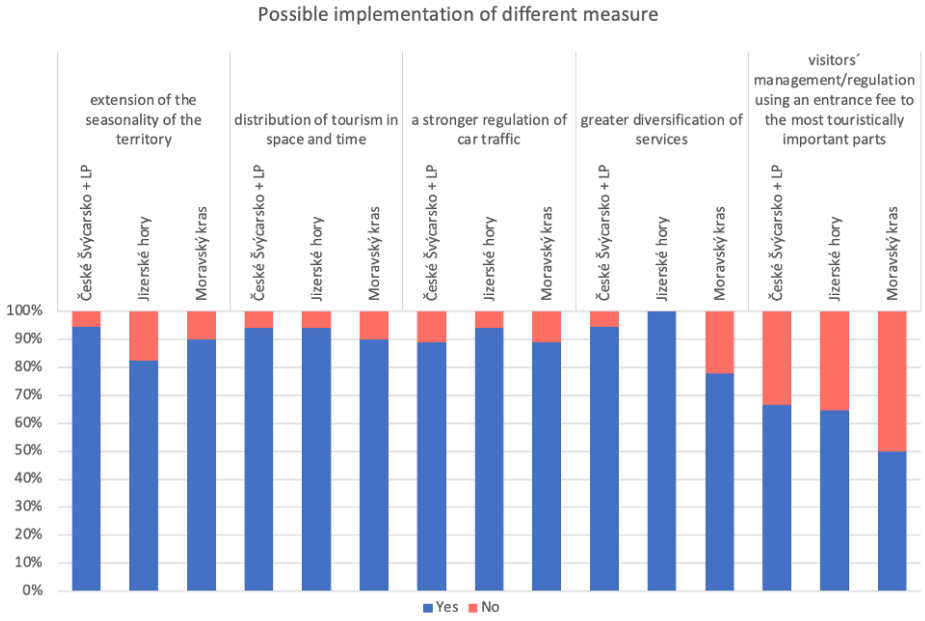

Fig. 2: Possible implementation of different measures
Source: Data from interviews with stakeholders

It turns out that the stakeholders regarded most of the measures as implementable in their areas. The only exception is introduction of entrance fees, which is not regarded as realistic particularly by stakeholders in PLA Moravský kras, where entry to the caves is already paid.
Promotion of less visited sites (better distribution of visitors in space) was regarded as the most easily implementable category of measures – it was perceived as highly realistic in all the selected areas.

Stakeholders' opinions on introduction of fees bring a wide range of views:

- *If a fee were collected, it should be adequately reflected in the services offered and quality of infrastructure (parking, toilets, etc.).* (service provider representative, České Švýcarsko)
- *The use of revenues from the fees would have to be transparent.* (service provider representative, České Švýcarsko; state administration representative, Moravský kras)
- *The fee could regulate tourism, but its amount would have to be set appropriately*. (destination service representative, České Švýcarsko; state administration representative, České Švýcarsko)
- *The fee should go directly to the self-government (municipality).* (service provider representative Jizerské hory; state administration representative, Jizerské hory)
- *The fee could hinder some groups from visiting*. (service provider representative, České Švýcarsko; state administration representative, Jizerské hory)
- *The fee would be suitable only as a voluntary fee*. (3 service provider representatives, Jizerské hory)
- *The process and form of the fee collection has to be set correctly, as well as collection rules and inspection.* (self-government representative, Moravský kras)

The statements indicate all the stakeholders' cautious attitude to this instrument. Although about a third of the respondents regard it as unrealistic, even those who view it as realistic note a number of problematic aspects of entry charging and the need to ensure transparency of using the funds collected, as well as the need to carefully design the collection and inspection system. Besides, stakeholders from PLA Jizerské hory mentioned that the fee could be voluntary; the experience from the area comes from the current voluntary fee for entering the arterial cross-country ski route. The fee could regulate tourism, but might also affect some low-income groups of visitors, for whom the set fee amount could be prohibitive.

Conclusion

The objective of this study was to use structured interviews with various types of stakeholders to identify their opinions on the current situation in tourism, its environmental impacts and priorities and tools for possible sustainable tourism development in large-scale protected areas of the Czech Republic.

Statements by local players in three case study areas indicate that the current situation in environmental protection is perceived positively, and they also agree on the necessity of nature and landscape protection. At the same time, they are aware of problems associated primarily with seasonality of tourism, and see tourism distribution in space and time as one of the main paths towards better sustainability.

Moreover, the data obtained indicate that sustainable tourism and its further development enjoy support of all the stakeholder types approached in the studied protected areas. They did not see any fundamental barriers to its further development.

The players' agreement across the areas is an opportunity for promoting sustainable development. The areas need better coordination of activities and faster support to sustainability of tourism, which has to be emphasized and implemented in system settings, strategic documents and legislation, including interpretation plans. Given the massive problems caused in the areas by traffic, development of mobility plans for the areas could be beneficial. The plans could be central documents assisting destination organizations and nature protection organizations in setting suitable conditions for sustainable movement and stay of visitors. (A methodology for mobility plans will be drawn, titled "Mobility Plans for Environmentally Sensitive Areas (ESAs)", which will be available in mid-2023; for more, see Brůhová Foltýnová et al., 2022). Better setting of primary conditions and documents will help players in the areas implement specific activities of measures, and thus strengthen and accelerate their sustainability.

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Souhrn
Příspěvek prezentuje výsledky kvalitativního výzkumu zaměřeného na udržitelný cestovní ruch ve třech CHKO a jednom národním parku v České republice. Cílem výstupu výzkumu je zjistit stav udržitelného cestovního ruchu v těchto oblastech a porovnat je z hlediska možností a potenciálu rozvoje udržitelného cestovního ruchu.
Příspěvek využívá data ze strukturovaných rozhovorů s klíčovými zainteresovanými subjekty (destinační agentury, obce a krajské samosprávy a subjekty nabízející služby v cestovním ruchu a mobilitě) a sekundární data o službách cestovního ruchu poskytovaných ve zkoumaných oblastech. Pomocí kvalitativních metod vyhodnocujeme informovanost a připravenost zainteresovaných stran a navrhujeme možná opatření k posílení udržitelného cestovního ruchu. Prezentované výsledky výzkumu jsou součástí komplexní studie k vypracování pokynů pro tzv. „Plány mobility pro environmentálně citlivé oblasti (ESA)“.

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RECREATION IN CZECH LARGE PROTECTED AREAS: COUNTED AND SORTED

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Abstract
Protected areas around the world attract people. Due to beautiful nature, landscape and suitable geomorphological conditions, leisure time activities are often concentrated in these areas. It can be in opposite to aims of nature conservation. Therefore, we mapped recreational infrastructure and areas across all Large Protected Areas within Czechia for four periods (1950s, around 1990, 2004–2006, 2016–2020). We included all forms of recreational land-use on the edges of built-up areas and outside of them. During our study period of approximately seventy years (1950–2020), their area and length increased significantly. Now, representation of recreational areas within protected areas varied from 0 to 1 % of whole area. Ski slopes and golf courses are among the biggest new recreational structures; playgrounds and sports fields are almost in each protected areas. Despite the relatively small portion of area, recreation created fragmentation features within the landscape and can generate other anthropogenic activities harmful for biodiversity and nature.

Key words: Recreational areas, Recreational infrastructure, National Parks, Protected Landscape Areas, Czechia

Introduction

Along with nature conservation, recreation is another desired goal of protected areas (PAs) (Brandon, Wells, 2002). PAs have potential to provide recreational services for society, but on the other hand, even non-invasive recreation can harm biodiversity and purpose of PA (Reed, Merenlender, 2008). In densely inhabited Central Europe, there is a need to find a compromise, solution, between protection of valuable parts of landscape and development for ensuring economic and social well-being, because recreation is an important for local community within the PAs as an economic activity (Heagney et al., 2018).
It is highlighted by examples from other parts of Europe (e.g. the Alps), where new forms of recreational land-use have been created in recent decades (Schneeberger et al., 2007). Moreover, an overlay of PAs and recreational attractiveness of the area is evident across Czechia (Perlín et al., 2010).
Therefore, in last five years (2018 – 2022) we monitored landscape in all Large Protected Areas for the Ministry of the Environment. Our work was also focused on recreational structures. Here, we bring quantification of their development during the study period.

Materials and methods

Spatial recreation data were manually vectorised in ArcGIS 10 software (ESRI, 2020) for four periods – 1950s (1949 – 1956), 1990 (1988 – 1995), 2004 (2002 – 2006) and 2016 (2016 – 2020) based on topographic maps, aerial images and ZABAGED (The Fundamental Base of Geographic Data of the Czech Republic). Data were prepared for Protected landscape areas (PLA, n = 26, 11 379 km^2) and National Parks (NP, n = 4, 1405 km^2) including their buffer zones. Recreational areas were recognized and divided into five categories: ski slopes, sport areas (beaches, outdoor swimming pools, playgrounds, shooting ranges, sports fields, tracks for motocross and cyclocross), golf courses, campsites and others (open-air museums, zoos) for all PAs.
Basically, we selected artificially transformed areas, which are used for recreation and are not buildings. Areas larger than 0.2 ha were taken into account. Furthermore, recreational infrastructure was mapped as lines of ski lifts and cable cars.
Then, we counted length and area of the recreational structures, their relative proportion as well, according above-mentioned categories and for each PAs.

Results

Generally, a huge increase of recreational areas and infrastructure happened in our study period. Areas enlarged from 236 ha to 2829 ha, tenfold on average per area (Fig. 1). Length of lines grew from 11 km in 1950s to 299 km in 2020. Especially after 1990, in period 1990 – 2004, building of new structures accelerated. However, proportion of the recreational areas and their types varied

significantly between PAs. Sport areas have been present almost in all PAs, on the other hand golf courses have appeared only in twelve PAs during the study period.

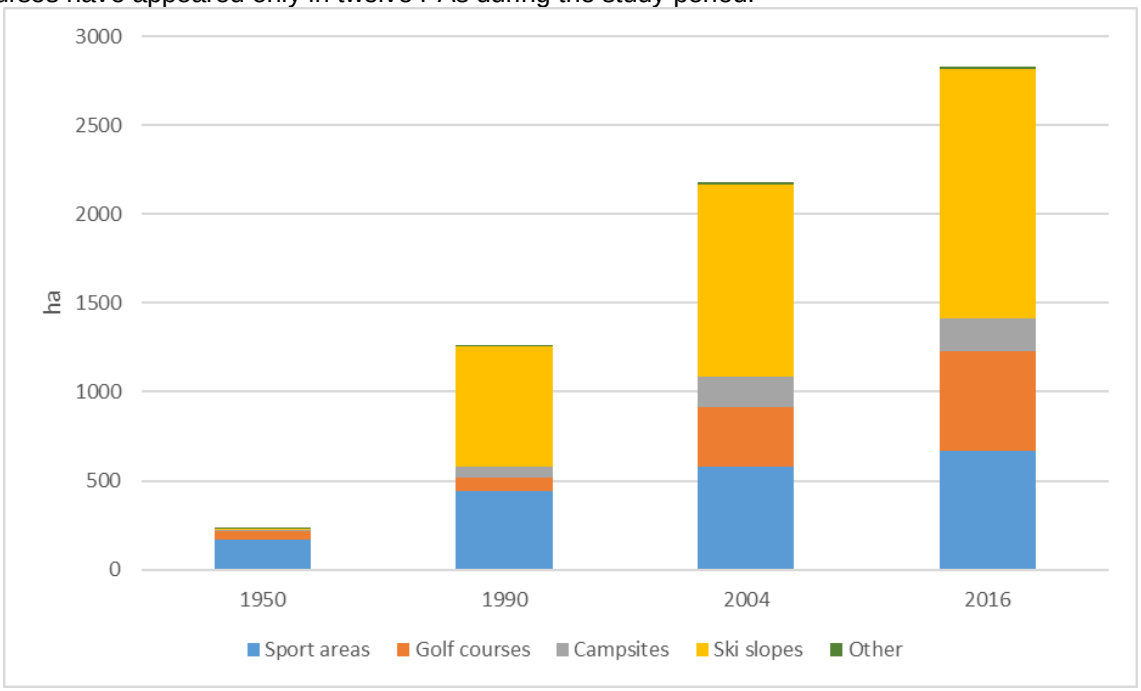

Fig. 1: An increase of recreational areas during the study period (1950 – 2020) according their types.

The lowest share of area nearly zero has been seen in densely forested and sparsely inhabited PAs: Brdy and Český les PLAs and České Švýcarsko NP. On the other hand, golf courses and ski slopes are larger recreational structures, thus PLAs and NPs with higher number of these patches have larger total area of recreation. The Krkonoše (Giant Mountains) NP and Slavkovský les PLA have a long tradition in mountainous and spa recreation and large proportion of ski slopes and golf courses, respectively, during our study period is a result. Nowadays, the Krkonoše NP has the largest share of recreation, followed by other mountainous areas, e.g. Beskydy, Jeseníky, Jizerské hory, Lužické hory (in this PLA, high share of recreation is given by combination of more categories of recreational areas), Orlické hory PLA and traditional recreational areas as above-mentioned Slavkovský les PLA with spa resorts and Český kras in vicinity of Prague (Fig. 2).

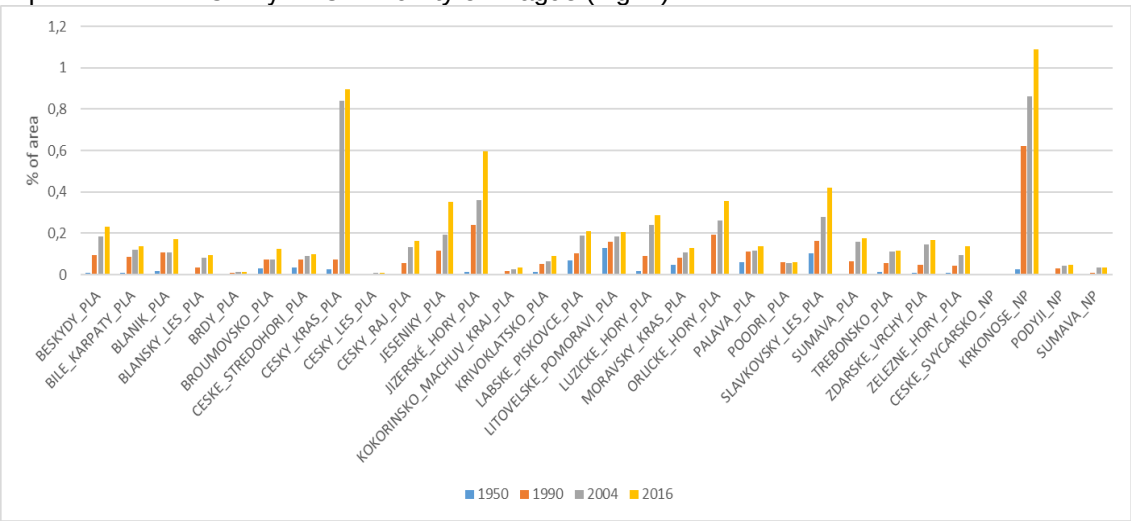

Fig. 2: Share of recreational areas during study period (1950 – 2020) in PAs.

Discussion

In the recent decades, a huge shift from productive to non-productive land-use has been evident in Central Europe (Boudný et al., 2022; Janík, Kupková, 2021; Lipský et al., 2022). Therefore, many new recreational areas were made.

However, there are huge differences of recreational structures share between PAs. Ski slopes experienced the highest increase and now have the highest share between all types of recreation, thus mountainous PAs especially after 1990 have had enormous growth of recreational areas despite their nature conservation status.
Therefore, this development of recreation has consequences for nature viability. This rapid growth destroyed natural land cover and habitats, e.g. mountainous forests, led to higher level of landscape fragmentation and disturbed protected species (Belotti et al., 2012; Filla et al., 2017; Štursa, 2007).

Conclusion

Recreational use of PAs is a result of their attractiveness, especially for some specialized activities. PAs provides recreational ecosystem services. However, it is often against interests of nature conservation, especially large new patches contributed to habitat loss, landscape fragmentation and lead to biodiversity decline. Especially since 1990 recreation has been highly demanded by society, which has been hand in hand with shift from productive to non-productive land-use in Czechia. This is in particular characteristic for some mountainous PAs and their ski slopes. On the other hand, range of share of recreational areas is wide between PAs and in some of them the recreational structures have been barely presented. Here, we showed ongoing anthropogenic pressure on PAs, which will probably continue. Therefore, managing its spatial impacts is a key task for PA's administrations.

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Souhrn
V průběhu posledních pěti lety jsme v rámci smlouvy s Ministerstvem životního prostředí monitorovali vývoj krajiny v českých velkoplošných zvláště chráněných území od 50. let 20. století do současnosti. Součástí bylo i zhodnocení vývoje rekreačních struktur v územích. Jejich stav by sledován ve čtyřech časových horizontech 50. léta 20. století (1949 – 1956), okolo roku 1990 (1988 – 1995), 2004 (2002 – 2006) a 2016 (2016 – 2020). Zaznamenány byly liniové (vleky, lanové dráhy) a plošné prvky (golfová hřiště, sjezdové tratě, sportoviště, kempy a další) ve velikosti větší než 0,2 ha. Sportoviště jsou přítomna kromě NP České Švýcarsko ve všech území, zato golfová hřiště jsou pouze ve dvanácti z nich. Celkem došlo k významnému nárůstu jak liniových (30x), tak plošných struktur (12x). Největší současné podíly i nárůsty během sledovaného období byly zaregistrovány u ploch sjezdových tratí, což vede k tomu, že právě některá horská chráněná území mají vyšší podíly rekreačních ploch a souhrnné délky infrastruktury. Vůbec nejvíce rekreačních ploch leží v současné době v Krkonošském národním parku, z horských území nalézáme vysoké zastoupení rekreace díky značným rozlohám sjezdovek v CHKO Beskydy, Jeseníky, Jizerské hory a Orlické hory. Velikost golfových hřišť pak předurčuje vysoké podíly rekreace v CHKO Slavkovský les, kde je toto využití krajiny spojeno s přítomným lázeňstvím, a v CHKO Český kras, které je samo poměrně hustě osídleno a nachází se v zázemí Prahy, čímž tvoří přirozenou rekreační oblast velkoměsta. Vysoké zastoupení rekreačních ploch v CHKO Lužické hory je pak dáno kombinací přítomnosti více typů rekreace – golfových hřišť, sjezdových tratí i sportovišť. Na druhé straně jsou území s minimem rekreačních ploch, ty spojuje vysoká lesnatost, stabilní krajinný pokryv a nízká hustota osídlení, jedná se zejména o CHKO Brdy, Český les a NP České Švýcarsko. Nárůst rekreačních ploch a infrastruktury jde ruku v ruce s posunem od produkčního k neprodukčnímu využití krajiny, přičemž ale důsledkem značného nárůstu rekreačních ploch a infrastruktury ve velkoplošných zvláště chráněných území je jeho dopad na krajinu, a to v podobě ztráty přírodních stanovišť, rušení chráněných druhů a zvyšování míry fragmentace, což vede ke ztrátě biodiverzity. Zejména po roce 1990 tato vysoká společenská poptávka po rekreaci znamená neutuchající antropogenní tlak na chráněná území a je pravděpodobné, že ten bude i nadále pokračovat. Poté je výzvou pro management území spravovat prostorové dopady rekreace tak, aby nedocházelo k poškozování předmětů ochrany přírody a krajiny.

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RECREATION LAND USE IN TERMS OF WATER PROTECTION

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Abstract
The landscape has a wide range of uses. The current era encourages urbanism and rapid development of cities, but it is necessary to think and leave space for recreational use as well. The development of green spaces not only creates heat islands, but also degrades the recreational potential of the landscape. A vegetated environment is more pleasant to people than a concrete jungle. Water areas fulfil several functions, among which we can also include the recreational function. The use of water areas is also related to their protection. As more and more land is covered with impermeable surfaces, such as roads, buildings, and pavements, there is a reduction in the natural infiltration and percolation of rainwater into the soil. This results in increased surface runoff, which can cause flooding and erosion, and also leads to a decline in the groundwater recharge. Overall, the rapid pace of urbanization is taking a toll on the environment and its components. It is important to find ways to balance the need for development with the preservation of nature, in order to ensure a sustainable future.

Key words: Recreation use of water, sustainable environment, protection of water resources

Introduction

Recreational land use has become an increasingly important topic in recent years, especially when it comes to water protection. Water is a valuable resource that is essential for human survival and the environment, and it is crucial to ensure its protection and conservation. Recreation activities that take place on or near water bodies, such as swimming, boating, fishing, and other water-based activities, can have a significant impact on water quality and aquatic life. The growing population's increased need for food, shelter, and energy puts tremendous strain on water resources, particularly water quality. Globally, the growing urbanization and intensive agricultural operations are the main causes of the declining water quality (Giri, Qiu, 2016).
Therefore, it is essential to understand the relationship between recreational land use and water protection. This understanding can help identify best practices and guidelines for managing recreational activities near water bodies to ensure the sustainable use of water resources. To this end, a growing body of research has emerged, exploring the impacts of recreational activities on water quality and aquatic ecosystems, as well as strategies for mitigating these impacts. The three most significant human-caused changes to the land, including urbanization and agriculture, are emissions and emissions. Compared to rural areas, urban habitats have different bioclimatic characteristics. Urbanization modifies atmospheric and natural surface conditions. higher temperatures, decreased evaporation, and higher surface runoff of precipitation are characteristics of urban environments. The rural surface is warmed more than the urban surface by evaporation (Zelenakova et al, 2015).
The majority of people on earth now live in cities. The changes in land use and land cover brought about by this demographic shift have been shown to have a number of documented consequences on streamflows. The rise in impervious surfaces in urban watersheds, which changes the hydrology and geomorphology of streams, is the effect that is most constant. Along with imperviousness, runoff from urbanized surfaces and municipal and industrial discharges also contribute to increased flooding in urban areas by lowering river channels' flow capacities. Regarding environmental management and social criteria, stormwater management should be viewed as a sustainable strategy for the reconstruction of rural and urban areas (Junakova et al, 2020, 2021).

Characterisation of surface water body types

The subject of the study is the territory located in Bratislava, in the urban district of Ruzinov. The area is bounded by Mlynske Nivy, Hranicna and Bajkalska streets.
There are no natural or artificial water bodies in the area concerned. The closest to the area of interest is the gravel lake Ruzinov lake at a distance of about 700 m to the north and Strkovec lake about 1.3 km to the north. These are artificially created bodies of water, which, like most of the gravel lakes in

the territory of Bratislava, were created by gravel extraction in the past and after the end of the extraction the original extraction pit was left to be flooded with groundwater. At present, these gravel lakes serve a recreational purpose. The implementation of the project does not endanger the protection zones of these recreational water areas in any way.
The area of interest falls within the catchment area of the Little Danube. The area of interest is approximately 2 000 m from the source of the river. Following Table 1 represents basic characteristics about the Little Danube river.

Tab. 1: Basic characteristics about Danube catchment.

	Little Danube – source	**Little Danube – estuary**
Altitude	126 m	107 m
Coordinates	48°07′41″S 17°09′04″V	47°55′37″S 18°00′11″V
Geological composition	Fluvial sediments: lithofacies of unconsolidated alluvial clays or sandy to gravelly clays of valley and mountain stream valleys; Fluvial sediments: resedimented alluvial fine-grained sands; Fluvial-organic sediments: fine sandy, clayey to silty humic loams of dead channels and marshes; Fluvial sediments: alluvial floodplain fine sandy loams, fine – to medium-grained sands; Fluvial sediments: resedimented alluvial sandy gravels of the near-corizontal zone; anthropogenic sediments: spoil heaps, stockpiles and landfills (Geological map, 2023)	
Area	3 173 km^2	

Estimation of land use
The Broad Relationship Map (Figure 1) provides a comprehensive overview of the surrounding landscape and the location of the subject property within it. From this map, it is evident that the subject property is situated at the heart of a thriving built-up urban area that features numerous recreational areas, including urban green spaces. The map also indicates that there are no agricultural or industrial areas in the vicinity, which is a great advantage for those seeking a peaceful and serene living environment.
The abundance of recreational land use in the urban green spaces surrounding the subject property makes it an ideal location for outdoor enthusiasts and nature lovers. These green spaces offer a wide range of activities, including walking trails, cycling paths, playgrounds, and picnic areas, providing residents with a healthy and active lifestyle. Moreover, the green spaces also serve as a natural habitat for diverse wildlife, adding to the natural beauty of the surroundings.
The presence of a small park within walking distance of the subject property is an added advantage for those who value easy access to nature. This park could serve as a perfect spot for leisurely walks, reading, picnics, or even outdoor yoga sessions. It could also be an excellent place for parents to take their children for some outdoor playtime, where they can enjoy the fresh air and greenery.

Assessing the ecological status of Danube river
The basis for the assessment of ecological status is the biological quality elements – communities of aquatic organisms that reflect the synergistic effect of changes in the aquatic environment. Through the response of organisms to environmental change, the structure and functioning of their communities is altered. Biological quality elements include benthic invertebrates, phytobenthos and macrophytes, phytoplankton and fish. In the Danube River Basin Management Plan, 1282 surface water bodies with a total length of 16687.55 km were assessed in the period 2013-2018. Very good ecological status was found in 20 water bodies with a total length of 245.50 km. Good ecological status or good and better ecological potential was achieved in 486 water bodies in the reporting period, representing a length of 5486.26 km. The environmental objectives for ecological status/potential were achieved in 34.35 % of the total length of water bodies in the Danube River Basin Management Plan, corresponding to 506 water bodies. Average ecological status and average ecological potential were found in 653 water bodies with a length of 8998.32 km (53.92 % of the total length) (Ministry of the environment, 2020).

Fig. 5: The broad relationship map.

Conclusion

The subject of the study, located in the Ruzinov urban district of Bratislava, is a crucial part of the city's landscape. The area of interest is primarily used for residential and commercial purposes, making it essential to ensure that land use is adequately managed to avoid adverse effects on the environment. Land use activities, such as construction and development, can have severe implications for water protection, and it is vital to protect the area's land and water resources from harmful impacts.

To ensure water protection, it is essential to focus on preserving the quality of the water bodies within the catchment area of the Little Danube, which is critical for maintaining the ecological health of the region. The Little Danube's ecological status is a vital indicator of the water quality and must be monitored and improved over time. In this regard, the assessment of ecological status based on biological quality elements such as benthic invertebrates, phytobenthos, macrophytes, phytoplankton, and fish is critical.

Protecting the water resources in the area is vital not only for the ecological health of the region but also for the welfare of the community. The area's residents depend on water for various purposes, including drinking, cooking, and recreation. Therefore, it is essential to maintain the quality of the water resources by reducing pollution, managing wastewater, and preserving the natural environment.

In conclusion, ensuring proper land use and water protection is crucial for maintaining the ecological health of the area of interest in the Ruzinov urban district of Bratislava. To achieve this, it is crucial to focus on preserving the quality of the water bodies within the catchment area of the Little Danube, monitoring the ecological status of the region, and safeguarding the land and water resources from harmful impacts. By doing so, the area can continue to thrive sustainably, benefiting both the environment and the community.

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Souhrn
Předmět studie, který se nachází v bratislavské čtvrti Ružinov, je významnou součástí městské krajiny. Zájmové území je využíváno převážně k obytným a komerčním účelům, proto je nutné zajistit odpovídající management využití území, aby se předešlo nepříznivým dopadům na životní prostředí. Činnosti spojené s využíváním půdy, jako je výstavba a rozvoj, mohou mít významný vliv na ochranu vodních zdrojů, a proto je nezbytné chránit půdu a vodní zdroje v této oblasti před škodlivými vlivy.
Pro zajištění ochrany vod je nezbytné zaměřit se na udržení kvality vodních útvarů v povodí Malého Dunaje, která je zásadní pro zachování ekologického zdraví regionu. Ekologický stav Malého Dunaje je důležitým ukazatelem kvality vody a je třeba jej dlouhodobě sledovat a zlepšovat. V této souvislosti má zásadní význam hodnocení ekologického stavu na základě biologických prvků kvality, jako jsou bentičtí bezobratlí, fytobentos, makrofyta, fytoplankton a ryby.
Ochrana vodních zdrojů v této oblasti má zásadní význam nejen pro ekologické zdraví regionu, ale také pro blahobyt obyvatelstva. Obyvatelé oblasti jsou závislí na vodě pro různé účely, včetně pití, vaření a rekreace. Proto je nezbytné zachovat kvalitu vodních zdrojů snížením znečištění, nakládáním s odpadními vodami a ochranou přírodního prostředí.
Závěrem lze říci, že zajištění správného využívání území a ochrany vod je klíčem k zachování ekologického zdraví zájmového území městské části Bratislava Ružinov. Pro dosažení tohoto cíle je nutné zaměřit se na udržení kvality vodních útvarů v povodí Malého Dunaje, monitorování ekologického stavu území a ochranu půdy a vodních zdrojů před škodlivými vlivy. Tímto způsobem může oblast i nadále udržitelně prosperovat a přinášet prospěch životnímu prostředí i společnosti.

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RECREATIONAL POTENTIAL OF RADOŠINKA MICROREGION: LANDSCAPE – ARCHITECTURAL PROPOSAL OF THE CYCLO ROUTE

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Abstract
Nitra region consist mostly of agricultural landscape with non forest vegetation, water features and forests. The plain landscape has a great potential for the recreational cycling activities – which could lead to the tourism development of the region and extension of the recreational infrastructure. There are several cycle roads, connecting Nitra with its surrounding – villages and cities – cycle roads are established mostly along the river Nitra and in the agricultural landscape. Former railway lines have hidden potential for the widening the accessibility of the landscape for the inhabitants and tourists. Chosen area is located in Nitra region, in the basin of Radošinka stream. The Radošinka stream connects 30 municipalities into the Radošinka NGO microregion. The main idea of our landscape - architectural proposal was to connect the municipalities with the greenway and offer citizens faster and healthier way for movement between the municipalities and possibility for everyday recreational use. There are also several former railway stations, which could be used as recreational and educational centres.

Key words: tourism development, recreational equipment, landscape architecture, Nitra

Introduction

Greenways are linear open spaces, in urban or rural environment intended only for non-motorized vehicles in order to increase the health of environmental life. The theory of greenways was developed in 1995 by Fábos and Ahern (1996) at the University of Massachusetts. Firstly, was this concept defining as: ecological corridors, possibility for recreation activities, connected cultural and natural values. The first serious attempt at green roads in Europe was in 1997, when the European Green Roads Association (EGWA) was founded.
Cycling brings a number of benefits for the society, including strengthening of mental and physical health, reducing emissions and the economy of target areas (Mikulka et.al., 2021). The fact remains that the construction of cycle paths is one of the most effective forms of investing in the entire society scale. They improve health and lengthen average length cyclists´ lifes, produces less emissions, dust and noise and are primarily associated with leisure entertainment (Martinek and Klučka, 2019). The typology of recreational cyclists by Martinek and Klučka (2019) is as follow: 1. long-distance cyclists, 2. off-road cyclists, 3. families with children, 4. Leisurely cyclists, 5. more capable recreational cyclists, 6. sport-recreational cyclists.
Martinek and Klučka (2019) describe successful marketing of cycling routes based on safe infrastructure of cycle routes, their locations, quality of the infrastructure, including orientation sign-and sports infrastructure around the route. Another criterion is the difficulty of the route, length and superelevation. Attractiveness is also key factor on the route or in its vicinity.
Good interpretation of the locality, its history and related historical monuments (Čibik et al., 2019), landscape values or current potential helps visitors to discover and better understand the culture and society. Their journey becomes something more than just a tour for attractions (Ptáček et.al., 2004). The most significant cultural and historical elements in our landscape, are considered small sacral objects as roadside crosses, shrines, statues and small chapels (Tóth et al., 2021) and calvaries (Lančarič and Bihuňová, 2011), which became a characteristic elements of slovak landscape and regional specifics. Tóth et al. (2014) recommended to strengthen the environmental education as a long term measure and support the recreational infrastructure.

Material and methods

Chosen area is located in Nitra region, in the basin of Radošinka stream. The locality belongs to the Danubian Lowland, which is an important agricultural area of Slovakia. All municipalities are mainly engaged in agricultural production. The Radošinka stream connects several municipalities into the Radošinka NGO microregion (a total of 30 municipalities). There are several symbolic monuments (various art and sculptural works), which connect the municipalities. The stream Radošinka is

followed by railway line, which has not been used since 2003, but the railway stations in the villages still remained in quite good condition.
There is still a railway station in each village remaining the former railway line. Eight stations are made of bricks and built in the same architectural style: cladding on the corner of buildings, a round window, cornices and a gable roof. The station in the village of Behynce is just a simple shelter and the station in the Lahne industrial zone was demolished in 2021. Four stations are currently privately owned and serve as family houses. Veľké Ripňany station is nowdays a community center.
The Paper presents the landscape-architectural proposal of the revitalisation of former railway line in Radošinka micro-region. The proposal was based on detailed field research, literature review and discussions with the representatives of the villages.

Results

The main idea of the design was to connect the municipalities of the microregion and thus offer citizens faster way of moving between municipalities. The second main aim was to offer possibility for recreational activities for dwellers and tourists by cyclin in the modest landscape, which is a unique way to explore the landscape and possibility to learn something.

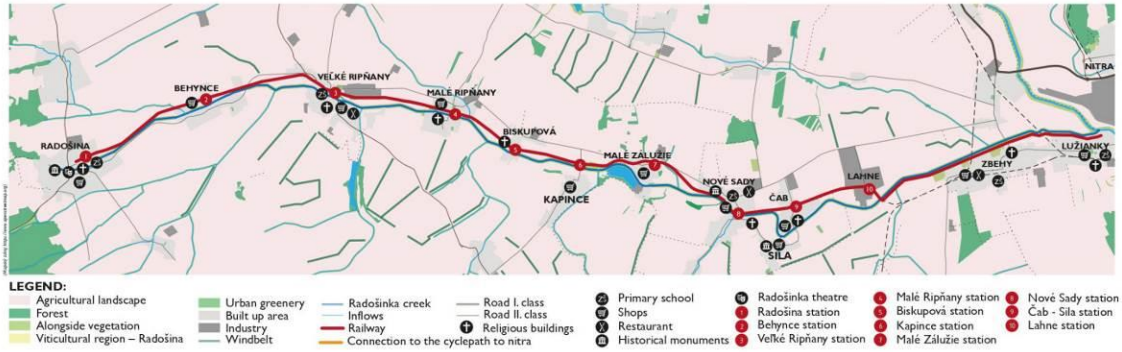

Fig. 1: Landsacpe-architetural proposal of cyclo route (Králik, 2022)

There have been designed special panels, which could be used as a puzzle structure put on the existing railways, which create safe surface for the cyclists. This idea have been developed by experts who have collaborated with Slovak University of Technology in Bratislava. The panels are made of recycled materials, mostly tires and recycled components, coated with an anti-slip layer. These parts are stored on existing rails, without the need for specialized major interventions. Connected panels will build comfortable ecological cycle path (Macko, 2021).
The cyclo path has recreational and education part. Two educational and interactive lines have been proposed – each one with different topic: Railways in Slovakia and Radošinka microregion.

Fig. 2: Landscape architectural proposal of Promenade in Radošina (Králik, 2022)

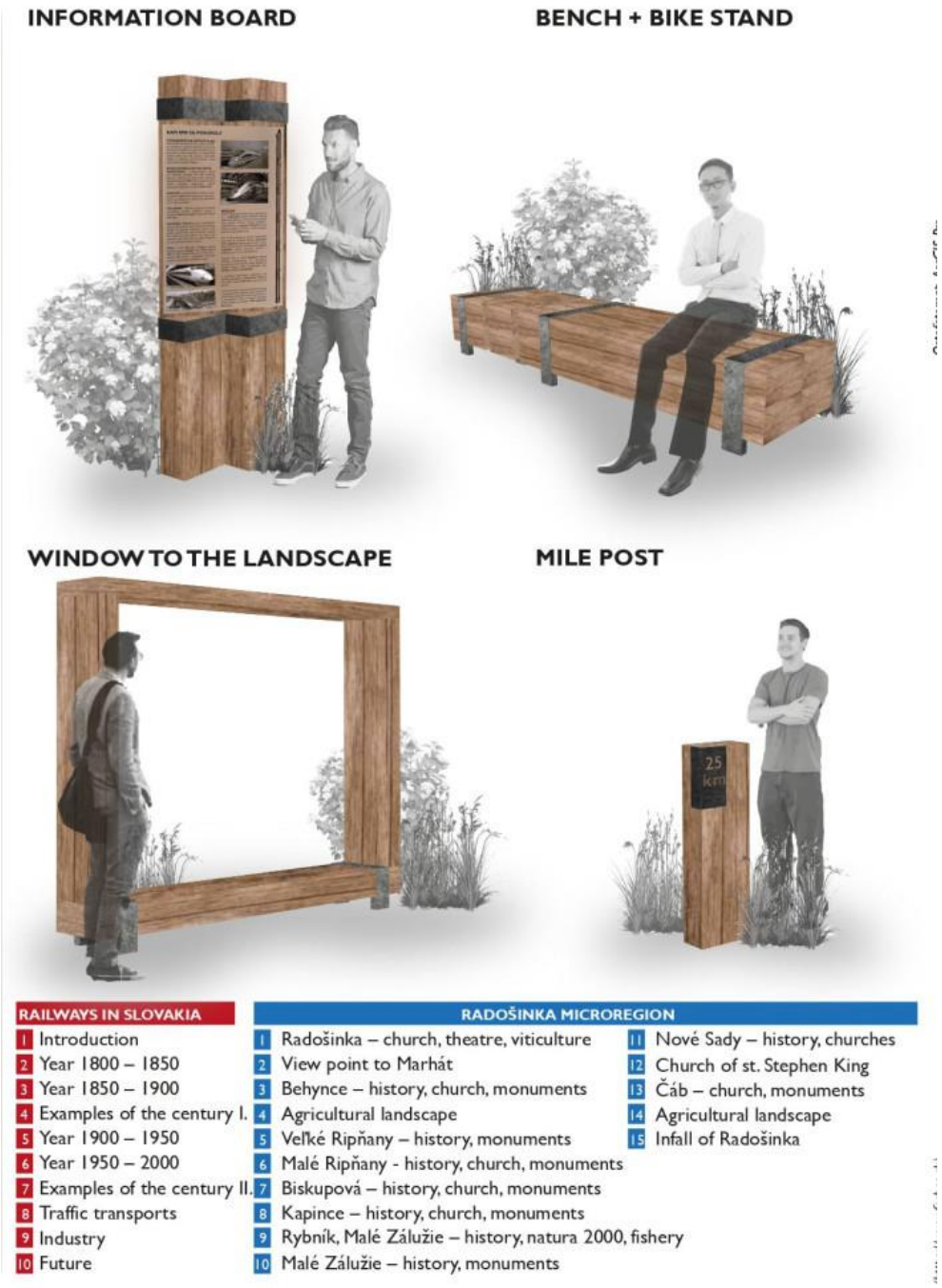

Fig. 3: Equipment proposal and topics of educational boards (Králik, 2022)

Discussion

The revitalisation of the brownfield areas could bring urban environment and landscape new values and various utilisation. The most famous revitalisation of the former railway is High Line in New York, which revitalization has started in 2004 and recently is used as a public park (Outdolf and Darke, 2017). The same function has Promenade Plantée in Paris, starting at Bastille leading to the Pois de Vincennes. It was the world´s first elevated park walkway. The Park am Gleisdreieck, the most popular park in Berlin (Germany), is located on a former railway area around the traffic junction. Another successful examples of redeveloping abandoned railway stations and tracks into museums are Union Station Terminal in Cincinnati and the NC Transportation Museum in North Carolina, United States (Zang, 2020).

The transformation of the former railway lines into to cycle path is a great opportunity how to make landscape accessible, how to promote the local natural and cultural uniqueness and how to offer the dwellers of the villages and tourists possibility for recreation and ecological transportations.

Agricultural landscape was primarily used for food production, currently is more open to the public as a recreational phenomenon with unique value (Supuka et al., 2019).
On the other hand, growing popularity of cycling brings negative effects, especially on natural ecosystems – mostly noise, visual and seasonal disturbances, waste (Mikulka et al, 2021). Also the conflicts between the cyclist, pedestrians and car traffic could occur (Flekalová, 2015).

Conclusion
The landscape architectural proposal of the revitalisation of the former railway lines in Microregion Radošinka, which connect the villages with direct connection to Nitra city could be a great way how to support local communities, widen the recreational possibilities of the dwellers and the tourist and offer the friendly way, how to learn something about the history of the railways in Slovakia and landscape – cultural values of involved villages. New trends of road construction, gaining the information, experience the landscape could be applied during the reconstruction.

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Souhrn
Území se nachází v Podunajské nížině (Nitranský kraj), která je významnou zemědělskou oblastí Slovenska. Všechny obce se proto zabývají především zemědělskou výrobou. Potok Radošinka spojuje jednotlivé obce do mikroregionu Radošinka (celkem 30 obcí) - okresy Nitra a Topoľčany. Na znamení soudržnosti jednotlivých obcí vznikla v jednotlivých obcích řada symbolických památníků

(různých uměleckých děl). Na vodní tok navazuje stará železniční trať, která se od roku 2003 nepoužívá. V každé obci, kterou prochází, je železniční stanice. Na celé trati je 10 železničních stanic. Krajinářsko-architektonické řešení propojuje obce mikroregionu pomocí cyklostezky, která vede podél bývalé železniční trati. V každé obci jsou zastávky s odpočívadly, vybavené odpočinkovým mobiliářem a informačními tabulemi o historii železnice na Slovensku a zajímavostech jednotlivých míst.

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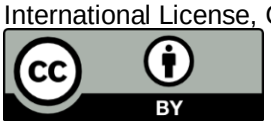

RECREATIONAL USE OF FOREST ROADS IN THE TERRITORY OF NATIONAL PARKS AND PROTECTED LANDSCAPE AREAS

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Abstract
Free use and entrance into the landscape has been allowed for centuries in Czech Republic. Nowadays, recreation use of forests is gaining importance. At the same time, the most interesting parts of the landscape are protected in the form of large-scale protected areas such as National parks or Protected landscape areas (PLA). Significant part of the recreation usage is concentrated on marked hiking trails, cycle paths and other routes in the forest. In protected areas, it is important to preserve the most valuable parts of these areas, and therefore to direct visitors on hiking trails. Forest roads and other forest transport routes are used for these purposes. The presented study analyzes the influence of recreation on forestry infrastructure, especially regarding to the limitation of its use, using the example of National Parks and Protected landscape areas territories.

Key words: forest (haul) road, forest road, recreation, national park

Introduction

As already stated in the author's previous contributions (Bystricky 2020, Bystricky 2021), recreation and leisure use of the forest is a growing phenomenon of modern times. At the same time, this use means a significant limitation in the economic use of the forest and further conflicts arise between the often-conflicting requirements for the forest use. In previous articles, we focused on tourist and cycle tourism use of forest roads from the point of view of regions and natural forest areas.
The most important locations of interest from the point of view of recreation are large-scale protected areas - National parks and Protected Landscape Areas. This is also place, where the greatest number of conflicts arise between different interests – nature protection in general, economic use, and the interests of visitors in terms of recreation and use of free time.

These facts are also reflected in the importance of forest roads in these areas. This is primarily not about the economic use of forest roads and forests in general, but about:
- controlled routing of visitors around the territory,
- enabling economic and conservation activities etc.
- access to the territory from the point of view of the Integrated Rescue System.

This point was highlighted by the fire in České Švýcarsko National Park in 2022.
So what is the situation in national parks and protected landscape areas in terms of the use of forest paths for recreation? What proportion of forest roads is used as a hiking or cycling route?

Tab. 1: National Parks in Czech Republic

NP	Podyjí	6 279
NP	České Švýcarsko	7 928
NP	Krkonošský národní park	36 352
NP	Šumava	68 460

Source: AOPK 2023

Tab. 2: Protected Landscape Areas in Czech Republic

Blaník	4 029
Poodří	8 153
Pálava	8 536
Litovelské Pomoraví	9 330
Moravský kras	9 682
Český kras	13 226
Český ráj	18 170

Blanský les	21 962
Orlické hory	23 323
Labské pískovce	24 261
Lužické hory	27 072
Železné hory	28 473
Brdy	34 501
Jizerské hory	37 415
Kokořínsko - Máchův kraj	41 037
Broumovsko	43 233
Český les	46 555
Slavkovský les	61 109
Křivoklátsko	62 497
Třeboňsko	68 745
Žďárské vrchy	70 889
Jeseníky	74 367
Bílé Karpaty	74 688
Šumava	99 521
České středohoří	106 892
Beskydy	120 510

Source: AOPK 2023

Materials and methods

Similar to the previous contributions (Bystrický 2020, 2021), the basic hypothesis is based on map research, where it can be said that at least part of the hiking routes, cycle routes and other routes use forest transport routes of class 1 L or 2 L.

This fact can be relatively objectively quantified and qualified and is not burdened by subjective assessment or incorrect understanding of a specific criterion. The problem is the different geometry of the linear objects of forest haulage roads and hiking routes, because the analysed data did not come from the same sources and were digitized on different bases.

To assess the similarity of the geometry, the overlap of forest haulage roads and individual types of routes can be used. Only hiking trails and cycle paths within 20 meters of the line of the forest access road will be assessed for verification. All lines at a distance of more than 20 m will be considered as separate lines that do not restrict forest traffic.

The aim of all work and analysis will be:

- To assess the consistency of the course of hiking routes, cycle routes and routes of forest haulage roads,
- To evaluate and to quantify the use of forest access roads for recreation for selected territorial units: national parks and protected natural areas.

The first step to achieve the goals was to assess the geometric similarity or difference in the course of hiking routes, cycle routes and forest transport routes. For this purpose, strips of 5/20 m width - the so-called buffer, where the intersection of the line of these routes with this belt created around the forest roads was investigated.

The second step was quantification – an analysis of the concurrence of hiking routes, cycle routes and forest transport routes at the National Parks and Protected Landscape Areas level and a specific calculation of the length of forest routes that simultaneously serve as hiking routes or cycle routes for recreation.

The third step was the evaluation of the initial results of the previous steps and their comparison.

GIS software was used for all steps. GIS analyses enabled a comprehensive approach to the problem and its objective evaluation.

In all analyses, data from the Regional Forest Development Plan - forest road network and data from the mapy.cz map portal containing TZCH data (marked hiking trails data) and cycle routes in vector display form from mapy.cz/seznam.cz from 2016 were used.

Results

To evaluate the use of forest roads for recreational purposes - for marked hiking routes and cycle routes, the same procedures as for regions and natural forest areas of the Czech Republic were used. It was based on the assumption that the recreational use of the territory can be objectively measured by the length of various hiking, cycling and other types of routes and its overlap with the tracing of forest roads. By comparing their overlap, it was possible to determine the intensity of use of the forest transport network and to determine the degree of restriction in the use of forest roads (Bystrický 2020).

Tab. 3: Lenght of forest roads in National parks and Landcape protected Areas [km]

	Length of forest roads	Length of forest roads	Length of forest roads
	L1L	L2L	Total
CHKO	4 170	6 491	10 660
NP	580	734	1 314
celkem	4 750	7 224	11 974

Source: ÚHÚL 2022,

Tab. 4: Lenght of hiking routes of forest roads in national park and Landcape protected Areas [km]

HIKING TRAILS				
Category	**Name**	**Length of LOC km**	**TZCH po LOC km**	**Share (%)**
CHKO	Beskydy	1 869,85	389,11	20,81
CHKO	Bílé Karpaty	370,07	97,68	26,40
CHKO	Blaník	12,31	4,14	33,63
CHKO	Blanský les	303	59,14	19,52
CHKO	Brdy	537,16	61,59	11,47
CHKO	Broumovsko	187,07	67,53	36,10
CHKO	České středohoří	278,92	143,73	51,53
CHKO	Český kras	23,01	12,04	52,33
CHKO	Český les	658,86	185,24	28,12
CHKO	Český ráj	78,56	63,74	81,14
CHKO	Jeseníky	1144,78	295,03	25,77
CHKO	Jizerské hory	406,88	224,43	55,16
CHKO	Kokořínsko - Máchův kraj	242,63	124,41	51,28
CHKO	Křivoklátsko	543,53	126,71	23,31
CHKO	Labské pískovce	178,85	70,37	39,35
CHKO	Litovelské Pomoraví	122,39	18,22	14,89
CHKO	Lužické hory	246,47	116,1	47,11
CHKO	Moravský kras	83,38	46,58	55,86
CHKO	Orlické hory	291,28	90,79	31,17
CHKO	Pálava	41,81	0,33	0,79
CHKO	Poodří	4,66	0,28	6,01
CHKO	Slavkovský les	373,91	142,86	38,21
CHKO	Šumava	1128,94	346,02	30,65

HIKING TRAILS				
Category	**Name**	**Length of LOC km**	**TZCH po LOC km**	**Share (%)**
CHKO	Třeboňsko	800,31	138,15	17,26
CHKO	Žďárské vrchy	579,47	153,76	26,53
CHKO	Železné hory	152,24	45,93	30,17
NP	České Švýcarsko	73,29	53,54	73,05
NP	Krkonošský národní park	473,17	227,31	48,04
NP	Podyjí	27,23	21,31	78,26
NP	Šumava	740,16	322,39	43,56
	Celkem	11 974,19	3648,46	36,58

Sources: ÚHÚL 2022, mapy.cz 2016

It is clear from the attached documents and analysis that, on average, approx. 37 % of all forest access roads in the National Park and Protected Landscape Areas protected by recreation are occupied by the use of marked tourist routes for their needs. Only the Brdy, Pálava and Poodří PLAs show a low level. On the contrary, higher than average values are achieved by all NPs, but also by the Český Ráj or Jizerské hory PLAs.

Tab. 5: Lenght of cycling/biking routes of forest roads in national park and Landcape protected Areas in km

CYCLOTRAILS				
Category	**Name**	**Length of LOC (km)**	**Cyclotrails of LOC (km)**	**Share (%)**
CHKO	Beskydy	1869,85	304,75	16,30
CHKO	Bílé Karpaty	370,07	61,84	16,71
CHKO	Blaník	12,31	0,75	6,09
CHKO	Blanský les	303	69,3	22,87
CHKO	Brdy	537,16	45,19	8,41
CHKO	Broumovsko	187,07	63,87	34,14
CHKO	České středohoří	278,92	34,06	12,21
CHKO	Český kras	23,01	0,09	0,39
CHKO	Český les	658,86	200,52	30,43
CHKO	Český ráj	78,56	44,86	57,10
CHKO	Jeseníky	1144,78	317,22	27,71
CHKO	Jizerské hory	406,88	152,77	37,55
CHKO	Kokořínsko - Máchův kraj	242,63	91,58	37,74
CHKO	Křivoklátsko	543,53	42,21	7,77
CHKO	Labské pískovce	178,85	35,89	20,07
CHKO	Litovelské Pomoraví	122,39	25,67	20,97
CHKO	Lužické hory	246,47	66,56	27,01
CHKO	Moravský kras	83,38	33,21	39,83
CHKO	Orlické hory	291,28	74,32	25,51
CHKO	Pálava	41,81	0,22	0,53

CHKO	Poodří	4,66	0,73	15,67
CHKO	Slavkovský les	373,91	127,3	34,05
CHKO	Šumava	1128,94	220,13	19,50
CHKO	Třeboňsko	800,31	71,28	8,91
CHKO	Žďárské vrchy	579,47	70,06	12,09
CHKO	Železné hory	152,24	35,48	23,31
NP	České Švýcarsko	73,29	58,74	80,15
NP	Krkonošský národní park	473,17	288,17	60,90
NP	Podyjí	27,23	22,3	81,89
NP	Šumava	740,16	261,01	35,26
	Celkem	11974,19	2820,08	27,37

Source: ÚHÚL 2022, mapy.cz 2016

Similarly, it can be said that approx. 27% of the LOC is used for cycle paths. Only the PLA Brdy, Pálava and Blaník show a low level. On the contrary, higher than average values are achieved by all NPs, but also by the Český Ráj or Moravian Karst PLAs.

Discussion

It is clear from the analyzes that the use of forest haulage roads for recreational purposes is far more significant in the NP than in the PLA. Their use exceeds the average values for all protected areas. Also, some PLAs such as Jizerské Hory and Český ráj use forest haulage roads to a large extent for the management of hiking routes and cycle routes. Unfortunately, this creates conflicts between individual types of sports, but also between forest users and individual types of vacationers. Areas heavily used by tourists require different access to the forest transport network, different surfaces and a different mode of use by forest management.

Conclusion

The submitted contribution concludes a basic series of analyzes that evaluated the use of forest transport routes for the needs of tourism and recreation. Analyzes point to the fact that specially protected areas such as NP or PLA use forest roads more than the average for the Czech Republic. In particular, NPs use Forest Road Network very intensively to guide recreation. The ongoing bark beetle calamity has not yet fully manifested itself in terms of limiting the use of TZCH or cycle routes. It can be assumed that this will happen.

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Souhrn

Turistika a jízda na kole jsou jedny z nejoblíbenějších aktivit obyvatelstva v ČR. Podmínky pro tyto druhy rekreace jsou vynikající. Je to možné i díky volnému užívání a vstupu do krajiny. Významná část tohoto užívání je koncentrována na lesní odvozní cesty a ostatní trasy pro lesní dopravu.

Z předložených podkladů a analýz je zřejmé, že průměrně je využito v rámci ZCHÚ cca 37 % všech lesních cest pro turistiku a cca 27 % pro cyklotrasy. Z hlediska využívání lesních cest je velký rozdíl mezi NP a CHKO. NP využívají lesní odvozní cesty daleko intenzivněji než CHKO. V rámci CHKO jsou velmi specifická rekreačně exponovaná území jako jsou Jizerské hory, Český ráj nebo Moravský kras.

Vznikají konflikty mezi jednotlivými druhy využití území navzájem, ale také mezi uživateli lesů a jednotlivými druhy rekreantů. Území silně turisticky využívaná vyžadují jiný přístup k lesní dopravní síti, jiné povrchy a jiný režim využívání ze strany lesního hospodářství (Bystrický 2020). Lze říct, že v porovnání s pěší turistikou je využívání lesních cest cyklistikou nižší, ale s většími extrémy.

Cílem příspěvku bylo zhodnotit objektivně zatížení území cykloturistikou a rekreací v rámci ZVCHÚ a jak uvádí Bystrický, vytvořit předpoklady pro další zkoumání a pro návrh opatření a postupů

v jednotlivých druzích území tak, aby došlo ke zmírnění tlaků a minimalizaci rozporů mezi různými druhy využívání lesa, které ve svém důsledku takřka znemožňují jeho smysluplné a racionální obhospodařování.
Tyto podklady se již postupně využívají v nově zpracovávaných OPRL. Tak bude možné definovat současná i budoucí konfliktní místa v síti lesních cest a využití území a navrhnout koncept opatření na jejich odstranění a ekonomické dopady jeho realizace (Bystrický 2020).

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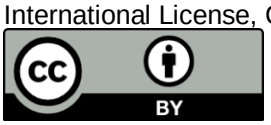

REFORM OF THE CONSTRUCTION ADMINISTRATION IN RELATION TO THE PERMITTING OF BUILDINGS FOR RECREATION

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Abstract
The paper is devoted to the new legal regulation of public construction law and issues related to legislation in this area. In 2021, a new construction law was approved, which should, among other things, reorganize the public construction administration and should simplify the processes of building permits. The law should come into full effect on 1 July 2023. A major amendment to this construction law is currently being approved. Following these changes, the paper focuses on selected issues related to the change in the organisation of the construction administration in relation to the permitting of buildings for recreation.

Key words: Building Act, building authorities, authorities concerned

Introduction

The permitting of buildings, not only buildings for recreation, has long been an area of criticism in the Czech Republic. One of the problems is the length of the permitting process, its complexity (or the difficulty of understanding which specific process is to be used for a specific building) and last but not least the complexity and lack of transparency of the authorities that are supposed to comment on buildings. In recent years, a long process of recodification of public construction law was initiated with the aim of speeding up and simplifying building permitting in the Czech Republic. The legislator, which was the Ministry of Regional Development, proclaimed "one application - one authority - one stamp". The aim was that the builder could submit one application, apply to one authority, which would arrange everything else related to the building permit and then issue one permit, which would include all the requirements necessary for the building.

One of the criticisms of building permitting concerns the number of authorities that a builder has to go to if he wants to carry out a building, even a building for recreation. In general terms, there are several types of building authorities and, above all, a large number of so-called 'concerned authorities' involved in the permitting process. The number of authorities concerned is generally criticised, but this is not entirely accurate. The authorities concerned, as specialised bodies, protect a number of public interests that may be affected by the construction. This raises the question of whether the problem lies in the number of authorities or in the number of public interests protected by law, or in the processes for determining whether a public interest is affected. Resolving this issue could certainly help to eliminate one of the many criticisms.

One of the many proposals to resolve the problem of the large number of authorities involved in the building permitting process was to merge all the authorities involved in building permitting into one large super-agency which would do or ensure all the assessments of the public interest implications itself and would also ensure that the impacts of the permitted buildings on public interests, the impacts of the buildings on private interests, etc. are assessed. Such a planned super-office aroused embarrassment and concern not only among the professional public. Given the very purpose of the existence of the authorities concerned, such a solution did not seem appropriate. The authorities concerned in the individual proceedings are acting from a position of expertise that is usually not available to the building authority. However, since the radical solution was not adopted, it was not necessary to deal with it in practice. The legislative changes were such that only some of the authorities concerned were integrated and some remained in the original regime. At the same time, as will be shown below, there are also changes in the structure of the building authorities that will authorise construction.

Recodification process

In 2019, a legislative process aimed at reforming public construction law began, which was intended to achieve the set goal of simplifying and speeding up the process of building permits. This year saw the publication of the substantive draft of the Construction Law, which introduced new basic rules of public construction law, including a proposal to reform public administration in the construction sector. The legislative process of approving the new regulation was completed on 13 July 2021, when the new approved Construction Act was published in the Collection of Laws under the number 283/2021 Coll.

The new Construction Act came into force gradually, and the comprehensive law was supposed to come into force on 1 July 2023, with the fact that Act No. 195/2022 Coll. approved the so-called transitional period (for the purposes of paragraphs 2 and 3, the transitional period shall mean the period from 1 July 2023 to 30 June 2024), when most constructions will be permitted according to the existing legislation. An extensive amendment to the Building Act No 283/2021 Coll. is currently being approved. The amendment to the Building Act No 283/2021 Coll. has been approved by the Chamber of Deputies (Parliamentary Document No. 330) and is now awaiting consideration by the Senate (towards days 17.4.2023).

Structure of building permitting authorities

The current model of bodies administering in the given area distinguishes between planning authorities and authorities permitting construction projects and the so-called affected bodies, which ensure the protection of selected public interests.

The type of construction (construction activity) depends on the type of construction (construction activity) when determining the competent building authority that will deal with the construction. General constructions (recreational constructions, etc.) are under the jurisdiction of the general building authorities (usually the construction or building regulations department of the municipal authority of the municipality with extended competence or the municipality with a designated municipal authority). Special constructions are dealt with by special construction authorities: waterworks by water authorities (usually the environmental department of the municipal authority), roads by road administrative authorities (usually the transport departments of municipal, city and regional authorities and the Ministry of Transport), railway constructions by railway administrative authorities (the Ministry of Transport and the Railway Authority), and aviation constructions by the Civil Aviation Authority. If there is any doubt as to whether the construction is to be dealt with by the general building authority or by a special building authority, the special building authority will decide. It is important to note that the municipal building authorities and some special building authorities exercise their competence within the so-called delegated competence of the local self-government.

Other subjects involved in the exercise of public administration in the field of construction law are the authorities concerned, which protect public interests whose protection is entrusted to them by special laws. These individual public interests are in many cases constitutionally enshrined in the Constitution of the Czech Republic or the Charter of Fundamental Rights and Freedoms. Since there is not, and cannot be, a single universal public interest common to all administrative authorities, it is necessary to address the consequences of the plurality of public interests which arise from various legal provisions and whose promoters and protectors are at the same time the authorities concerned. The public interests protected by a number of special laws are, for example, health protection, environmental protection, fire safety, protection of monuments, etc.

The model planned under the new Building Act (Act No. 283/2021 Coll.) creates new types of building authorities that should no longer be part of the territorial self-government but should exercise their competence as a direct exercise of state power. There was to be a Supreme Construction Authority as a central authority (the exercise of the central authority's powers was to be transferred from the Ministry of Regional Development to this newly created authority), a Specialised and Appellate Construction Authority, as well as regional (state) construction authorities and other construction authorities. The other construction authorities were to be the Ministry of Defence, the Ministry of the Interior and the Ministry of Justice. Another important aspect was the merger of the general construction authorities and the special construction authorities into one administrative body. For example, the construction authority would now be responsible for permitting the construction of waterworks, while the water authority would permit water management.

The amendment to the new Construction Act currently under discussion prepares another model of the structure of administrative bodies (https://www.psp.cz/sqw/historie.sqw?o=9&t=330). According to the amendment under discussion, the Ministry of Regional Development should remain the central authority. A new Transport and Energy Construction Authority should be created. However, the basis for the exercise of public construction administration should remain within the exercise of delegated competences of territorial self-government units (regional authorities, municipal construction authorities) and other construction authorities should continue to function.

Buildings for recreation and their permitting

Due to the variety of buildings for recreation, for the purposes of this article we will focus on the construction of holiday cottages (according to the Building Act, this building is referred to as a building

for individual recreation) and the construction of a pond (according to the Water Act, the construction of a water work, specifically the construction of a dam dam damming a watercourse). For the purposes of this paper, the form and method of permitting construction projects related to the above described construction is not relevant, but the administrative authorities involved in permitting construction projects are relevant.

Holiday Cottage

Fig. 1: Cottage in Adršpach

In the first case, it is the construction of a holiday cottage (or a building for individual recreation).
The administrative authority that should authorise the construction is currently the municipal building authority (namely the municipal authority of the municipality with the municipal authority in charge, or the municipal authority of the municipality with extended competence). This building authority can also authorise the location of the building and its implementation. The authorities concerned are also involved in the permitting process and should assess in each case whether the public interests they protect are affected.
According to the new Building Act, the permitting authority should be the regional building authority (within the framework of direct state administration). The agenda of the authorities concerned has been largely integrated into the activities of the building authorities, where, for example, the permit for the withdrawal of agricultural land (Act No. 334/1992 Coll., on the protection of the agricultural land fund) from the agricultural land fund for projects permitted under the Building Act (i.e. including a holiday cottage) replaces the permit for the project under the Building Act.
According to the amendment to the Building Act under discussion, the permitting authority should be the municipal building authority (specifically, the municipal authority of the municipality with a designated municipal authority, or the municipal authority of the municipality with extended competence). Some change is expected in the authorities concerned in connection with the new law on the single environmental statement. The essence of this draft law is to integrate the issuance of the administrative acts supporting the authorisation of a construction project under the various environmental laws into a single binding opinion. The environmental agendas integrated into the Construction Act should be separated out from the environmental agendas that will be integrated in a single opinion issued by the competent environmental authority instead of the construction authorities as foreseen in the new Construction Act (Kusák, Mareš, 2023).

Permitting the construction of a pond, resp. construction of a dam damming a watercourse

Fig. 2: Fish pond

Fig. 3: Pond in Křtiny arboretum

According to the current legal regulation, for the construction of a pond (or the construction of a dam dam damming a watercourse), the competent authority to permit the location of the construction is the municipal building authority (municipal authority of the municipality with the authorized municipal authority or municipal authority of the municipality with extended competence, in the delegated competence), and to permit the implementation of the construction is the water authority (municipal authority of the municipality with extended competence, in the delegated competence), which at the same time as permitting the construction permits the water management (water accumulation). The authorities concerned also comment on the construction and protect any interests involved. It is possible to combine the process of permitting the siting of the building and the permitting of the building into a single procedure and thus permit the building (both the siting and the construction) and

the water management in one administrative procedure. The permit can therefore be issued by a single authority.
According to the new legislation (according to the approved valid Building Act No 283/2021 Coll.), the construction of a waterworks should be authorised by the regional building authority within the direct exercise of state administration, but the water management should be authorised by the water authority within its delegated competence (namely the municipal authority of the municipality with extended competence). The authorities concerned will be partly integrated into the competence of the building authority.
The authorisation for water management, which can only be exercised by using a water body (which is the case of the dam damming of a watercourse that we have mentioned), is a condition for the enforceability of the authorisation of the water body under the Construction Act. The water management permit ceases to be valid if the planning permission under the special law does not come into force within 3 years from the date on which it became legally valid.
According to the amendment to the Construction Act under discussion, the construction of a waterworks should be authorised by the construction authority (municipal authority of a municipality with delegated municipal authority or municipal authority of a municipality with extended competence in delegated competence), but the water management permit should be issued by the water authority (municipal authority of a municipality with extended competence in delegated competence). As an improvement over the version in the current Building Act No 283/2021 Coll., it can be considered that both authorities will decide in the so-called delegated competence and there will be a certain possibility (after meeting a number of conditions) to combine these procedures into one under the Administrative Code (Act No 500/2004 Coll.). The above described suspension of the enforceability of water permits will apply equally.

Conclusion

The new Building Act will certainly bring some simplification in relation to the processes of permitting buildings (not only) for recreation. On the other hand, it is necessary to reflect on whether the planned simplification will also take place in relation to the institutions involved in the permitting process. Given that the new structure of building authorities has not been and will not be created as planned by the new Building Act, it is worth reflecting on the benefits of the approved amendment.
When comparing the current situation in the context of permitting holiday cottages (building for individual recreation) with the planned change, it is obvious that there will be no fundamental change concerning the authorities. The building authority authorising these structures will continue to be the municipal building authority.
When comparing the current legislative situation with the planned legislative situation for the permitting of the pond (dam), we conclude that it will be a more complicated process than at present. The main problem is the separation between the permitting of the construction itself and the permitting of water management (water storage). Under the current legal situation, one authority can authorise both, whereas the new system will involve two authorities.
Given the uncertainties surrounding the changes to the Building Act, initial application confusion can also be expected. It is worth considering whether the reform of the construction administration should not be done more comprehensively, with greater care and attention to the possibilities and requirements of practice.
The originally proposed changes to the construction administration, which aimed at deconcentrating the construction administration and separating it from the system of delegated competences, were certainly a well-intentioned solution, but the actual incorporation into legislation has not brought the desired expectations. For this reason, a major amendment to the new Building Act was also tabled in 2022, which changes the newly proposed system and brings it back under the delegated competence of municipalities.

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Souhrn
Nový stavební zákon zajisté přinese určité zjednodušení ve vztahu k procesům povolování staveb (nejenom) pro rekreaci. Na stranu druhou je nutné se zamyslet, zda také dojde k plánovanému zjednodušení ve vztahu k institucím, které se na procesu povolování podílí. Vzhledem k tomu, že nevznikla a ani nevznikne nová struktura stavebních úřadů, tak jak plánoval nový stavební zákon, je vhodné se zamyslet nad přínosem schvalované novely. Když porovnáme stávající situaci v rámci povolování rekreačních chat (stavba pro individuální rekreaci) s plánovanou změnou, je evidentní, že k zásadní změně týkající se úřadů nedojde. Stavebním úřadem povolujícím tyto stavby bude i nadále obecní stavební úřad.
Při porovnání stávajícího legislativního stavu s plánovanými legislativními změnami v rámci povolování stavby rybníka (hráze), docházíme k závěru, že se bude jednat o proces komplikovanější než nyní. Problém je hlavně v oddělení povolování samotné stavby a povolování nakládání s vodami (akumulace). Dle současného právního stavu obojí může povolit jeden úřad, kdežto nově to budou dva úřady.
Vzhledem k nejasnostem panujícím ohledně změn ve stavebním zákoně, lze také čekávat úvodní aplikační zmatky. Je k zamyšlení, zda by se neměla reforma stavební správy udělat komplexněji s větší pečlivostí a s důrazem na možnosti a požadavky praxe.

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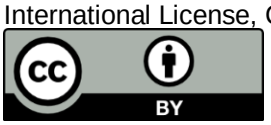

REVITALISATION OF DRAINED FOREST AREA

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Abstract
The article deals with a possible way of revitalisation of the drainage system established in the past in the locality "Křížovna" in the cadastral area of Čejkov in the Vysočina region. The area is located at an altitude of 649 - 657 m above sea level, the affected area is 1.33 ha and has the character of a spring area. Currently, there is a mixed forest with a predominance of conifers of approximately 50 - 100 years of age. In the past, the site was drained by a system of ditches which were connected to a sunken unnamed stream. In the context of ongoing climate change, the drainage system has lost its purpose. It is desirable to retain water rather than to facilitate its accelerated runoff. Revitalisation measures of a purely natural manners have been implemented using local materials. Simple types of measures have been used to create, among other things, pools, loosened flow paths, cross dams, etc. The text describes the individual types of solutions. In the design process, the individual measures were sensitively chosen so as to minimise interference with mature vegetation. The technical element was the implementation of a ford on the existing logging road and the reconstruction of a culvert under the forest road. The revitalisation measures aim to initiate naturalisation processes both in the stream bed and in the ditches.

Key words: Drainage, ditch, pool, ford

Introduction

The drive for intensive farming has not escaped forest complexes in the past. In order to be able to plant economic forest in the form of a predominantly spruce monoculture, some areas had to be intensively drained. In the area in question, a network of drainage ditches was built, connected to a nameless stream whose bed was straightened and deepened. The single network was easy to maintain (cleaning the channel of sediment), drained rainwater more quickly and lowered the water table.
In the context of the climate change we are facing today, the emphasis is on retaining water in the landscape and slowing down the flow of rainwater. The revitalisation of sites where drainage on forest land has been carried out in the past is therefore very topical.

Materials and methods

The area is located in the district of Pelhřimov, west of the village of Čejkov, in an undeveloped area at an altitude of 649 - 657 m above sea level (Křížovka forest complex, GPS localization: 49.376 N,15.310 E). The area affected by the project (1.33 ha) has the character of a spring area in which a network of sunken, straight drainage ditches has been built in the forest complex. An unnamed left sided tributary of the Nemojovský stream flows through the area and is the subject of revitalisation measures together with the drainage network. The stream itself is straightened and deepened. At present, there is a mixed forest with a predominance of conifers of approximately 50 to 100 years of age (*Picea abies*, *Abies alba*, *Fagus sylvatica*, *Alnus glutinosa*, *Betula alba*). The stand is accessible via the forest transport network - forest road 2L Do Křížovky, logging roads and extraction racks. On the transport network there are necessary elements of transverse drainage - concrete and steel pipe culverts without headwalls.

Hydrology

The territory is located in the Vltava river basin, sub-basin of the IV. category of the ČHP 1-09-02-011. The watercourse affected by the project is an unnamed watercourse (IDVT 10256758), LP Nemojovský stream. The revitalisation measures are situated in the source area (approx. river km 1.375-1.740 according to the existing stationing), where the construction works were realized in the forest complex in the past – excavation of a network of sunken, straight drainage ditches. The site suffers from accelerated surface runoff from the source area. At stationing r.km 1.475, the unnamed stream is crossed by a forest road and a non-capacitated pipe culvert in poor technical condition, carried through the earthen road body. The administrator of the affected section of the watercourse is the Lesy ČR s.p. organization.

Results

The purpose of the proposed measures is to modify the water regime of the site in the form of simple terrain modifications with the aim of slowing down the surface water runoff through the existing network of sunken drainage ditches with accompanying effects (increasing the retention capacity and ecological stability of the landscape, restoring the diversity of biotopes and increasing the biodiversity of the site).

On the unnamed stream in the stationing km 1.375 - 1.740, controlled renaturation will take place in the approximate length of 450 m (Fig. 1) - adjustment of the parameters of the sunken channel, restoration and creation of nature-like shapes and natural functions.

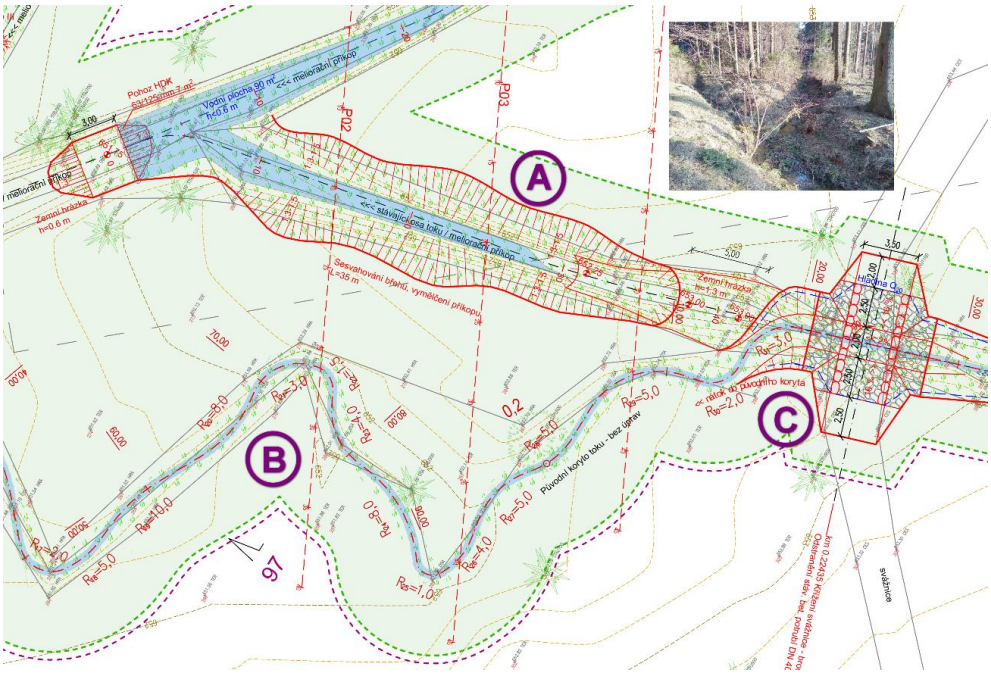

Fig. 1: The part of the project situation plan: A - revitalisation of drainage ditches; B - stream original alignment support; C - rockfill ford

The aim of the proposed routing solution is to return the channel to its original alignment, which is still visible in the terrain. The proposed alignment is characterised by its irregularity, with alternating counter-curves of small radii that follow the original trace and local depressions. The existing bed of the stream channel will be raised by sloping the steep side slopes to create a shallow natural channel with irregularly alternating slopes with maximum slopes of 1:3 - 1:5 or less. Grading and earthworks will not be carried out along the entire length, but only in sections, locally.

In the sections following the original alignment, i.e. outside the current channel, these shallow depressions of variable widths of 0.5 - 1.5 m will only be stripped of organic matter with a thickness of 0.10 - 0.15 m. Due to the nature of the expected revitalisation effects, manual execution is recommended in these sections (Fig. 2).

At the point where the proposed alignment diverges from the existing deepened channel, a dike will be created or filled with surplus soil in a length of at least 5 m, in order to prevent preferential flow of water through the deepened channel and, on the contrary, to direct the flow into the original shallow channel.

By modifying the directional design, the resulting route will be lengthened and the longitudinal slope of the bottom will be reduced, which has a positive effect on the water regime of the site - slowing down the runoff and increasing the retention capacity of the area, restoring natural hydrological processes.

Revitalisation measures on the network of drainage ditches in the scope of the construction include their local widening and raising of the bottom - partial or full backfilling with soil together with the insertion of stumps into the existing channel. Excess soil will be deposited, resulting from the modification of the transverse profile of the ditches (reducing the slope of the steep side slopes), or by excavating pools in local depressions. In total, approximately 200 m of the drainage ditches will be rehabilitated, which will have the character of shallow depressions or their flow profile will be filled in completely.

At the crossing point of the watercourse with the forest road 2L Do Křížovky (stationing km 1.475), the road will be excavated there and the existing concrete pipe culvert will be reconstructed, since the

technical condition and parameters do not comply with ČSN 73 6108 Forest road network. A pipe culvert will be built with a flow capacity of Q_{20} according to the applicable related regulations (dimensioned according to hydrological data of the Czech Hydrological Institute).
At the river km 1.550, the non-functional concrete pipe culvert on the existing logging road will be removed. A ford was proposed at the stream crossing, constructed as a rockfill with erosion resistant aprons (rockfill).

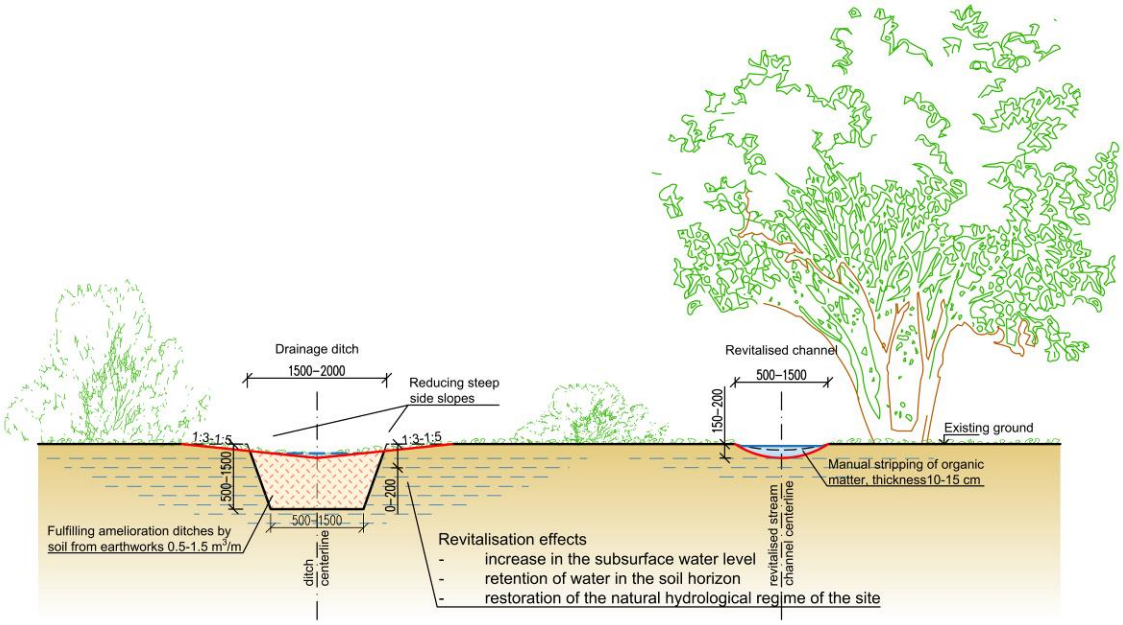

Fig. 2: The sample cross-section of selected revitalisation measures – the technical solution

Discussion
It is still very important to remind the public, both professional and non-professional, the important role ameliorations play in our now predominantly cultural landscape. Even today, there are places where we cannot operate economic activities without these measures. Ameliorations include drainage, irrigation, erosion control measures, damming of torrents and gullies, etc.
However, there are places where these structures have lost their significance and, in the light of today's climate changes, their function. Today's landscape management is no longer focused on 'yield' alone, but seeks to preserve the natural functions of the landscape as part of sustainable management development. Thus, even on some forest land, the revitalisation of amelioration systems is realized.
Even today, in a number of places, it is appropriate to make use of amelioration measures. But it doesn't always have to be technical solutions like in the past. Forestry ameliorations are intended to improve habitat conditions, particularly by applying the reclamation function of suitable forest trees and stands. This includes all types of protective afforestation, the establishment of buffer strips and the greening of buildings and settlements. Forest ameliorations also include the adjustment of the water and air regime on temporarily and especially permanently waterlogged forest soils. Drainage is an organic part of purpose-built forestry structures and the forest transport network.

Conclusion
The purpose of the proposed measures is to modify the water regime of the site in the form of simple terrain modifications with the aim of slowing down the surface water runoff through the existing network of sunken drainage ditches with accompanying effects (increasing the retention capacity and ecological stability of the landscape, restoring the diversity of biotopes and increasing the biodiversity of the site). In the stream channel, the parameters of the deepened and straightened channel will be adjusted in the approximate length of 450 m, restoring and creating nature-like shapes and natural functions. The aim of the proposed routing solution is to return the channel to its original alignment, which is still visible in the terrain.
The revitalisation measures on the network of drainage ditches in the scope of the construction consist of their local widening and raising of the bottom - partial to full backfilling with soil together with the insertion of stumps into the existing channel. Redundant soil from the modification of the transverse

profile of the ditches (reducing the slope of the steep side slopes) or by excavating pools in local depressions will be deposited in the deepened network of ditches. In total, approximately 200 m of the drainage ditches will be rehabilitated, which will have the character of shallow depressions or their flow profile will be filled in completely. Grading and earthworks will not be carried out along the entire length, but only in sections, locally.

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ČSN 73 6108 Forest road network
https://www.mezistromy.cz/slovnik/meliorace

Souhrn

Řešená lokalita nedaleko obce Čejkov v okrese Pehřimov, má charakter pramenné oblasti, ve které byla v lesním komplexu zbudována síť zahloubených, napřímených odvodňovacích příkopů. Územím protéká bezejmenný levostranný přítok Nemojovského potoka, který je spolu s meliorační sítí předmětem revitalizačních opatření.
Účelem navržených opatření je úprava vodního režimu lokality formou jednoduchých terénních úprav s cílem zpomalení povrchového odtoku vody stávající sítí zahloubených odvodňovacích příkopů s doprovodnými efekty (zvýšení retenční schopnosti a ekologické stability krajiny, obnova rozmanitosti biotopů a zvýšení biodiverzity lokality). Na bezejmenném toku proběhne v přibližné délce 450 m úprava parametrů zahloubeného koryta, obnova a tvorba přírodě blízkých tvarů a přirozených funkcí. Cílem navrženého směrového řešení je návrat koryta do své původní trati, která je v terénu stále patrná.
Revitalizační opatření na síti melioračních příkopů v rozsahu stavby představuje jejich lokální rozšíření a zvýšení dna – částečný až úplný zásyp zeminou spolu s vložením pařezů do stávajícího koryta. Uložena bude přebytečná zemina, vzniklá úpravou příčného profilu příkopů (zmírnění sklonu bočních svahů), případně hloubením tůní v lokálních depresích. Celkově bude sanováno cca 200 m melioračních příkopů, které budou mít charakter mělkých průlehů, případně bude jejich průtočný profil vyplněn zcela. Terénní úpravy a zemní práce nebudou prováděny v celé délce, ale pouze úsekově, lokálně.
V kontextu klimatických změn, kterým jsme dnes vystaveni, je kladen důraz na zadržování vody v krajině a zpomalení odtoku srážkových vod. Revitalizace lokalit, kde bylo v minulosti provedeno odvodnění na lesních půdách je tedy velmi aktuální.

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REVITALIZATION OF THE PARK IN THE CENTER OF IVANKA PRI DUNAJI

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Abstract
Square of Fallen Heroes represents a central municipal space in Ivanka pri Dunaji, which was the subject of a solution by students of the Institute of Landscape Architecture from the Slovak University of Agriculture in Nitra on the basis of an assignment from the municipality of Ivanka pri Dunaji. The location of the village within the settlement system of Slovakia is part of the most developed Bratislava-Trnava settlement agglomeration. The aim of the revitalization of the central park area in the village is to make the space for rest and recreation more attractive for people of different age categories and at the same time to integrate it into the busy area, surrounded by frequent communication routes. Design solutions reflect the requirements of building a landscape-architectural concept in the center of the village, in accordance with current urban trends, which emphasize, in addition to aesthetics, the absorption and retention of water in the territory and the need to eliminate the negative effects of climate change.

Key words: recreation, landscape architecture, environmental education, greenery in the village

Introduction

The public space in the village represents an important living space for the general public. The central spaces of municipalities are also a business card of the cultural, social and society-wide interest of citizens and self-government in public space (Kuczman, Feriancová, 2019). The countryside faces the challenge of renewing its landscape circularly and sustainably (Tóth, 2022b, Čibik et al. 2022). The rural landscape and rural settlements face current global challenges such as climate change or reduction of biodiversity (Rózová et al., 2020, Kuczman, et al., 2022, Tóth, 2022a, Šinka et al., 2019). They face the important task of fulfilling the goals of sustainable development (Schneider, Kalasová, Fialová, (2020), Mariš, 2022), especially the creation of sustainable municipalities and communities. For almost two decades, the attention of municipalities has been focused on the restoration of public spaces from European financial resources (Marišová et al., 2023). These interventions often significantly influenced and changed the image and morphology of the Slovak countryside (Bechera et al. 2022, Bihuňova et al., 2021, Kuczman, Bechera, Rusko, Feriancová, 2021). The European Union announces the ambition of green renewal of the country and countryside, either through the Common Agricultural Policy (CAP) and its eco-schemes or in the context of the EU Strategy for Green Infrastructure (Čibik et al., 2020, Tóth, 2022a) and biodiversity by 2030. Financial mechanisms in in the form of structural funds, operational programs or payments for ecosystem services, including direct payments are available. Other financial and project mechanisms such as LEADER/CLLD, Interreg, Life and others are available, which focus on sustainable local development. At the national level, the Village Renewal Program and the Village of the Year competition, organized annually by SAŽP and ZMOS, with the possibility of winning the European Prize for Village Renewal (Gudábová et al., 2022, Majernik et al., 2020), have played an important role for a long time. According to the European Landscape Convention, the Slovak countryside has both everyday and exceptional landscapes. One such challenge for the revitalization of the park space was the central space in the village of Ivanka pri Dunaji. As part of the design study, we analyzed and evaluated the current situation of this central space in a rural residence and developed two different design solutions, which are presented and interpreted in more detail in this paper (Kuczman et al, 2020).

Materials and methods

The Department of Landscape Architecture entrusted the management of the municipality of Ivanka pri Dunaj SPU in Nitra with the request to process the revitalization of the park area. The subject of green renewal of a rural residence as a compulsory subject in the second stage of the master's study is focused precisely on the landscape-architectural modifications of public spaces in rural-type residences. The village of Ivanka pri Dunaji is situated in the south-western part of Slovakia, beyond the border of the capital Bratislava, see Fig.1. The village is part of the most developed Bratislava-

Trnava residential agglomeration, and the so-called the Seneca belt, formed by villages located along the D1 highway. It belongs to the area of the Danube Plain.
In the adjacent areas of the area of interest, there are several cultural and historical landmarks such as the mansion, which is a romantic building in the park with a distinct silhouette, and on the other side of the park there is a Roman Catholic church. The social, cultural and sports life of the village is implemented through a wide range of activities of the local government, voluntary, interest and civic associations, which have also shown interest in the revitalization of the park. Citizens are actively involved in the activities of local associations within the Economic Development and Social Development Program of the Ivanka pri Dunaji municipality. The airport M.R. Štefánika is located in the immediate vicinity of the village. The area of the planned park is 17,230 m2.

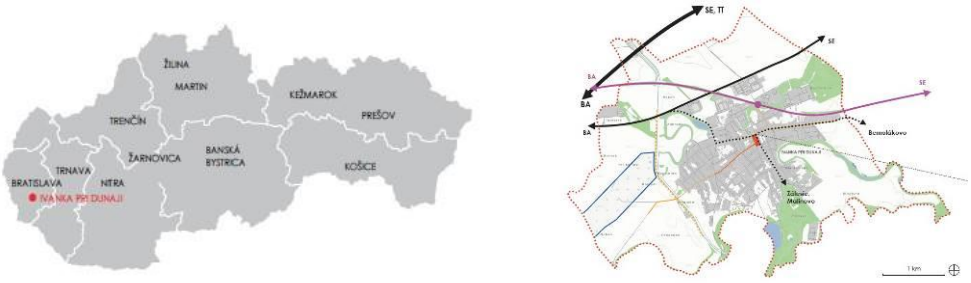

Fig 1: Localization of the addressed territory within the Slovak Republic

From the point of view of the research by design approach, the goal of the paper is to define the key principles of design that students apply in their design solutions (Kuczman, 2018). The method consisted of two main parts: 1) analysis (wider relationships, historical, functional, spatial, traffic, visual and landscape analysis and a detailed inventory of woody plants and with measures for cutting and treating trees. 2) design (students worked in a design group that developed two different design concepts (Kuczman et al., 2020).

Results

The result of the creative activity of students from the master's degree was creative solution proposals in two creative variant solutions. They presented new functional uses of the park space to the general public, the so-called park of fallen heroes and adjacent street spaces. The proposed park space introduces new possibilities of recreational use into the space, taking into account the requirements of the residents and the municipality for the functional use of the territory, with a connection to the cultural-historical elements and objects in the space and in the surrounding area. The overall concept of the floor plan solution is shown in fig. 2.
A total of 87 trees were inventoried in the park, of which 17 species and 11 species of trees were grouped in the form of dense plantings. The main interventions in the greenery were directed mainly to the removal of severely damaged trees that threatened the safety of people in the space and to the illumination of the park, especially on the lower floor, in order to ensure the openness of the space in the park and highlight the main lines of sight to the surrounding cultural and historical objects. 66 pieces of trees, 883 pieces of bushes in the form of green walls ensuring the protection of the area from the frequent surrounding traffic were added. The color effect in the park area is completed by 2156 pieces of perennials in the form of mixed perennial beds and 7777 pieces of bulbs with a spring appearance. The revitalized park creates a recreational environment for people of different age groups. The park space is divided into several functional areas that offer a number of active and passive options. The southwestern part of the park offers citizens a gathering space with stands and seating, visualisation, see Fig. 3.
The designed space forms a connecting area between the surrounding church garden and a small market, which ensures social contact of the residents. At the same time, it is also one of the entrance areas to the park. The park is crossed by the main path, along which there is a cycle path that connects to the surrounding areas. The walkway was transformed from the old castle road, which in the past formed an important connecting element towards Bratislava. The routing is preserved, but adapted to a green solution, as the function of the connecting roads is currently already the surrounding roads. Along this connecting line, mixed perennial beds are designed to complete the park in color. From this trail, there are several interesting views of the surrounding cultural-historical objects, such as the mansion built in the Rococo style in the third quarter of the 18th century for the Grassalkovich family. Communication results in another meeting space with a dominant monument to

fallen soldiers in the SNP. The internal structure of the park forms a space shaded by original trees with dense crowns, which create a pleasant environment for residents to relax. This potential was used for different age structures of people, such as: play areas for children with additional small architecture, a space for relaxation and rest with a footpath, see Fig. 4, in the next zone, a space for dog walkers.

Fig 2: Situation plan of landscape architecture developed by students (Authors: Angyal, J., Stanček, T., Sršňová L., teacher / head of the design studio: Gabriel Kuczman, Denis Bechera)

Fig. 3: View in the southwestern part of the park of the meeting area with stands and furniture (Authors: Angyal, J., Stanček, T., Sršňová L., teacher head of the design studio: Gabriel Kuczman, Denis Bechera)

Fig. 4: Visualization of the park area with use for relaxation surrounded by greenery (Authors: Angyal, J., Stanček, T., Sršňová L., teacher / head of the design studio: Gabriel Kuczman, Denis Bechera)

Ecological solutions in the park are enhanced by a dry polder, a terrain depression in the shape of a channel, which would capture rainwater and at the same time would be an interesting attraction of the space. Mixed perennial beds are proposed for the banks, which would cover the slope along the entire space. The proposals were presented to local residents, members of the municipal assembly and the mayor at a regular meeting of the local government in the village of Ivanka pri Dunaji, who initiated the possibility of realizing this park area in the village.

Conclusion

Enhancing central parks in municipalities is an essential part of supporting social life in municipalities. The case studies were consulted by representatives of the local government and the citizens of the village, which resulted in concrete landscape-architectural solutions. This paper presents the main results of the process of analytical and creative thinking of students in the master's degree at ÚKA SPU in Nitra.

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Souhrn
Příspěvek představuje krajinně-architektonická řešení centrálního parkového prostoru ve vesnici Ivanka u Dunaje. Požadavkem na zpracování revitalizace parkového prostoru pověřilo vedení samosprávy Ivanka při Dunaji SPU v Nitre Ústav krajinné architektury, který ve spolupráci se studenty v rámci předmětu Obnova zeleně venkovského sídla zpracovaly kreativní návrhy s důrazem na rekreaci a podporu sociálního využití parku nejen místním obyvatelům. Případové studie byly prezentovány veřejnosti, poslancům obecního zasedání na zasedání samosprávy v obci Ivanka u Dunaje, který inicioval možnosti realizace parkového prostoru na venkově.

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RISK ASSESSMENT ON GEODIVERSITY SITES

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Abstract

Geoconservation is an action of conserving and enhancing geological, geomorphological, hydrological and soil features and processes. Particular geoconservation measures are very often applied on the site-level to protect important geodiversity sites. Nevertheless, despite established legal protection and related geoconservation activities, threats to geodiversity sites related to the multiple use and human society demands can arise and reaching a compromise can be difficult. In this contribution, a two-level threat assessment is applied and discussed. The first level of threat assessment is based on the already used criteria within geosite/geomorphosite concept. The second level of threat assessment is represented by Risk Assessment Matrix, which may be considered a useful tool providing a complex view on the threats to geodiversity sites. The methods are applied on two different sites and their advantages and limits are discussed. Based on the assessment, specific management proposals may be implemented in order to balance conservation needs and demands resulting from human activities related to the sites.

Key words: geoconservation, risk assessment matrix, degradation risk, geosites, geomorphosites

Introduction

Currently, declaring a natural site or area as legally protected is considered as one of the effective tools of how to protect valuable geodiversity phenomena from negative impacts. However, despite the existing and established legal protection, there is still a range of possible threats to geodiversity and geoheritage, both of natural and anthropogenic origin (Gray 2013, García-Ortiz et al. 2014, Fuertes-Guttiérez et al. 2016, Crofts et al. 2020). Thus, the identification, assessment and management of these threats, risks and conflicts of interests should become an integral part of every geoconservation effort which can contribute to the balance of all the needs and demands on the site or area. In our case study, we use a two-level methodological approach to risk assessment: the first one is represented by assessing degradation risk based on geosite/geomorphosite approach (Selmi et al. 2022) and the second level is represented by assessment of identified threats by using the Risk Assessment Matrix (Kubalíková and Balková 2023). These methods are applied on two different sites situated in the South Moravian Region: Ledové sluje in Podyjí National Park and Rudice-Seč Natural Monument. Based on the results, specific management measures can be proposed and the advantages and limits of both approaches are discussed.

Methods

The method used for this case study consists of the following steps:

1) Description of geodiversity phenomena on the site including the identification of threats (especially based on the fieldwork);
2) Assessment of the degradation risk by using the criteria based on the geosite/geomorphosite concept (Kubalíková and Balková 2023, Table 1);
3) Assessment of the threats to geodiversity by using the Risk Assessment Matrix (Figure 1);
4) Interpretation of the results, proposals for risk treatment, further management and monitoring.

Study areas

The proposed methodological approach is applied on two different legally protected geodiversity sites (Figure 2): Ledové sluje (a site with limited anthropic influence) and Rudice-Seč (a site intensively used by public).

Ledové sluje (“Ice caves”) are situated in the heart of Podyjí National Park (NP) declared in 1991. The site is formed by Bíteš orthogneiss of the Dyje Massive and it is shaped as a rocky spur. On the slopes, numerous cryogenic landforms (frost cliffs, debris fields) can be found. The meandering Dyje River has influenced the static of the slopes and the sequence of subsidence movements occurred

during Late Pleistocene creating numerous cavities and pseudokarst phenomena. Generally, the biodiversity (resp. species diversity) is very high thanks to the diversity of the geomorphological and specific microclimatic conditions: 159 species of lichens, 133 species of moss, 28 species of liverworts, 502 species of vascular plants, 58 species of spiders and 39 species of mammals. The occurrence of 21 relic species of *Araneae* (spiders) and specific case of vegetative reproduction of spruce (*Picea abies*) make the site unique from the biodiversity point of view. Although the site is still affected by active geomorphological processes (e.g. slow slope movements or occasional rock fall; last one in February 2021), they do not disturb the site in general. Currently, the site is not accessible for tourists (Nováková et al. 2018, Reiterová et al. 2022), however it is visited illegally by an average of 50 visitors per month, in exposed months (summer) it is more than double. An interesting fact is that there are some visits even during winter season. The only accessible place within the site is the upper part with a marked path and a viewpoint.

Rudice-Seč is an abandoned sandstone and caoline pit declared as Nature Monument in 2022. So called Rudice Beds lie on an undulating relief with deep karst depressions which are supposed to originate during Lower Creatceous (one of the oldest known period of karstification within the Bohemian Massive). The Rudice Beds consist of remains of laterite-kaolinite weathering products, forming limonite layers at the base which were extracted by prehistoric people already in Halstat period. The layers of kaolinic quartz sands, reddish coloured ferruginous sandstones and colourful kaolinic clays contain numerous flints, hornblende concretions and quartz geodes (so called Rudice balls) which are attractive for mineral hunters. On the upper part, lenticular layers of quartz pebble gravels and loess clays of variable strength appear. The site is important from stratigraphical, paleontological and mineralogical point of view (Czech Geological Survey 2023, AOPK 2022). The bottom of the pit is flooded, creating a specific ecosystem important for protected species (*Bombina bombina*) and suitable for the reproduction of amphibians. The unstable slopes are covered by pioneer vegetation (birches, aspens, pines) and protected *Lycopodium clavatum* can be found here. The site is very well accessible and very often visited by tourists.

Tab. 1: Degradation Risk assessment criteria: each criterion is evaluated on the scale from 0 to 1, a total sum then represents a degree of risk degradation; if the sum exceeds 4.5 points, the site is considered endangered

criterion	scoring
Integrity	0 – excellent conditions; 0.25 – good conditions; 0.5 – medium, average conditions; 0.75 – bad conditions, but with a possibility to recover; 1 – bad conditions, site is damaged
Accessibility	0 – more than 1 km both from a parking place and stop of public transport; 0.5 – the stop and/or parking in the distance 0.2 and 1 km; 1 – the stop and/or parking place no more than 0.2 km from the site
Current threats and their management	0 – site practically not endangered; 0.25 – low anthropic and natural threats; 0.5 – potential threats, but managed well or possible to decrease; 0.75 – current anthropogenic threats but existing plans how to decrease them; 1 – existing and ongoing processes leading to the destruction of the site with no plans to recover
Legal protection	0 – protected on national level; 0.25 – protected on regional level; 0.5 – protected on municipal level; 0.75 – ongoing monitoring of the site; 1 – no legal protection
Proximity to problematic areas	0 – site located less than 1 km of a potential degrading area/activity; 0.5 – site located less than 0.5 km of a potential degrading area/activity; 1 – site located less than 0.2 km of a potential degrading area/activity
Current use	0 – 1 activity; 0.5 – 2 different activities; 1 – 3 and more different activities
Visitation	0 – low; 0.5 – medium; 1 – high
Number of threats	0 – no threat; 0.25 – 1 threat; 0.5 – 2 threats; 0.75 – 3 threats; 1 – 4 and more different threats
Use limitations	0 – the use is very hard due to limitations difficult to overcome (legal, permissions, safety etc.); 0.5 – the site can be used occasionally after overcoming limitations; 1 – no limitations for public use

PROBABILITY						
	Highly probable	5 Moderate	10 Major	15 Major	20 Severe	25 Severe
	Probable	4 Moderate	8 Moderate	12 Major	16 Major	20 Severe
	Possible	3 Minor	6 Moderate	9 Moderate	12 Major	15 Major
	Unlikely	2 Minor	4 Moderate	6 Moderate	8 Moderate	10 Major
	Rare	1 Minor	2 Minor	3 Minor	4 Moderate	5 Moderate
		Very low	Low	Medium	High	Very high
				IMPACT		

Fig. 1: Risk Assessment Matrix: for every identified threat, the probability and impact is established, the product then indicates the level of risk

Fig. 2: Geodiversity sites: Ledové sluje in Podyjí NP (pseudokarst phenomena), Rudice-Seč NM (kaolinic clays and sands)

Results

For both sites, existing and potential threats have been identified based on the fieldwork and literature review (e.g. Crofts et al. 2020, Kubalíková and Balková 2023 and references therein). The results of the degradation risk assessment and evaluation of particular threats are presented in Table 2 and 3.

The site Ledové sluje has reached a relatively low degree of degradation risk, main identified threats are represented by current use and a number of different threats. However, when looking at Table 3, it is evident that the site is very vulnerable – some potential threats (construction, landuse change) would generate rather higher impact even if their probability is low. In such cases, these threats have to be considered and taken into account. Nevertheless, mainly thanks to the existence of legal protection and official limited accessibility, the risks are on moderate level. The possible solutions can be the fostering nature guides that would give penalties to the illegal entries to the site. Perhaps it would be appropriate to define dangerous and critical places within the site of interest with regard to the stability of rock blocks and walls. Other threats are difficult to influence (e.g. change of mesoclimatic conditions).

Tab. 2: The assessment of the total level of degradation risk (using the concept of geosites)

Criterion:	Int	Acc	Thr	Leg	Prob	Use	Vis	Num	Lim	**Sum**
Ledové sluje	0	0	0.5	0	0	0.5	0.5	0.75	0	**2.25**
Rudice-Seč	0.5	1	0.75	0.25	0.5	1	1	1	1	**7**

Tab. 3: Risk assessment of identified threats (using the Risk Assessment Matrix)

Threat to geodiversity	Prob	Imp	**Sum**	Prob	Imp	**Sum**
	Ledové sluje			***Rudice-Seč***		
Urbanisation, construction	1	5	**5**	2	5	**15**
Mining, re-opening the quarry or pit	n/a	n/a	**n/a**	1	5	**5**
Changes in land use management on site and in close proximity	2	5	**10**	3	5	**15**
Recreation, tourism (littering, breaking the rules)	3	5	**15**	5	5	**25**
Change of mesoclimatic conditions	3	5	**15**	3	5	**15**
Geomorph. processes: erosion, accumulation	4	1	**4**	5	1	**5**
Restoration of pit (landfill, restoration of agriculture or forest land)	n/a	n/a	**n/a**	1	5	**5**
Collecting fossils and rock specimens.	n/a	n/a	**n/a**	3	3	**9**
Confusion in legal protection (different types and authorities)	n/a	n/a	**n/a**	2	4	**8**
Vegetation overgrowth	n/a	n/a	**n/a**	5	5	**25**

The site Rudice-Seč is quite different. Although enjoying the legal protection, there is a very high total sum of degradation risk and two threats may be considered as severe (visitation and vegetation growth). In this case, the urgent action is needed to resolve the possible negative impacts. At first, the visitation needs to be managed well and it is necessary to ensure following the rules (including the entries outside the marked paths or prohibition of bathing in the pond, which disturb the amphibians and other species). The natural erosion is not considered an important threat here as it enable the renovation of the Earth Science phenomena. However, the vegetation growth can obscure the phenomena and contribute to disappear it. The possible solution is to regularly cut the overgrowing trees and maintain the good visibility of the Earth Sciences phenomena. Other threats are represented by urbanisation and changes in landuse in the surrounding area which may generate higher pressure on the site (both resulting from the higher visitation and changes of natural conditions). Mesoclimatic conditions may change as well, especially due to the long lasting droughts – this does not endanger the Earth Science phenomena so much, but the fragile ecosystems and protected species may suffer. Mining or re-opening the quarry may be considered a moderate threat – although the site is protected according to Nature conservation Act (114/1992 Coll.), the protected deposit area according to the Mining Law (44/1988 Coll.) is still valid. There is a very low probability of this threat, but in the case of its realization, the site would be heavily damaged. The same apply for restoration and landfill. A related threat is represented by confusion of different types of protection and de facto two different authorities that somehow manage the site (Nature Conservation Agency and Mining Office).

Discussion and conclusions

The assessment of risk degradation based on geosite concept represents a quite useful tool which enable to evaluate the total degree of risk on the site, but it does not allow to prioritize the particular threats. For this purpose, it is suitable to use the risk assessment matrix where we can simply evaluate the degree of particular threats; it allows to see which threat is urgent and may have significant impact on the site's geodiversity. The method also allows to estimate the degree of vulnerability of the site which may be less obvious when applying just geosite approach. Thus, when assessing the degradation risk on sites, a traditional geosite approach should be complemented by the risk assessment matrix.

In this preliminary study, both approaches have been applied on two different geodiversity sites. The main threats have been identified and prioritized and possible solutions have been proposed. Ledové sluje (Ice Caves) are less endangered, however, it is suitable to continue watching the illegal visitations and follow some recommendations (e.g. fostering nature guides) taking into account a very high vulnerability of this site. Rudice-Seč NM is more endangered and some of the threats are necessary to resolve as soon as possible (especially vegetation overgrowth or high visitation and related pressure on site). However, to effectively manage the threats, it is suitable that all the stakeholders involved in this site cooperate, be they nature conservation institutions, universities, owners, municipalities and local public. Also, environmentally educative activities (information panels, geoeducation programmes) may contribute to the better acceptation of the proposed measures and to balance conservation needs and human activities on site.

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Souhrn
Příspěvek se zabývá hodnocením hrozeb a rizik na geolokalitách. Prvním krokem je podrobný terénní průzkum včetně identifikace možných hrozeb, následuje zhodnocení pomocí vybraných kritérií (vycházejících z metodiky geomorphosites), rizika a hrozby jsou také analyzována pomocí matice rizik (pravděpodobnost a dopad hrozby). Metodický přístup je aplikován na Ledových slujích v NP Podyjí a v rámci nově vyhlášené PP Rudice-Seč. Na základě hodnocení jsou navržena opatření, která mohou přispět ke zmírnění dopadů hrozeb, případně rovnou k jejich eliminaci.

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RIVERS AS BACKBONES FOR URBAN AND PERIURBAN RECREATION – CASE STUDIES FROM KOŠICE AND PREŠOV, SLOVAKIA

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Abstract
Most of the urban centers in Slovakia developed in valley locations, in the floodplains of the river landscapes. The gradual growth of settlements transformed the character of the riverscapes and caused significant changes in the physical structure and functions of the river systems. They were modified to fulfill functions required by society, to increase the level of flood protection of the adjacent territory, to create conditions for navigation, to become a source of energy and water supply for the population, agriculture, or industry, and they became recipients for drainage and sewage systems. Regulated rivers have become part of the urban structure of the city. Despite the changes, they fulfill the role of essential bio-corridors of ecological networks and form a key part of the green and blue infrastructure providing valuable ecosystem services, including recreation. In the paper, we examine and compare the history and current patterns of urban and periurban recreation development in contact with a watercourse, rivers Hornád, and Torysa, in the towns of Košice and Prešov.

Key words: riverscapes, greenways, green and blue infrastructure, bluefields, waterfronts

Introduction

While the first settlements were located usually in protected and elevated positions, most of the urban centers in Slovakia developed in the later medieval period as merchant settlements under the castles, in valley locations, and the floodplains of the river landscapes (Hruška, 1961). Their growth up to the present day gradually transformed the character of the riverscapes and caused significant changes in the physical structure and functions of the river systems (Halaj, 2010). Regulated rivers have become part of the urban structure of cities. The contact areas of cities and rivers acquired various forms and functions - urbanized waterfronts, ports, industrial zones, but also recreational zones (Hanáček, 2015). The recreational demands of city dwellers develop gradually, with the growth of settlements and the increasing population, reflecting the level of development of society and the increasing amount of free time of different social strata (Bihuňová, 2019). The banks are modified for recreational needs. In Bratislava, e.g., the first public park was established in 1774-76 by adapting the floodplain forest on the banks of the Danube. In the 19th century, physical education and sports became part of the urban culture. Water sports were very popular, the first modern sports club in Slovakia was the Bratislava Rowing Association founded in 1862. During the 20th century and until today, the demands for daily urban and suburban recreation are growing, and the natural potential of the river offers many possibilities. Despite the negative effects of urbanization and industrialization, rivers remain to fulfill the role of essential bio-corridors of ecological networks, form a key part of the green and blue infrastructure, and recreation by the river belongs to valuable and important ecosystem services, provided by river landscapes (Schneider, Kalasová, and Fialová, 2020).
In the paper, we examine the development of historical and current patterns of urban and periurban recreation related to a watercourse, in two case studies, in selected towns Košice and Prešov, along the rivers Hornád and Torysa.

Materials and methods

Košice and Prešov are located in the eastern part of Slovakia (Fig. 1). Košice, the second largest city in Slovakia (with a population of approx. 240,000), is situated in Košice Basin in the floodplain of river Hornád. Prešov, the third largest city in Slovakia (with a population of approx. 90,000), is located in the northern part of Košice Basin, in the floodplain of river Torysa and its tributary Sekčov.

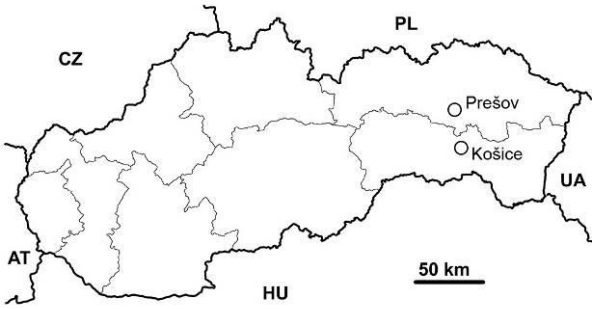

Fig. 1: Towns Košice and Prešov in Slovakia

For examination of the historical recreation uses connected to riverscapes, we used historical maps, literary sources, and historical photographs. For identification of current patterns of recreation, we used current map sources, municipal master and development plans, information about recreation activities from news and social media, and site visits.

Results

Historical patterns of urban and periurban recreation related to rivers in Košice and Prešov

Historical maps show the gradual development of the recreational use of the riverscapes in the hinterland of the cities. Both cities developed at a safe distance from the meandering course of the river, but the water was brought closer to the city by the mill races (Fig. 2).

Fig. 2: The relationship between the city and the river in the 18th century. (Source: 1st Military Survey of the Hungarian Kingdom 1782–1785)

Although it is impossible to read the specific existence of recreational areas from the map, gardens, green spaces, and high vegetation near the rivers, their branches, and mill races indicate this use (Fig. 2).

Construction of the railway in the 70s of the 19th century cut off both cities from the river, which had a significant impact on the further development of the city-river relationship. In later years, in Košice, a strip of industrial zone was formed in the areas along the river and the railway, which limited the possibilities of recreational use of the river until the present day. In Prešov, a zone of housing, sports, and amenities was developed between the railway and the river, which enabled closer contact with the river for everyday leisure and recreation activities.

In Košice, a recreational area near the river developed in the suburban zone above the city, related to the source of mineral water. In 1863, the spa with a park and a spa building was created around the Lajos Spring. In 1922-24, it was rebuilt and renamed the Gajda Baths (Tometz, Dirnerová, and Tometzová, 2019) (Fig.3).

Fig. 3: Historical postcard of the spa house Lajos Spring (left) and swimming pool (right) in Gajda Baths. (Source: archive of authors)

In Košice and Prešov, mill race channels were also important for recreation. Historical photos and memories document their summer and winter recreational use. In summer, they were used for swimming or boating, and in winter for ice skating. The mill race in Prešov supplied water to the city swimming pool and several city baths, and in winter, it served as a water source for the municipal ice rink, built at the end of the 19th century. In Košice, a city park was built along the mill race channel, between the railway station and the city center. The mill race in the park was used for boating and supplied water to the municipal ice rink with a building from 1909 in the Art Nouveau style (Fig. 4).

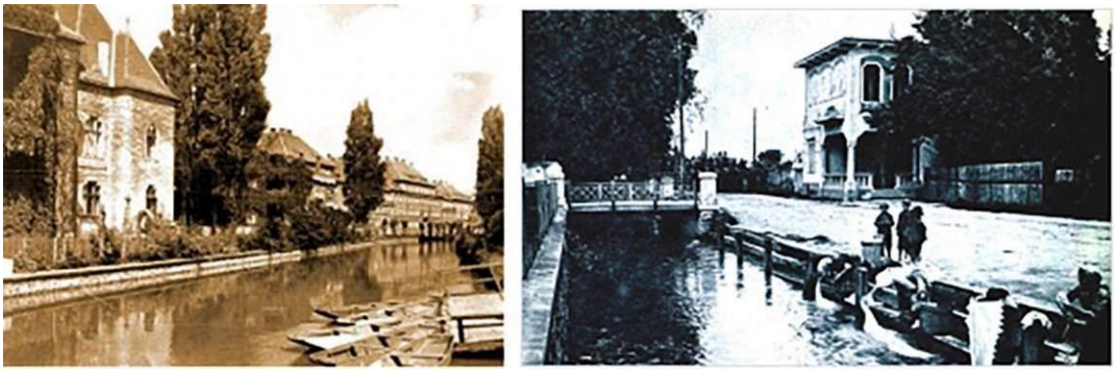
Fig. 4: Historical postcards of the mill race in Košice (left) and Prešov (right). (Source: archive of authors)

Current patterns of urban and periurban recreation related to rivers in Košice and Prešov

In Košice, the tradition of the Lajos Spring and Gajda Baths by the river Hornád, in the northern part of the city, is currently being followed by the recreation area called Anička. In the southern part of the city, in the housing estate Nad Jazerom, built during the socialist period, there is a recreation area by the river in the vicinity of the lake, created by quarrying sand and gravel. It is used for summer swimming and winter skating. Cycling is a popular recreational activity these days. A bicycle path runs along the river, but its continuity in the central part of the city is interrupted by various premises of former industrial areas and warehouses, blocking access to the river. The historical mill race was channeled underground in contact with the city center, which meant the impoverishment of the recreational attractivity of the city park. Current initiatives are trying to revitalize the existing parts of the mill race for better utilization of its recreational potential. In 2021, the city announced an urban planning competition for the regeneration of unused and neglected former industrial areas along the railway and the river, intending to build a new city center with housing for 18,000 inhabitants and various amenities. Emphasis is placed on revitalizing the river, strengthening the green-blue infrastructure, and creating spaces for recreation (Fig. 5).

Fig. 5: Košice - Hornád – New city center – proposal Gogolák + Grasse (Source: Archinfo, www.archinfo.sk)

In Prešov, the river is currently surrounded by residential zones with multifunctional facilities, university campuses, sports fields, swimming pools, sports halls, and parks for everyday recreation. The most popular cycle route runs along the river Torysa, suitable for recreational cyclists, families with children, and bicycle carriers. It connects the city of Prešov and the small town of Šariš with the castle, which is one of the most popular attractions in the vicinity of Prešov. The mill race channel in Presov was buried, and a cycle path was built in one part of it. A large residential complex of Sekčov housing estate was built in the valley of the river Sekčov.

Discussion

The research results indicate that the river played an important role in suburban and urban recreation in various historical periods. Recreation activities by the river are changing. In the past, the river and the mill races were used for bathing. Today, the green corridor along the river is used for cycle routes and various physical activities and relaxation. Regulation and flood control measures have made access to water difficult. The disappearance of mill race channels in both cities meant the loss of the recreational potential of public spaces in the city centers. Currently, both cities are trying to find ways to create new relationships with their riverscapes.

Conclusion

Residents' needs for recreation are growing, and cities are looking for ways to valorize the potential of riverfront spaces. The artificial environment of the city in contact with the natural organism of the river is, in many cases, solved non-conceptually without examining mutual relations and contexts at different levels (Hanáček, 2015). The revitalization of rivers, restoration of accompanying vegetation of watercourses, and restoration of the functioning of floodplains and wetlands can also become part of measures to mitigate the consequences of expected climate changes. When planning an urban riverfronts revitalization strategy for recreation uses, it is necessary to clarify which ecological processes are the most important for revitalization and to what extent river ecosystem restoration should be included in the revitalization projects.

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Souhrn
Většina městských center na Slovensku vznikla v údolních polohách, v nivách říční krajiny. Postupný růst sídel proměnil ráz říční krajiny a způsobil výrazné změny ve fyzické struktuře a funkcích říčních systémů. Byly upraveny tak, aby plnily společensky požadované funkce a regulované řeky se staly součástí urbanistické struktury města. I přes změny plní roli zásadních biokoridorů ekologických sítí a tvoří klíčovou součást zelené a modré infrastruktury poskytující cenné ekosystémové služby včetně rekreace. Nároky městských obyvatel na rekreaci začínají narůstat a prostory u břehů vodních toků jsou upravovány pro rekreační využívání. V příspěvku zkoumáme a porovnáváme historii a současnost rozvoje městské a příměstské rekreace v kontaktu s řekami Hornád a Torysa, ve městech Košice a Prešov. Výsledky výzkumu naznačují, že řeka hrála důležitou roli v příměstské a městské rekreaci v různých historických obdobích. Rekreační aktivity u řeky se mění. V minulosti řeky a mlýnské náhony byli využívané ke koupání. Dnes je zelený koridor podél řeky využíván pro cyklotrasy a různé pohybové aktivity a relaxaci. Regulace a protipovodňová opatření ztížily přístup k vodě. Zánik náhonů v obou městech znamenal ztrátu rekreačního potenciálu veřejných prostranství v centrech měst. Dnes obě města hledají způsoby, jak vytvořit nové vztahy se svými řekami.

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SMALL-SCALE INVASIVE INTERVENTIONS AS IMPULSES FOR THE REACTIVATION OF FORGOTTEN URBAN SPACES

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Abstract
The term "invasive", which the presented research introduces in connection with urban interventions, is perceived mostly negatively by experts and the general public. Especially if a non-native species has an adverse impact on the native territory. This is not quite the case if such short-term invasive interventions appear within urban structures. Then they are notably important and valuable for the city. Many times, they stimulate the activation of communities, warn, increase interest in the site and turn passers-by into observers and later into users. The most important is that the short-term interventions work as social experiments, where passers-by are interacting with the installation, each of them reacts differently and at least force themselves to think about the specific space. The presented article focuses on small-scale interventions that have been displaced or introduced into the environment of forgotten dysfunctional spaces. To places where limited or regulated development is recognised or where the implementation of characteristic urban elements is impossible and a liveable public space with public activities does not usually arise here. The contribution illustrates the possible forms of invasive interventions on the example of concrete realisations from practice. Based on available methods verified in practice through qualitative and quantitative parameters, the article also focuses on evaluation and comparison of such interventions verified and adopted by users, where the result is a set of successful stories.
Key words
interventions, activation, recreation, host structure, small-scale architecture

Introduction

We think of public space as a set of several entities that are sometimes vague, unspoken, and difficult to grasp (Čibik et al., 2022). They can be full or empty. We are also sensitive to what is happening to the space at the city level and, consequently, to the impact of the outcome of nonconceptual decisions on the landscape, as the cultural cradle of our nation (Prochnow & Čibik, 2022). Today's image of the city consists of the basic framework of public spaces (streets, squares, parks, waterfronts) together with a wide range of other, often underutilised public and semi-public spaces, as well as long-term unused areas, so-called lost places (Žolobaničová, 2022). Forgotten or lost places of the city are a barrier to the civilised world and in the urban structure they perform as public spaces without the presence of the public. They are marginalised empty boxes without care left to their fate. To ensure increased attention to such places and thus prevent ignoring their current state, it is necessary to think about alternative functions. Positively recognise the potential and pay attention to a constructive approach when looking for their new temporary use (Fornal-Pienak & Bihuňová, 2022). Small-scale invasive short-term interventions are the opposite of ignoring the problem or perceiving only obstacles to potential solutions. Despite the semantic meaning of the word invasive, for the purposes of this research, the term invasive interventions will not refer to events that result in the liquidation, reduction, or removal of urban matter, but on the contrary, its creation – formation of urban spaces, activities or impulses stimulating their beginning (Dlesk, 2016).

Materials and methods

Research in its initial stages introduces analytical methods for evaluating invasive interventions from Dlesk (2016), which enable their comprehensive evaluation. The evaluation also uses scientific and research comparative methods, so there may be a possible comparison of the evaluated interventions. The proposed comparative method must be able to deal with a fundamental complication. Based on the highly variable nature, urban interventions, urban activities, and urban spaces in general, cannot be comprehensively described by observing only their formal appearance. It happens not infrequently that two urban interventions included in the working database, both of a similar formal expression, arising based on very similar motivation of their initiators, in their variable environment will behave differently in a certain sense - for example, by a different degree of intensity of their expression, i.e., by

a different degree of activation of its "host" structure by the public activity of its users. To evaluate and compare urban invasive interventions, the research applies three partial sub-methods:

Sub-method 1, visual register of intervention features (direct observation method)
Sub-method 2, assessment of intervention parameters (schemes and diagrams)
Sub-method 3, verbal description of non-comparative and specific characteristics of interventions

The resulting selection of evaluated parameters, considering the above assumptions, is aimed at monitoring the following qualitative and quantitative parameters of urban invasive interventions:

Quantitative parameters:
- size
- duration
- intensity of expression

Qualitative parameters:
- material nature
- space modification
- property nature
- initiator
- reversibility
- authorisation

Each of the parameters can take on different values in the real conditions of urban intervention, simplified, e.g. in the size parameter, the intervention can be an element, or a set of elements, or a system of elements (structure); within the evaluation of the intensity of the expression, the intervention may have a negligible, supportive or essential intensity; in the duration parameter, the intervention can be temporary or permanent; according to the material nature, the intervention can be structural or non-structural, and so on.

Results

The results present examples of the application of the invasive intervention evaluation method, as well as two specific interventions verified and adopted by users, where the result is a set of successful stories. The first of them is a small-scale wooden installation, which was given the working name "greenhouse". It was installed in the city market in the regional city of Nitra (Slovakia). The market is undergoing a restoration project and this installation was the first impulse and attention to the qualities of this national cultural monument. The intervention is an example of good practice connecting a private partner who cares about environmental issues and the work of local authors in collaboration with students, while the result is a functional object in a public space with a social impact (Fig.1).

Fig. 1: Technical details of the structure and a photo from the opening day

The intention of the installation is to leave it for the care of passers-by. The public greenhouse is a symbol of what is happening to our planet right now. Its placement in the public space is intentional – it will depend on the care of all of us, just like our planet. Since the installation consists of four smaller modules, it can also be temporarily placed in other places in the city. The modules are also

multifunctional and can also serve as an atypical space for relaxation or smaller cultural events, discussions, and lectures.

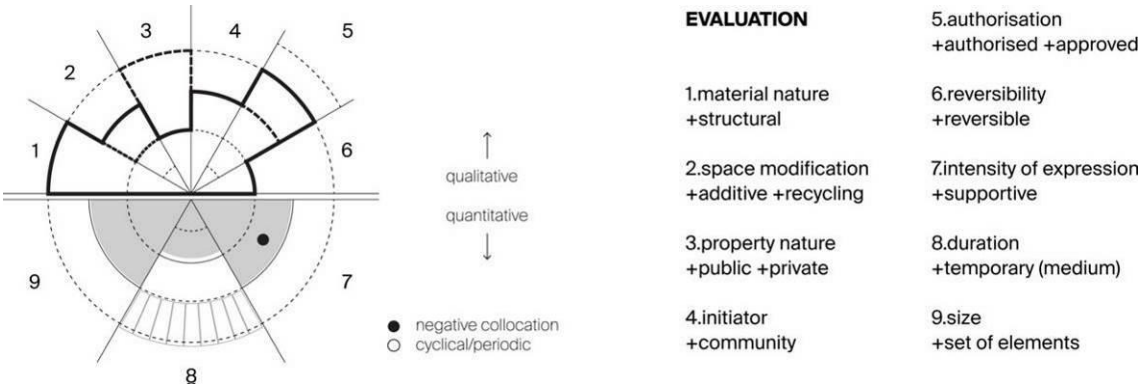

Fig. 2: Evaluation of the intervention through analytical methods developed by Dlesk (2016)

The second intervention called Mathereal (Fig. 3, Fig. 4) was a performance by the young artist Jakub Užovič, who is primarily inclined towards performance art. He works with intermedial overlaps of sculpture, object installations, performance, music, and sound elements, while trying to create a certain relationship between the performer, himself, and the object. The intervention was repeated cyclically in several public spaces to find out what the boundaries are between theatre and performance. By working with passers-by as spectators, he draws attention not only to the performance itself, but also to the space in which the intervention and the recipients are currently located.

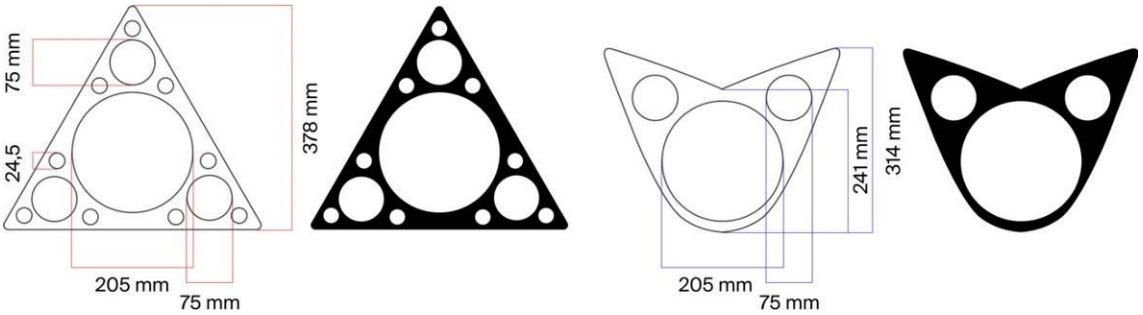

Fig. 3: Technical details of the construction of the object, which served as the basis for the artist's performance (Užovič, 2022.

Fig. 4: Illustration of the performance called Mathereal (Užovič, 2022)

The installation element itself, the object, is also a medium, a mediator of the statement, which is also part of the scenic or installation space. There is a certain interactivity of the objects with the live body of the performer. They become unity at certain moments. The visual composition of the "image" itself has a strong sculptural basis, which is related to Jakub Užovič's bachelor's studies - storage and precision of sculptural thinking and its construction in the realisation of the performance space.

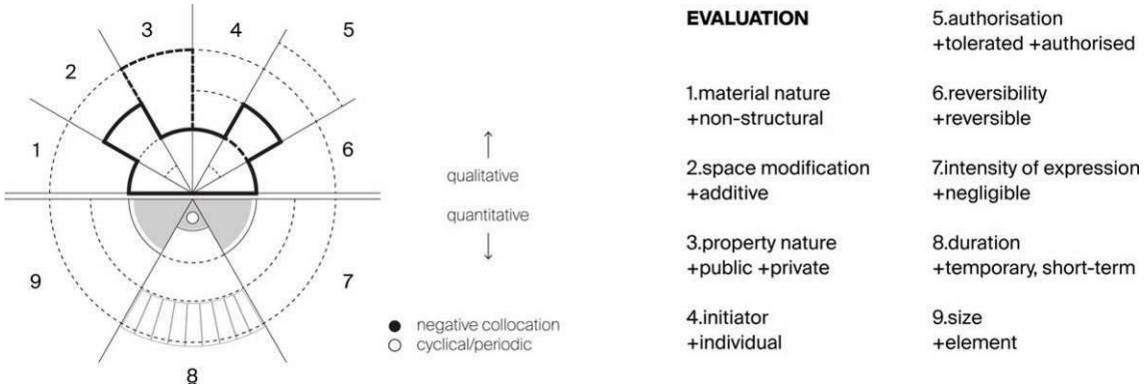

Fig. 5: Evaluation of the intervention through analytical methods developed by Dlesk (2016)

Discussion and Conclusion

A well-functioning public space is the result of a combination of various factors, the quality of which also determines its overall quality. One of the most important determinants of a successful public space is the relationship with the surrounding environment and openness to the public. This is represented by an environment where different activities and events come together. The presented small-scale invasive interventions are an example of how even an undemanding activity can draw attention to a space, evoke different reactions, whether positive or negative, but above all restore at least a temporary function to lost places. Examples of two different interventions where an interdisciplinary link occurs were selected. One work is very technical, physical, rational, tangible, real, and the other, on the contrary, very artistic, ephemeral, action-oriented, performative. Despite their different nature, both works met with positive reviews. All these arise from the fact that we are not passive recipients of world events. We actively participate in the interactions between events and ourselves – which together will determine our perception. So, being able to perceive the place's characteristics and features can lead us to the most interesting results in planning and designing. Not every dimension must or shall be present in every place – that turns the approach even more dynamic. Some places are supposed to be "empty", to let the whole urban landscape breathe. Empty of concreteness but full of nature, full of art, full of activities and full of people. It is a necessary part of the organic tissue that shows nowadays even greater value (Prochnow & Čibik, 2022).

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Souhrn

Předkládaný článek se zabývá možnostmi oživení a reintegrace zapomenutých a ztracených míst prostřednictvím invazních "small-scale" intervencí. Takové nenáročné impulsy jsou účinným prostředkem, jak opětovně začlenit zbytkové nefunkční městské struktury do tkáně města. Přínosem

příspěvku je i aplikace v praxi ověřené a volně dostupné metodiky hodnocení invazních zásahů, která následuje logickou posloupnost kroků podél koncepční linie stanovené dlouhodobým víceúrovňovým výzkumem bílých míst. Výsledná městská struktura by měla být schopna nabídnout poměrně pestrou škálu různorodých aktivit. V závěru článek odkrývá příklady úspěšných realizací, které přinášejí do zapomenutých míst nový impuls a funkci do doby kdy se naplní dlouhodobý záměr jejich kompletní rekonstrukce.

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STUDY OF THE RELATIONSHIP OF MOISTURE AND COMPACTION ON THE MODULUS OF RESILIENCE OBTAINED BY CYCLIC CBR TESTING IN LOCAL SOILS FOR A QUALITY RURAL TOURISM

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Abstract
Low Volume Roads are a key part of both rural and urban life and an accurate study of the parameters involved in their design is fundamental at an environmental level. In nature, due to the passing of the seasons, with changes in humidity and temperature, the density and compaction of the soil changes notably, giving rise to cracks and defects that directly affect their users and entail both economic and environmental costs in terms of vehicle efficiency and repair costs. Furthermore, this type of defect hinders the practice of outdoor activities and sports, which are essential for the development of rural tourism. For this reason, in this study, the Resilience Modulus of a nearby material has been analysed by cyclic California Bearing Ratio tests, thanks to Mendelu's specialised software, under different compaction and humidity conditions.

Key words: Humidity, Density, Soil, Recreation, Low Volume Roads

Introduction

The recreational use of the natural environment in the Czech Republic is a fundamental part of life in the Czech Republic for its inhabitants and many tourists. Furthermore, they are an integral part of the constructive elements - constructions - works - that complete the landscape, connecting and facilitating movement for both economic and recreational activities. Construction for these purposes must meet the criteria, not only in terms of carrying capacity, but also minimise impacts on the surrounding ecosystems. Therefore, proper preservation of rural roads is fundamental and one of its key points is the precise design of rural roads (CSN 73 6108, 2016), known in the world as Low Volume Roads (LVR) already defined by the American Association of State Highway and Transportation Officials (AASHTO, 2011).

These roads have a low traffic flow of less than 400 vehicles on average per day. These types of roads make up long networks of rural roads linking small towns and villages and providing access to various routes in natural environments. Moreover, in larger cities, although they are not so frequent, they can be seen in parks or accesses to peripheral areas. In summary, it can be said that LVR are a key part of many people's lives, both for freight transport and for purely leisure and rural tourism.

In order to design them and simulate their behaviour during deformation, the most significant parameter is the Resilient Modulus (M_r), which is fundamental to be able to define whether the material will be able to support the necessary load under the conditions of each zone and the deformations that are within the permitted limits. M_r is a fundamental material property used to characterize unbound pavement materials. It is a measure of material stiffness and provides a mean to analyse stiffness of materials under different conditions, such as moisture, density and stress level. In order to obtain M_r and to determine the elastic behaviour, it is proposed to perform them in a cyclic manner by simulating repeated traffic loading. This parameter is usually obtained by Cyclic Load Triaxial Tests (ČSN EN 13286-7, 2004). However, these tests are generally very time-consuming and expensive and not all countries can afford them. For this reason, the validity of cyclic tests on California Bearing Ratio (CBR) device, which are much cheaper and would allow an optimal design at a very low laboratory cost, began to be studied.

In addition, the materials used must be taken into account; economical design does not have to come before sustainable design, especially when it comes to infrastructure in a natural environment. Therefore, the aim is to use local materials as much as possible in order to preserve the landscapes that form the rural environment. The consequences of poor design affect society in many ways.

First, a damaged road increases both fuel and repair costs for the vehicles that travel on it, increasing the carbon footprint generated. On the other hand, poor roads and paths can easily hinder the practice of many outdoor sports and transit for people with reduced mobility. These kinds of things are key to

generate good quality and attractive "adventure" tourism. Finally, as previously discussed, a poor choice of material can damage and even destroy local ecosystems (Arias, 2020).
Thus, the University of Mendel, in collaboration with the geotechnical laboratory Geostar, has developed its specialised software (SW) on CBR cyclic test to obtain the Resilience Modulus M_r (PUV 304642, 2014). This software can carry out two types of tests. The first one penetrates the sample until one constant depth, generating high stress levels. For the second test a maximum constant stress value is set in order to simulate the weight of the vehicles. Both tests end when a constant elastic deformation is obtained according to the AASHTO guide, as alternative to Cyclic Load Triaxial Test (MEPDG, 2008).
This SW was key in the presented experiment to analyse the behaviour of M_r under variable natural conditions. These study focuses on local materials and analyses the effect of compaction, soil density and humidity. This is important as, during the year, the seasonal cycle generates abrupt changes in the roads and can damage them.

Materials and methods
The presented analysis was carried out on a pavement constructed in the vicinity of the city of Brno. The deformation behaviour of natural base materials was determined in soils taken from the active zone of the forest roadway at a depth of about 500 mm below the construction layers. From the roadway subgrade, soil classification analysis was performed according to the Unified Soil Classification System (USCS) according (ČSN EN ISO 14688-2, 2005 and ČSN EN ISO 14689-1,2004*)*. In addition to the classification tests, a standard Proctor test (ČSN EN ISO 13286-2, 2015) was performed to define the optimum moisture and maximum dry density. Resilient Modulus was measured on the CBR device which allows the application of cyclic loading (PUV 304642, 2014) in order to obtain Resilient Modulus according to MENDELU methodology.
To detect the changes produced by humidity and compaction, the following methodology has been followed, using the second test-type of the SW. First, a sample is compacted according to the CBR test standards (ČSN EN ISO 13286-47, 2015) and a CBR cyclic test is carried out on each side of this sample to check the effect of different levels of compaction ($M_{r,max1}$ and $M_{r,min2}$). After this, a sample is compacted again and the same tests are carried out but switching the order surfaces ($M_{r,max2}$ and $M_{r,min1}$). In addition to the influence of the degree of compaction on M_r, the influence of increasing humidity was also monitored.
The moisture content of the sample was increased gradually from 2% to the maximum allowed by the material itself. Finally, ten samples have been tested with the optimum moisture content of the material.

Results
Geotechnical Result
The analysed material was classified following (ČSN EN ISO 17892-4, 2017) as a F4 CS compound by a 21.6% of gravel, a 29.1% of sand and a 49.4% of thin material. That thin material following (ČSN EN ISO 17892-1, 2015) y (ČSN EN ISO 17892-12, 2018) as clay (sasiCl) sandy silty clay. Laboratory Reference Density 1820 kgm^3 and Water Content 8.5 % from the Proctor Compaction test.
In total 54 cyclic tests were carried out with increasing and optimum humidity. The humidity was progressively increased and a constant tension was applied with a maximum of 210 kPa, the value expected in subgrade. (Fig.1).

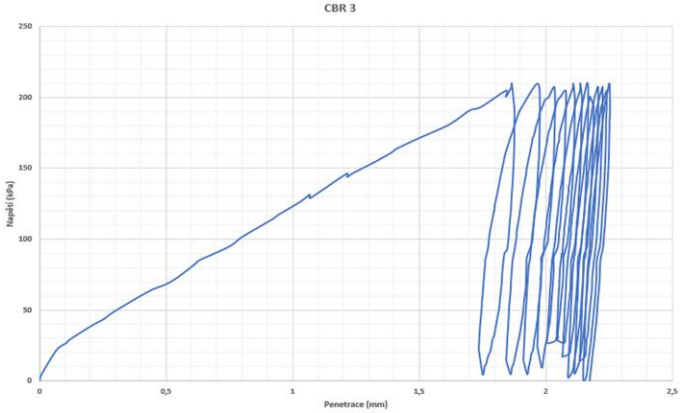

Fig. 6: Cyclic CBR test result under a set maximum stress level.

For each moisture content two measurements were carried out. On the most compacted surface, resp. least compacted, and the Modulus of Resilience Mr,max, resp. M_r,min was calculated.
The moisture values for the most compacted surface were found to be between 2.84 % and 17.03 %, for the least compacted surface between 2.11 % and 17.82 %.
Dry density values for the most compacted surface were found to range from 1408.71 kgm3 to 1837.50 kgm3, for the least compacted surface from 1413.41 kgm3 to 1823.63 kgm3.
The density values are averages over the whole sample and are therefore not representative of the actual density on each surface. They serve to control and verify the performance of the test and for the preparation of the results.
The Resilient Modulus values for the most compacted surface were found to range from 77.0 MPa to 1000 MPa, for the least compacted surface from 48.57 MPa to 848.14 MPa.
The trends of the M_r values related to dry density can be seen in Fig. 2. The values of the two Modulus, $M_{r,min}$ and $M_{r,max}$, increase from the lowest density and culminate near the maximum dry density obtained from the proctor test. Modulus $M_{r,max}$ archives higher values.

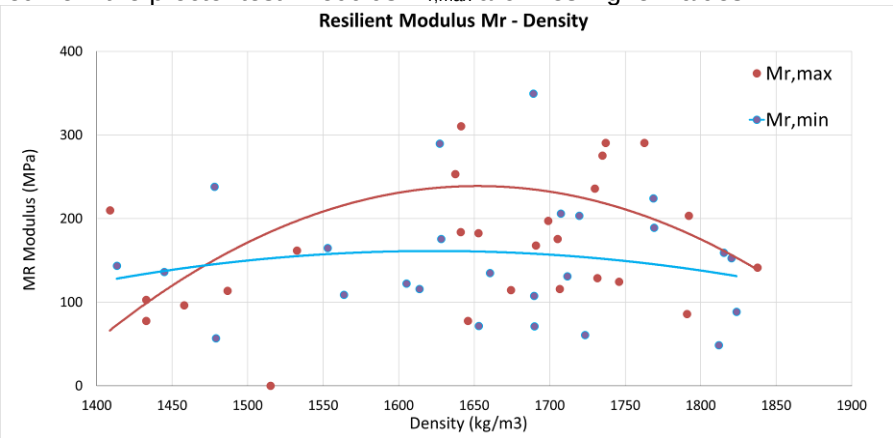

Fig. 7: Relation between the Resilient Modulus and the density of the material

Fig. 3 shows the trends of the Mr values in relation to humidity. The values of the two Modulus, $M_{r,min}$ and $M_{r,max}$, increase from the lowest humidity and culminate at humidity 13 %, slightly above the optimum humidity.

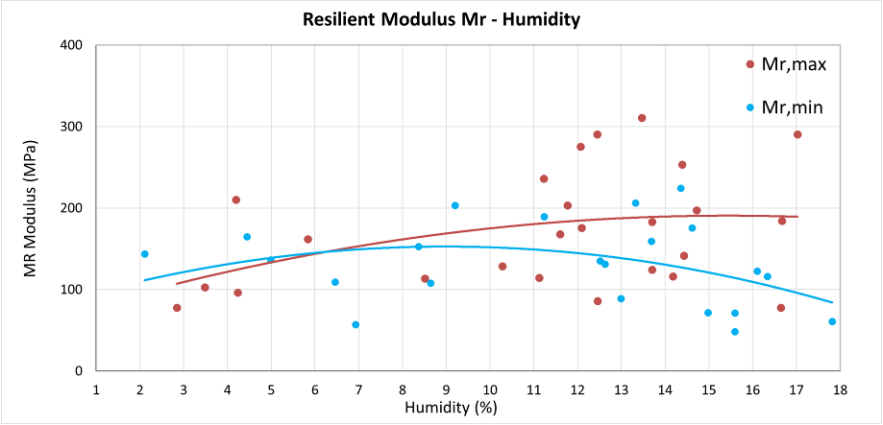

Fig. 8: Relation between the Resilient Modulus and the moisture of the material

Discussion
Analysis showed that the Resilient Modulus reaches higher values in the case of higher compaction, while at the same time shows a clear dependence of the modulus on moisture. They peaked at optimum moisture and after exceeding the maximum dry weight. Although this trend was expected to be fulfilled only in the case of modulus and moisture dependence when the soil is more compacted, the modulus growth stopped after exceeding the maximum dry weight and started to decrease. However, the modulus growth stopped after exceeding the maximum dry weight and started to decrease.

Conclusion

The problem of modulus definition and sample preparation is essential for pavement design. The results obtained from this analysis show the influence of natural conditions on the variety of parameters of construction materials. The modulus varies with humidity and density and the parameters influence the values with similar shape. In both cases the module values increase to the ones obtained from Proctor compaction and even when the density increases the values do not go up.

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Souhrn

V této studii byl analyzován vliv zhutnění, hustoty a vlhkosti na modul pružnosti zemin. Za tímto účelem byly použity cyklické zkoušky CBR a data byla shromážděna a zpracována pomocí specializovaného softwaru Mendelovy univerzity. Výsledky ukazují, že tyto parametry významně mění hodnotu modulu pružnosti. Vždy však dosahuje maxima při optimální hustotě a vlhkosti, které byly dříve získány z Proktorovy zkoušky zhutnění.

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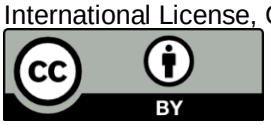

THE 'KAMIEŃ' EDUCATIONAL PAVILION IN WARSAW AS A PLACE OF PRO-ENVIRONMENTAL ACTIVATION OF THE URBAN COMMUNITY

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Abstract
Actions aimed at environmental education are crucial for raising the awareness of city dwellers in terms of their life and functioning in a sustainable way. The aim of the article was to identify events organised in 2022 (after the period of the covid-19 pandemic) in the 'Kamień' (Stone) Educational Pavilion in Warsaw – a place of modern education and local activity in the field of popularising knowledge about nature, counteracting climate change, strengthening awareness and good pro-environmental habits among the city's inhabitants. Based on the analysis of data collected from Facebook, completed events were identified (65), and then those related to nature conservation, urban greenery and gardening (37) were distinguished to determine social preferences in the field of environmental education. The largest number of events concerned those classified in the category of educational workshops (23), and the largest number of people interested on Facebook were educational walks and picnics organised in the open air. The obtained results indicate the great needs of the inhabitants of Warsaw in terms of expanding both their theoretical knowledge to raise ecological awareness, and acquiring practical skills useful to support their pro-environmental activities in the city.

Key words: environmental education, educational centre, sustainable society, sustainable city, Warsaw

Introduction

The intensive development of technology and civilisation causes many threats to the natural environment, which translates directly into the deteriorating living conditions of city dwellers. At the same time, cities are perceived as key centres of thinking and acting in the field of pro-environmental education and expanding knowledge about sustainable development. Unfortunately, social awareness regarding the possibility of joining the process of counteracting these negative changes is insufficient. Therefore, initiatives aimed at creating ecological societies should be undertaken. Education and learning are essential tools to achieve the 17 Sustainable Development Goals, shape more sustainable cities and more inclusive communities (Education for Sustainable Development Goals, 2017; Kimic, Ostrysz, 2021).

Environmental education is a concept of educating and rising society in the spirit of respect for the natural environment. It covers a wide spectrum of teaching activities whose task is to prepare the society to solve practical environmental problems. It serves to shape a pro-environmental system of values by increasing the activity of society in order to protect nature (Sobczyk, 2003). There is also a direct link between the quality of education and improving the quality of the environment. At the same time, the educational community has a special role to play – instilling pro-environmental attitudes in the next generation of citizens. Environmental education is therefore crucial to creating solutions for a better, more sustainable future (Paul et al., 2015).

In many cities, activities in the field of environmental education are undertaken to raise public awareness of saving the environment and its resources (Potyrała, Walosik, 2005). The 'Kamień' Educational Pavilion, opened in 2020, is a centre of modern ecological education and local activity in the field of nature protection, established on the initiative of the Green Board of the Capital City of Warsaw (Poland). Located in the Natura 2000 area in the vicinity of the Vistula River, it functions as a space for debates, meetings, exchange of experiences and green initiatives. The educational offer is addressed to residents of Warsaw of all ages. The activities focus on strengthening awareness and good pro-environmental habits, popularising knowledge about the Vistula riverside nature, promoting the idea of protecting Natura 2000 area, supporting biodiversity and counteracting climate change. Events are organised both inside and outside the building (Pawilon edukacyjny 'Kamień', 2022). The aim of the study was to identify events related to nature carried out in the 'Kamień' Educational Pavilion in Warsaw in 2022 to determine the interest of city residents in environmental education.

Material and methods

Research on the identification of events carried out in the 'Kamień' Educational Pavilion in Warsaw was based on analysis of data collected from the organisation's Facebook website. As a publicly available and popular communication tool in the age of digitalization (Prensky, 2001; Kimic et al., 2019), this platform allows reaching a wide audience, and at the same time allows website users to exchange information and declare interest in the event. The study was conducted in the period from 15 January to 31 December 2022, and this year was selected as a key year for the activation of the city's residents after the end of the covid-19 pandemic. Information such as date, location of events and their detailed description was collected. Among all identified events, those related to ecological education focused on environmental protection, urban greenery and gardening were distinguished. Each of them was assigned to one of 5 categories: workshop, educational walk, lecture, picnic and recycling. The number of events in each category and their leading topics were taken into account. The number of people interested in the events was determined in order to know their preferences in the field of environmental education, as well as to assess the popularity of individual events.

Results

In 2022, the 'Kamień' Educational Pavilion in Warsaw hosted 65 events that were free and open to the public. More than half of them (37) were related to ecological education focused on environmental protection, urban greenery and gardening. Their division into 5 categories along with a list of leading topics and the number of people who expressed interest in the events on Facebook is presented in Tab. 1.

Tab. 1: Ecological events organised in the 'Kamień' Educational Pavilion in Warsaw in 2022

Category	Number of events [total]	Main topic	Number of editions	Number of inhabitants interested in events on Facebook	
				Event	Category [total]
Workshop	23	- monotyping using tree leaves	3	69	711
		- water retention	2	90	
		- pollinators	2	77	
		- indoor plants	2	75	
		- composting	2	58	
		- functioning of the forest	2	47	
		- biodiversity	2	31	
		- flowering balcony plants	1	59	
		- designing perennial plantings	1	54	
		- herb gardens	1	54	
		- useful plants for the balcony	1	50	
		- trees and shrubs for the garden	1	38	
		- protection of amphibians	1	9	
Educational walk	7	- ornithological walks - observation of birds in their natural environment	4	670	786
		- dendrological walks - observation of trees in their natural environment	3	116	

Lecture	3	- synanthropization of wild animals in the city	2	71	133
		- flower beds in the city	1	62	
Picnic	3	- Warsaw in Flowers - lectures, field games, competitions	1	519	777
		- Ecological Picnic – a campaign for the development of bicycle traffic, competition	1	163	
		- Warsaw Tree Day - lectures, workshops, competitions	1	95	
Recycling	1	- reuse of flowers from urban space	1	401	401

The largest number of events (23) concerned the workshop category – activities held in the building and its immediate surroundings. A total of 771 people declared interest in them on Facebook. The leading topic concerned learning the monotype technique using tree leaves, with three editions carried out. Workshops focused on expanding theoretical knowledge about pollinators, biodiversity, water retention, composting, forest functioning, and gaining practical skills in the selection of plants for interiors were popular, with two editions carried out. This shows that initiatives enabling broadening of general knowledge in the field of ecology and sustainable development enjoy great public interest. Single editions of the workshops were devoted to the design and care of plants in home gardens (trees, shrubs, perennials) and on balconies (useful and ornamental plants). The advantage in this case was the opportunity to gain not only theoretical knowledge, but also to participate in practical classes. The least interest concerned workshops on the protection of amphibians (9 people).
Significantly fewer events fell into the other four categories. Educational walks covered 7 editions - ornithological walks were organised 4 times and attracted a total of 670 people, while dendrological ones took place 3 times and attracted 116 people. Lecture and picnic events were held 3 times. The lecture on the synanthropisation of wild animals in the city was repeated and interested 71 people, and the lecture on flower beds was held only once and interested 62 people. This shows that even a stationary form of acquiring knowledge can be considered attractive. Picnics organised by the 'Kamień' Educational Pavilion were the most popular on Facebook – three events organised in the summer season attracted a total of 777 people. This may be due to the fact that picnics were held outdoors in a natural environment and were related to the results of thematic competitions ('Warsaw in Flowers', 'Warsaw Tree Day' and 'Bicycles – ecology and safety'), and also enabled participation in accompanying activities such as workshops and lectures. An event in the recycling category was held only once, but it was also very popular with as many as 401 people.

Discussion

Shaping pro-environmental attitudes in modern society requires a change in both thinking and mobilisation to act. In order to become more involved in issues related to ecology and sustainable development, both individuals and the entire community must become creators of positive change (Education for Sustainable Development Goals, 2017). The participation of a fairly large number of people in the events organised by the 'Kamień' Educational Pavilion in Warsaw is in line with this trend (Wals et al., 2008). This confirms the willingness of the city's inhabitants to broaden their theoretical knowledge and their need to engage in nature conservation, as well as to acquire new practical skills in the above-mentioned scope. In addition, the activity of this institution made it possible to identify and highlight local environmental problems related to e.g. water retention, biodiversity, selection of plants for urban conditions, protection of animals, with which the city's inhabitants particularly identify (McKenzie, 2000) and look for ways to solve them. Taking up key topics for the local community is one of the important aspects of its direct connection with a place and justification for the success of joint ecological initiatives. At the same time, it allows event participants to increase their self-awareness and positively affects their personal development based on environmental sensitivity and respect for nature (Martin, Leberman, 2005).

Conclusions

The results of the study based on data from Facebook show that Warsaw residents are generally very interested in pro-environmental events proposed by the 'Kamień' Educational Pavilion. This proves the legitimacy of their organisation, which can be considered a success. Particularly valuable is the openness of this institution to the transfer of theoretical knowledge focused on environmental protection in the city, as well as enabling the acquisition of practical skills through participation in workshops, educational walks and picnics. Information about events posted on Facebook allows to reach a wide range of people, and the diverse offer helps to choose the subject and type of event in accordance with individual expectations of city inhabitants, which contributes to raising their environmental awareness. These observations can serve as guidelines for further activities in the field of pro-environmental education carried out by the 'Kamień' Educational Pavilion, as well as by other organisations operating in Warsaw.

It should also be noted that although social networking systems such as Facebook have not been designed specifically for the organisation of educational activities, they can support their initiation, expand access to information and encourage participants to join various pro-environmental activities that increase their knowledge and raise competences.

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Souhrn

Akce zaměřené na environmentální výchovu mají zásadní význam pro zvyšování povědomí obyvatel měst o jejich životě a udržitelném fungování. Cílem článku bylo identifikovat akce pořádané v roce 2022 (po období pandemie covid-19) ve varšavském vzdělávacím pavilonu "Kamień" (Kámen) - místě moderního vzdělávání a místních aktivit v oblasti popularizace znalostí o přírodě, boje proti klimatickým změnám, posilování povědomí a dobrých proenvironmentálních návyků obyvatel města. Na základě analýzy dat získaných z Facebooku byly identifikovány dokončené události (65) a následně byly rozlišeny ty, které se týkaly ochrany přírody, městské zeleně a zahradničení (37), aby bylo možné určit sociální preference v oblasti environmentální výchovy. Největší počet akcí se týkal těch, které byly zařazeny do kategorie vzdělávacích workshopů (23), a největší počet zájemců na Facebooku byly vzdělávací vycházky a pikniky pořádané v přírodě. Získané výsledky ukazují na velké potřeby obyvatel Varšavy, pokud jde o rozšíření jak teoretických znalostí pro zvýšení ekologického

povědomí, tak o získání praktických dovedností užitečných pro podporu jejich proenvironmentálních aktivit ve městě.

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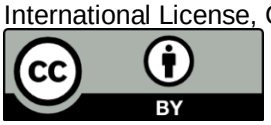

THE ASSESSMENT OF ECOSYSTEM SERVICES IN TRNAVA (SLOVAKIA) AND SURROUNDING REGION

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Abstract
Ecosystem services represent the contributions and benefits of ecosystems. This paper aims to evaluate highly relevant ecosystem services in Trnava as a regionally significant city and in the functional area which consist of 15 surrounding villages. In this research we used our own progressive methods using complex spatial units (representative potential geoecosystems and representative real geoecosystems) to define the most important ecosystem services in the area. The results of our study consist of two types of outcomes. Firstly, we provide assessment for each spatial unit for various ecosystem services in urban functional area of Trnava and secondly, we have created maps which can help to see a broader image of spatial arrangement of benefits.

Key words: ES, REPGES, potential, benefit, recreation

Introduction

Ecosystem services represents the contributions and benefits which are provided by ecosystems, as for example water, food, wood, soil formation, air and water purification, flood and dry protection, pollination of crops and more. However, human activity destroys biodiversity and reduces the resistibility and ability of healthy ecosystems to provide this broad range of goods and services. Potential representative geoecosystems (here and after REPGES) (Miklós, Izakovičová et al. 2006) represents complex landscape-ecological units characterized by a set of abiotic components (relief, geological background, soil, water and air) and biotic components (especially vegetation, including biogeographic aspects) and are a representation of the potential state of the landscape if humankind did not get involved in it in the past. Since REPGES are based on natural structures and processes in the landscape, they express the conditions for natural ecosystem functions – the potential for providing ecosystem services. Representative real geoecosystems are a representation of the current state of the landscape. Real geoecosystems are the basis for evaluating the current options for providing ecosystem services (ES) in the model territory and are the basis for designing a functional green infrastructure. The main aim of our study is assessment of ecosystem services of urban functional area (UFA) of Trnava (Slovakia). The outcome of the evaluation of individual ecosystem services are separate maps in scale 1:50 000, providing a picture of spatial arrangements of benefits provided by individual geosystems and are the basis for further evaluation and environmental management of the area.

Material and methods

Trnava was defined for the purpose of promoting sustainable urban development as an county city, together with a functional territory consisting of 13 municipalities: Biely Kostol, Bohdanovce nad Trnavou, Brestovany, Bučany, Dolné Lovčice, Hrnčiarovce nad Parnou, Jaslovské Bohunice, Malženice, Šelpice, Špačince, Zavar, Zeleneč, Zvončín. Based on local relations and functional links, the UFA was extended with the municipalities Ružindol and Suchá nad Parnou. From a geomorphological point of view, the territory consists of a geomorphological unit - Podunajská nížina (part of Trnavská pahorkatina and Podunajská rovina). Podunajská nížina is built by neogeneous clay, sand, and gravel, which are covered with loess in the hill-lands parts and with river sediments in river alluvium. On loess is binded the existence of black soils which towars to Little Carpathians passes into brown soils and represents the most fertile lands of Slovakia. From the natural resources in the territory point of view, there are high quality soils which, with favourable climatic conditions, create a high potential for agricultural development. From the functional typization point of view, rural villages have an agricultural character with a residential, partially recreational function (Kamenný Mlyn). From an industrial point of view, UFA belongs to the most advanced areas of Slovakia. Industrial production is concentrated in city of Trnava.

Analysis and assessment of the potential of UFA Trnava using methodology of ecosystem services

Within the analysis of the potential of area using ecosystem services methodology, the most important ecosystem services have been selected (categorisation based on CICES (Haines-Young, Potschin, 2013):

ES01 – Biomass for food production – providing harvested crops

The evaluation was based on the classification of real geosystems. The following features of geoecosystems were included in the evaluation: soil quality, workability of soil and climate type.

ES02 – Water for drinking and for technical purposes - drinking water supply, irrigation, industry

The assessment fully reflects the potential of geoecosystems to provide water for drinking, irrigation, and industry. The surface water potential is expressed as an indicator of the average annual flow rate for individual flows. Groundwater potential was expressed by a combination of indicators:

• Usable groundwater resources in the hydrogeological region
• Replenishment of groundwater reserves
• Protection zones of water sources

ES03 - Air quality regulation - improvement of air quality, hygienic benefits

The assessment fully reflects the potential of geoecosystems for air quality. Impact on air quality have been assigned to individual categories of landscape structure (three categories for negative and three for positive impacts). The impact of road and rail transport was weighted based on the intensity of road transport and the type of railway line.

ES04 - Water quality regulation -improvement of groundwater and surface water quality

The assessment fully reflects the potential of geoecosystems for the quality of surface water and groundwater. The impact of geoecosystems on the quality of surface and groundwater was synthetically expressed through three indicators:

• Buffering function of the soil
• Buffering function of the current landscape cover
• The volume of the surface runoff from the geoecosystem

ES05 – Water flow control, flood protection - water retention and drainage regulation

The assessment fully reflects the potential of geoecosystems to regulate water flows and to protect against floods. The potential was determined based on the evaluation of the retention capacity of the current geoecosystems. For each type of the current geoecosystem, a surface runoff coefficient was modeled, which represents synergistic result of the influence of hydrophysical properties of the geological base, soil, relief, and current land use. It indicates which percentage of rainfall may be drained by the surface runoff.

ES06 – Micro and regional climate regulation - local climate regulation

The assessment fully reflects the impact of geoecosystems on the micro and regional climate regulation and local climate. Individual climatic categories were assigned an impact on climate. The impact of the landscape structure was calculated with the weighted distance of impact of the individual categories.

The impact of road and rail transport was weighted based on the intensity of road transport and the type of railway line (electric vs. diesel) and the distance from line elements. By spatial synthesis with global radiation, we expressed the overall impact of the geoecosystem on local climate regulation. By showing the leeward sides of georelief and the areas affected by the moisture deficit, the negative influence of the geosystem on the local climate was highlighted.

ES07 – Support for natural soil composition

The assessment fully reflects the potential of geoecosystems for supporting natural soil composition. The current water erosion has key importance for preserving the natural composition of the soil in evaluated area. Current erosion was calculated for the area using the erosive model RUSLE, which employs empirical calculation based on rainfall erosivity factor, topographic factor (slope, contributing surface), soil erodibility factor and the cropping factors) for erosion soil transport calculation. For environmental management of the area, it is important to identify the geoecosystems in which their current use has a large anti-erosive effect, that means those areas in which the erosion threat could increase greatly if their current use is changed. For this purpose, a model of potential erosion was calculated without including the protective effect of vegetation. By comparing current and potential erosion, the layer of anti-erosive effect of the current usage of geosystems was interpreted.

Complex spatial units were used for the evaulation of ecosystem services:

- representative potential geoecosystems (processed as synthesis of abiotic and biotic elements of the landscape)
- representative real geoecosystems (identification and evaluation is based on land use)

Results and Discussion

Identification and specification of potential representative geoecosystems (REPGES)

The basis of the synthesis for the allocation of REPGES in the model territory were:
1) Units of potential vegetation - a total of 4 types of potential vegetation according to bioclimatic conditions and 2 types allocated based on azonal conditions were allocated to the UFA area.
2) types of abiocomplexes. In the model territory, we have singled out 9 types of abiocomplexes in two basic categories (plains, uplands). Within each group, we have allocated other subgroups. Within the plains, 6 sub-groups were allocated, within the uplands, 3 subgroups were allocated. UFA area is dominated by poorly corrugated loess tables. Based on the synthesis of the mentioned indicators, we have allocated 19 basic types of REPGES.

Identification and evaluation of recent geoecosystems

The current landscape structure reflects the current state of land use in the area of interest. It reflects the combination of a set of elements of the natural, semi-natural (man-altered elements of the landscape structure) and the artificial (man-made elements of the landscape structure) character. As a result of the development of economic activities, the natural REPGES of the area of interest gradually changed to agricultural and also artificial ecosystems. Thus, many natural REPGES have not only been altered but also destroyed. The dominant position in the current structure of land in the area of interest has agricultural land. The territory occupies 21 675 ha, which is 80% of the total area. Up to 95% of farmland is intensively used as arable land with character of large-scale arable land.

Assessment of ES

ES01 – Biomass for food production – providing harvested crops
It should be stressed that the absolute potential for food production in the area is very high as it is the area with our most productive soils.
In general, the central parts of the area in the flat parts of the Trnava Tableland with black soil have the highest potential for providing agricultural crops.
ES02 – Water for drinking and for technical purposes - drinking water supply, irrigation, industry
Based on our model, it can be concluded that groundwater recharge in the UFA is generally low compared to typical values for the territory of the Slovak Republic and ranges from a negligible 8 mm per year in the Trnava agglomeration area to values of 88 mm in the northwestern parts of the UFA, where they are the result of both a larger rainfall surplus and favourable seepage conditions. Increased groundwater recharge is also associated with areas of fluvial sediments.
ES03 - Air quality regulation - improvement of air quality, hygienic benefits
The most negative impact on air quality is in the regional city of Trnava with a high concentration of traffic and a large proportion of industrially exploited land. With the exception of built-up areas, negative to very negative impacts were identified in the immediate vicinity of roads (depending on traffic intensity) and in the vicinity of the Jaslovské Bohunice nuclear power plant. Smaller forested areas have a positive impact on air quality.
ES04 - Water quality regulation -improvement of groundwater and surface water quality
With the exception of built-up areas, we identified negative to very negative impacts in the northwestern part of the UFA with lower sorption capacity of soils and in areas with greater slope and thus greater runoff coefficients.
ES05 – Water flow control, flood protection - water retention and drainage regulation
The current geoecosystems with the lowest runoff coefficient have the highest retention capacity. In this respect, apart from built-up areas, geoecosystems with the steepest slopes, heavy soils and landscapes with little water retention capacity have the lowest retention capacity. Conversely, areas with minimal slope on relatively lighter soils have the highest retention capacity, irrespective of landscape cover.
ES06 – Micro and regional climate regulation - local climate regulation
The most negative impact is in areas with residential development and industrial complexes with significant heat accumulation in the vicinity of the regional city of Trnava. The area of the nuclear power plant Jaslovské Bohunice also has a significantly negative impact. Smaller forest areas and areas along watercourses and reservoirs have a positive impact.
ES07 – Support for natural soil composition
The highest erosion rates are associated with geoecosystems with steeper slopes and arable land, which are predominantly located in the northwestern, more rugged part of the area and on the more sloping transitions of the loess table into the watercourse floodplains. Other geoecosystems are little erosion-prone.

The results of ecosystem service assessment using innovative assessment approach that is not based solely on land cover and average values applied to each land cover type, as is the case for matrix assessment of ecosystem services based on land cover types (Burkhard et al. 2009), but take into account a wide range of factors affecting the level of ecosystem services provided, promise the potential for more accurate assessments. However, further research is needed and our next step will be to compare assessment results with each other using both approaches on the same area of interest.

Conclusion

In our research, we have proposed innovative methods for ecosystem service assessment and applied these assessment methods to the assessment of ecosystem services in the urban functional area of Trnava. By taking into account various factors affecting the level of provided services, we have refined the assessment of ecosystem services of the area of interest, which is very similar in terms of landscape cover and land use within individual municipalities, but the level of provided ecosystem services varies even within the same landscape cover classes.

We see that this research can be very helpful to provide the basis for further evaluation and environmental management of the area, created by different individual geosystems.

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Souhrn

Tento vědecký článek hodnotí ekosystémové služby v Trnavě (Slovensko) a okolních regionech. Studie hodnotí potenciál poskytování ekosystémových služeb pomocí reprezentativních potenciálních geoekosystémů (REPGES), což jsou krajinně-ekologické jednotky, které představují potenciální stav krajiny, pokud by do ní člověk v minulosti nezasahoval. Reálné geoekosystémy, které reprezentují současný stav krajiny, jsou použity k vyhodnocení současných možností poskytování ekosystémových služeb a k návrhu funkční zelené infrastruktury.

Analýza potenciálu území Trnavy pomocí metodiky ekosystémových služeb se zaměřuje na nejdůležitější ekosystémové služby, které jsou kategorizovány na základě Společné mezinárodní klasifikace ekosystémových služeb (CICES). Vybranými ekosystémovými službami jsou biomasa pro produkci potravin, voda pro pitné a technické účely, regulace kvality ovzduší, regulace kvality vody a regulace vodních toků a ochrana před povodněmi. Hodnocení jednotlivých ekosystémových služeb vychází ze specifických vlastností geoekosystémů, jako je kvalita půdy, zpracovatelnost, klima, potenciál povrchových vod, využitelné zdroje podzemních vod a ochranná pásma vodních zdrojů. Výsledkem výzkumu jsou samostatné mapy, které znázorňují prostorové uspořádání přínosů poskytovaných jednotlivými geoekosystémy. Tyto výstupy jsou podkladem pro další hodnocení a environmentální management ÚPD Trnavy.

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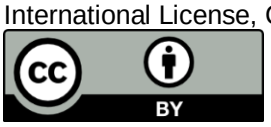

THE CONCEPT OF SENSE OF PLACE IN ENVIRONMENTAL EDUCATION

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Abstract

In recent years, research on the "sense of place" (SOP) concept has gained importance in both the international environmental and geographical literatures. The formation of a student's relationship to place is one key challenge of the educational process in today's globalized society. Although the concept is part of the cross-cutting area of environmental education, its implementation in schools is widely insufficient. To some extent, this situation might be rooted in the lack of theoretical research on this topic in Czechia. Thus, the main aim of this paper is to offer an overview of foreign research that deals with this concept in the context of education, discuss its conceptual definition, and present the results of the research that deals with children's SOP in Czechia and Slovakia. The respondents consist of upper-primary school pupils (n = 8,653). Their responses to an open-ended questionnaire were evaluated via inductive content analysis. The findings suggest that pupils' relationships to specific places exist in the psychological, sociocultural, and biophysical dimensions and that it includes the cognitive, conative, and affective domains. Furthermore, the results provide evidence that a pupil's SOP exists at different scales. The results of this research can contribute to improving the efficiency of implementing the SOP concept in the educational process.

Key words: children; relationship to place; recreation; education

Introduction

In the process of building pupils' environmental literacy, forming a relationship to place is an essential component. According to the model of recommended expected outcomes for the cross-cutting area of environmental education in the Czech curriculum (Pastorová, ed., et al., 2011), one's relationship to place is a connecting theme that should permeate all key topics of this field. The home is usually where pupils begin to form their relationship to place, which then extends gradually to the local region. This part of the geographical space is first recognized by the pupil. It offers not only opportunities for cognitive development but also opportunities for forming emotional attachment to the territory and the places within it. However, scant research has been conducted on this issue. The aim of our research was to answer two research questions: (1) *which types of places in their region do pupils relate to most*, and (2) *what are the reasons for pupils' relationships with these places?*

Theoretical Background

The term "sense of place" (SOP) has been used in the foreign literature to describe one's relationship to place. Lynch (1960), among the first to use the term SOP, referred to the symbolic and memorable aspects of the urban environment. Subsequently, geographers have elaborated on this concept (e.g., Relph, 1976). Tuan (1977) considers SOP to comprise the emotional bonds that develop between a person and an environment and emphasizes the process when people by observing, experiencing, etc. attach meanings to their environment and thus transform the abstract space into a unique place. The concept has also been explored in fields such as psychology (Proshansky, Fabian, & Kaminoff, 1983), anthropology (Altman & Low, 1992), sociology (Brehm, Eisenhauer, & Krannich, 2006), and architecture (Hashemnezhad, Heidari, & Mohammad Hoseini, 2013). According to the International Encyclopedia of Human Geography, "SOP refers to the emotive bonds and attachments people develop or experience in particular locations and environments, at scales ranging from the home to the nation. Sense of place is also used to describe the distinctiveness or unique character of particular localities and regions" (Foote, Azaryahu, 2009, pp. 96–100).

Environmental literacy, which is the main goal of environmental education, is considered a concept that comprehensively encompasses all the framework goals of such education (Hollweg et al., 2011).

The components of this literacy are (affective) dispositions, (cognitive) knowledge, and (psychomotor) environmentally responsible behavior. The SOP concept is a suitable means to shape all three parts of environmental literacy.

Methods

Data for the research was collected using an online questionnaire that was sent to all primary schools in Czechia and Slovakia in June 2022. The questionnaire was filled out by 8,653 upper-primary school pupils in Slovakia 3,980 (i.e., 1.8% of all pupils (ŠÚSR, 2022)) and in Czechia 4,673 (i.e., 1.1% of all pupils (ČSÚ, 2022)). All regions of Czechia and Slovakia and all age categories were represented. In Czechia, those who completed the questionnaire were 49% boys and 51% girls, in Slovakia 48% boys and 52% girls.

Answers to the research questions were gathered from the following questionnaire item: "Which specific place in your region do you have the closest relationship to and why?" The open-ended responses to the questions were subjected to inductive content analysis, resulting in a categorization of the types of places to which the respondents have the closest relationships and a categorization of the reasons for their close relationships to these places.

Results

The results show that the reasons for the pupils' relationships to certain places exist in several dimensions (psychological, sociocultural, and biophysical) within which the cognitive, affective, and psychomotor domains of the relationships can be defined.

The psychological dimension is based on one's personal relationship to and feelings about the place. The respondents expressed their long-term experience with the place ("because I was born there," "I spent my childhood there," "I have lived there all my life," "because I spend most of my time there," "because I have lived there the longest," "I am there almost every day"), its familiarity (*cognitive domain*) ("because I know it"), emotional attachment to the place or its connection with memories (*affective domain*) ("I have experienced many great things there," "I have many memories of something I enjoy," "I spent my childhood in the beautiful countryside"), or influence on the place (*psychomotor domain*) ("the Boskovice trails because I designed them myself").

The sociocultural dimension is based on the pupil's relationship with other people living in the place. Often these are family members ("because I have my grandmother there," "I have my family there") or friends ("I have lots of friends there," "because I have met lots of new people there and we are meeting them now").

The biophysical dimension is determined by the properties of the site. It can express feelings about a place (*affective domain*) ("it is peaceful and quiet," "it is a magical place full of mysteries"), the general familiarity of a place or its interestingness (*cognitive domain*) ("there are famous sights," "the Wolf Pits because I find it fascinating that there is snow all year round"), or the fact that the place allows one to do certain activities, to experience something (*psychomotor domain*) ("because I can do whatever I want there and nobody goes there," "because I can watch wild animals there", "I go fishing there").

In addition to the abovementioned dimensions and domains, the third area of SOP is its spatial scale. In the responses, local, regional, and national levels were noted. At ***the local scale***, the students declared their greatest relation to the spatially smallest locations (e.g., "my room," "my house," "to the bench in the forest," "the pier in Vrbica," "to the meadow near Důlňák," "Petra Bezruč park," "Gabinec forest," "the dirt road lined with young trees leading to the cross with a lime tree and a bench"). ***The regional scale*** was most often represented by the mention of a specific region (e.g., "Pošumaví," "South Moravia," "Krkonoše," "Jizerské hory," "Český ráj"). To a lesser extent, there were also answers at ***the national scale*** (e.g., "Ukraine, I was born there," "Vietnam").

The results of the content analysis suggest that SOP is a multidimensional concept that encompasses many areas. On the basis of these areas, in the following section, we focus on the conceptual definition of SOP.

Discussion

Research on students' SOP is mainly devoted to exploring their relationship with the place where they learn (e.g., forest school: Harris, 2021; field trips: Goralnik et al., 2021; outdoor environmental education programs: Sedawi, Assaraf, & Reiss, 2021) and focusing on the relationship between

residential mobility and affect place attachment (Vidal, Valera, & Peró, 2010) or the connection between SOP and a particular instructional design or strategy (place-based education: Grimshaw & Mates, 2022; environmental education: Chen, 2020; science learning: Lim & Barton, 2006). Other research on SOP focuses on reflecting on students' experiences with places in their childhood (Tani, 2017). One review on SOP in environmental education is presented by Kudryavtsev, Stedman, and Krasny (2012). However, few studies focus on pupils' relationship with their region, to specific places in it, and why these places are popular. Our research sought to add to this under-emphasized area of research, and based on the research findings, we defined the concept as follows. SOP is a multidimensional relationship to place that arises by observing, experiencing, living, imagining, and dreaming humans who attach meanings to their environment and thus convert abstract spaces into unique places filled with meanings. SOP includes sub-concepts such as place attachment (place identity, place dependence) and place meaning and can have a local, regional, national, or global scale. SOP consists of the affective (emotional bonds), cognitive (knowledge, thinking), and psychomotor (behavior, action) domains and includes the biophysical, psychological, and sociocultural dimensions.

Based on the Regional Identity Scale instrument, Asún, Zúñiga, and Morales (2018), in their quantitative research, revealed three dimensions of regional identity (could be classified as a regional SOP): awareness of regional belonging (BEL), identification with the regional territory (TER), and identification with the regional culture and history (CUL). The given dimensions can be identified with those revealed by the content analysis in our research: psychological (BEL), sociocultural (CUL), and biophysical (TER). Similar dimensions are defined by Ardoin, Schuh, and Gould (2012), who, however, in addition to the dimensions we have identified, have also distinguished a political-economic dimension.

Conclusion

Based on the research conducted, this paper presents the concept of SOP as multidimensional, consisting of psychological, sociocultural, and biophysical dimensions as well as cognitive, affective, and psychomotor domains on the local, regional, and national scales. The paper then presents and discusses a conceptual definition of SOP as well as highlights some international research that addresses this issue in relation to education. The need to address the formation of pupils' relationship to place is evident nowadays in such content, among others, as domestic and foreign curriculum documents.

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Souhrn
Výzkum konceptu SOP nabývá v posledních letech v zahraniční environmentální a geografické literatuře na významu. Formování vztahu žáka k místu je v dnešní globalizované společnosti jednou z výzev výchovně-vzdělávacího procesu. Vztah k místu je v Česku ukotven v modelu průřezového tématu Environmentální výchova pro základní školy. Přesto je implementace konceptu SOP do vzdělávání v Česku problematická. Zároveň v Česku chybí teoretické výzkumy na toto téma. Cílem příspěvku je nabídnout přehled zahraničních výzkumů, které se konceptem zabývají v souvislosti se vzděláváním, diskutovat jeho konceptuální definici a prezentovat výsledky výzkumu, který se zabýval vztahem k místu českých a slovenských žáků. Respondenty tohoto výzkumu byli žáci 2. stupně základních škol (n = 8,653). Odpovědi na otevřenou otázku dotazníku, který byl v online formě rozeslán do všech základních škol v Česku a na Slovensku, byly vyhodnocovány pomocí induktivní obsahové analýzy. Zjištěné dimenze vztahu k místu jsou diskutovány s výsledky zahraničních výzkumů. Ukazuje se, že vztah žáků k místům existuje na úrovni psychologické, sociokulturní a biofyzikální dimenze a zahrnuje kognitivní, konativní i afektivní doménu. Dalším zjištěním je, že dětský vztah k místu existuje v různých měřítkách – od lokálního, přes regionální až po národní. Potenciálem výzkumu konceptu je zefektivnění jeho implementace do výchovně-vzdělávacího procesu a přispění k výchově environmentálně gramotných občanů.

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THE EFFECT OF GRASS STRIPS ON SOIL RETENTION AND EROSION REDUCTION IN AGRICULTURAL LANDSCAPE

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Abstract
Grass strips are one of the landscape features that separate large blocks of arable land into smaller plots. Together with other elements, they form a landscape mosaic that contributes to improving the ecological, aesthetic and cultural values of the agricultural landscape. A varied landscape mosaic is the main prerequisite for increasing the ecological stability of the landscape, opening up the landscape to people, or further use for recreational purposes. The research activities of RISWC include long-term measurements of the retention capacity of grass strips and continuous monitoring of erosion events in catchments with implemented grass strips. The results show the positive effect of these grass strips. After their implementation, the infiltration rate of rainwater is significantly increased. There is also a significant reduction of erosion on the slope with the implemented grass strips. In this paper we present an example of the function of grass strips in the model catchments Hustopeče-Starovice.

Key words: Grass strips; water erosion; water retention; landscape; recreation

Introduction

In the Czech Republic (CR), more than 50% of farmland is threatened by soil erosion (Podhrázská et al., 2022). The main reasons of the high erosion threat in CR were insensitive human interventions into the landscape in the second half of the 20th century. Until this period, agricultural production exploited land blocks of a mean size of 0.5 ha. Appropriate anti-erosion measures must be implemented to reduce the risk of water erosion (Karásek et al. 2022). One of these multifunctional measures is anti-erosion grass strip. Protective grass strip must be placed on the slope along the contour. Retention grass strips have an anti-erosion and retention function (Hejduk, 2011; Kučera et al. 2021; Sochorec, 2016; Podhrázská et al. 2022). They can be implemented as technical anti-erosion measures, which serve to interrupt the surface runoff and to infiltrate it (Karásek et al. 2022). Research on infiltration processes in permanent grasslands has long been carried out by the Research Institute for Soil and Water Conservation in the Hustopeče-Starovice experimental catchment. In this paper, the results of infiltration experiments on erosion-resistant grasslands are interpreted in comparison with the surrounding arable land.

Methods and Results

The experimental catchment area Hustopeče u Brna – Starovice (Fig. 1–3) is part of a small agricultural catchment area with a distinct valley, terminated by a dry reservoir with an outlet to the Starovický Brook on the border of the intravilan. The grassed valley is followed by a total of 5 anti-erosion grass strips implemented in 2017. The grass strips are about 300-500 m long and 20 m wide. According to the overall climate, Hustopeče and its surroundings belong to the natural area of the Hustopeče Upland with favourable climatic conditions. The geomorphological unit belongs to the warm, warm and dry region with mild winters and relatively shorter sunshine. The annual average temperature is 9,2 °C. The annual rainfall is 563 mm with a maximum in July and a minimum in February.

To simulate natural rainfall and measure the rate and amount of infiltrated water, including surface runoff, a portable rain simulator, the U.S. Geological Survey Infiltrometer, modified by Janecek (1989) and subsequently by Karasek (2017), was used. This type of simulator meets the requirements for applicability in field conditions. The components of the said device are: a rain head (drip head), a water reservoir with a regulator, a stand with wind protection, and an overflow device for catching surface runoff. Distilled water is used for throttling. The volume of water in the storage tank (approx. 20 l) is sufficient to produce 120 mm of rain. The droplets fall on the surface to be rained from a height of 1.6 m inside an organic glass tube. A metal ring in the shape of an inverted cone with an inner diameter of 200 mm is used to define the rainfall area. In this ring there is a hole (overflow) at the level of the soil surface through which the eroded soil slurry drains into a graduated cylinder. Field investigations were always carried out in the spring and autumn seasons (before full growth of field crops and after harvest) (Fig. 4, 5).

Fig. 1: Anti-erosion grass strip in the cadastral area Starovice – Hustopeče u Brna

Fig. 2: Anti-erosion grass strips in the cadastral area Starovice – Hustopeče u Brna

Fig. 3: Anti-erosion grass strip in the cadastral area Starovice – Hustopeče u Brna

Fig. 4: Measurement of infiltration characteristics on arable land in the vicinity of an anti-erosion grass strip

Fig. 5: Measurement of infiltration properties on the anti-erosion grass strip

In the course of the research, 58 simulated rainfall processes were carried out by the field rainfall simulator in the period 2019-2021 and the results of experiments on permanent grassland and arable land were compared. The following data were processed: rainfall duration, total simulated rainfall, total rainfall intensity, total infiltration, total infiltration intensity, average infiltration intensity, infiltration coefficient, total surface runoff, total surface runoff intensity, average surface runoff intensity, runoff coefficient. From the results of the simulated rainfall-runoff ratio measurements, the parameters infiltration coefficient and runoff coefficient were determined. The infiltration coefficient (ratio of

infiltrated rainfall to rainfall volume) for all measured sites and land types, as an indicator of soil infiltration capacity, is presented in Fig. 6.

All measurements showed a higher infiltration rate on permanent grassland (erosion control grassland) compared to conventionally managed arable land in its surroundings. The differences in infiltration rates are in the order of tens of percent. Differences are also evident between years and measurement periods. The infiltration characteristics are also influenced by the way the arable land is cultivated, the condition of the soil on the surface (soil crust vs. loose surface), etc.

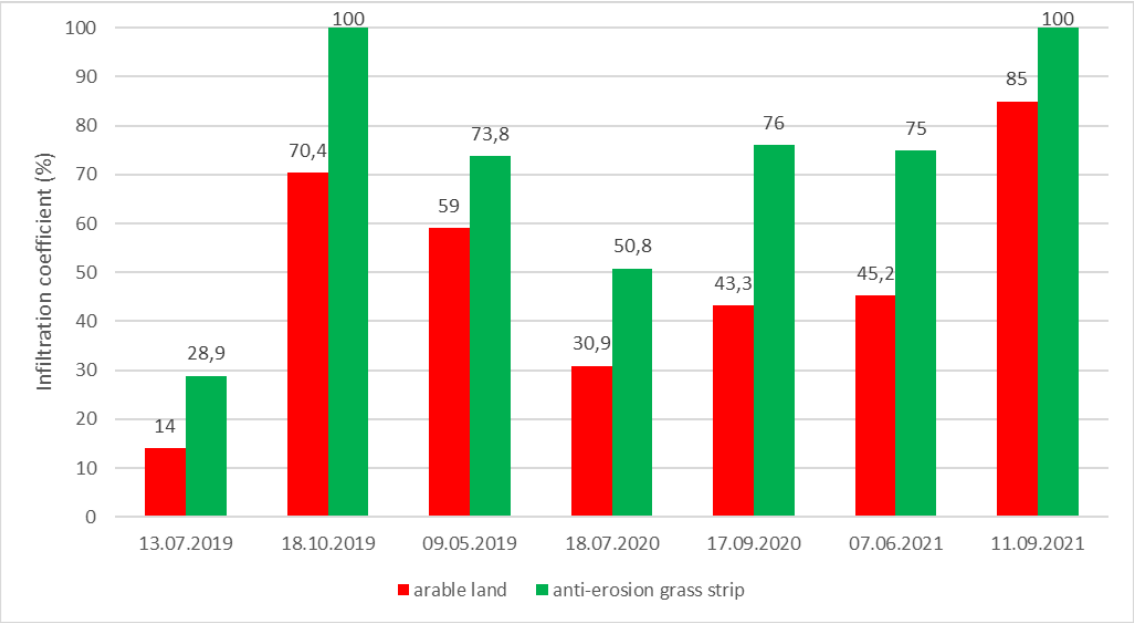

Fig. 6: Comparison of infiltration characteristics of arable land and anti-erosion grass strips on the model locality Starovice – Hustopeče u Brna

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Souhrn

Trvalé travní porosty mají výrazně vyšší míru infiltrace srážkové vody oproti konvenčně obhospodařované orné půdě. To platí i protierozní travní pásy. Ty se realizují v orné půdě jako ochranné opatření. Rovněž však mají funkci krajinotvornou. Utváří pestrou krajinu, jsou přirozeným stanovištěm živočichů, zvyšují estetickou funkci krajinu a rekreační potenciál venkovské krajiny. Jednou z jejich funkcí je zasáknout vodu, která při srážce naprší na travní pás i nad plochu (svah) nad

ním. V modelovém území Starovice-Hustopeče u Brna byly v letech 2019–2021 prováděny polní měření přenosným simulátorem deště za účelem testování míry infiltrace protierozních travních pásů a okolní orné půdy. Při všech měřeních byl prokázána výrazně vyšší schopnost travních pásů infiltrovat srážkovou vodu (oproti orné půdě). To potvrzuje teorii o jejich pozitivní funkci při ovlivňování povrchového odtoku a vzniku eroze na svažitých erozně ohrožených pozemcích.

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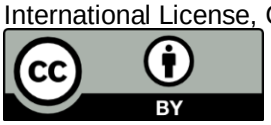

THE FIRST OFFICIAL FOREST MIND TRAIL IN THE CZECH REPUBLIC – KŘTINY ARBORETUM

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Abstract
The forest can do wonders for us. We all have our own experiences with it. It is an environment that becomes a contrast to today's hectic times full of sensations, noise, information overload. The aim of this route is to point out the importance of trees, which is mostly hidden, to offer visitors simple relaxation techniques that they can take back to their lives, to allow visitors to stop, rest and relax among the trees, to popularize scientific research concerning the importance of being in the forest on the physical psychological side of man, to communicate to visitors the importance of the arboretum and the Training forest enterprise Masaryk Forest Křtiny as its manager. The Forest Mind Route, which is the first of its kind in the Czech Republic, is appreciated by experts not only in the Czech Republic but also abroad.

Key words: wish tree, binocular, trees, health, mindfulness

Introduction

The forest can do wonders for us. We all have our own experiences with it. It is an environment that becomes a contrast to today's hectic times full of sensations, noise, information overload. After being in the forest for a while, your eyes relax, inner peace gradually comes, stress and tension recede, your mind becomes clearer... and you don't have to do anything. Nature, the forest can do magic. Many of today's researches show in numbers what we suspect - that nature has an influence on our mental and physical health. (lesnimysl.cz)

Introducing Forest Mind by Sirpa Arvonen (founder of Forest Mind):
"Spending time in nature has been found to promote health. Forest Mind is an innovative mental skills training system designed to harness and deepen the natural healing benefits of forests. This method utilizes the latest, most widely accepted trends in psychology, therapy and coaching, including mindfulness and life coaching, in natural settings or with natural imagination. Forest Mind is a mental skills training program designed to harness and deepen the natural healing powers of the forest. Forest Mind is ideal for promoting self-awareness, relaxation, stress relief and refreshment. The method uses psychology, mindfulnes, in a natural setting or with imagination." (taken from lesnimysl.cz)

The prevalence of ill health in urbanised societies has increased due to expanding urbanisation and modern lifestyles associated with increasing sedentary work and stress. Increasing stress is related to urban life and contemporary work practices dominated by high technology and virtual worlds. Current healthcare alone does not seem to be able to address all these problems. Fortunately, it has been recognised that natural and green spaces have the potential to improve human health (Karjalainen, Sarjala, Raitio, 2010).
The forest environment supports human mental and physical health in many ways. Forests help to reduce stress and relieve fatigue. Thus, they significantly improve the psychological and physical state of humans. Forests can help in both the prevention and treatment of mental illnesses such as burnout and depression. Many studies from different parts of the world report that compared to urban environments, natural environments improve mood state, concentration and performance and bring positive changes in human physiology after stressful or attention demanding situations. Studies show lower levels of blood pressure, heart rate, skin conductance and muscle tension in natural environments than in urban environments (Karjalainen, Sarjala, Raitio, 2010).
In Japan, Shinrin-yoku and its ability to provide relaxation and reduce stress is currently receiving increasing attention. The term Shinrin-yoku can be defined as soaking up the atmosphere in the forest or bathing in the forest. Shinrin-yoku is considered one of the most affordable ways to get in touch with nature and reduce excessive stress to a level that matches what is expected of our bodies. In Western societies, this approach has been incorporated into the lives of individuals since the nineteenth century. Shinrin-yoku and its concept were introduced in Japan by the Forest Agency of the Japanese

government in 1982. In 2005, the Forest Agency introduced the "Forest Therapy Plan", which included research to determine the physiological effects of Shinrin-yoku. Physiological experiments were conducted in actual forests, as well as in laboratories, to clarify the physiological effects of the overall forest environment or certain elements of the forest environment, such as the smell of wood, the sound of flowing water, and the image of the forest. In conducting research on Shinrin-yoku, the authors hypothesized that the reason behind people's sense of comfort in nature is closely related to human evolution. Frumkin states that the connection between nature and humans is not surprising, as human physiological functions must have adapted to the natural environment during evolution. Living in our modern man-made society is therefore inherently stressful for humans. It is therefore natural for humans to feel a sense of comfort or kinship with the natural environment (Tsunetsugu, Park, Miyazaki, 2010).
Smell is most closely associated with instinct, emotion and preference and thus has a greater influence on physiological changes than stimuli to other senses. When performing olfactory stimulation, phytoncides (phyto = plant, cide = "to kill") were worked with. They can be defined as volatile or non-volatile substances produced by all plant species that affect other organisms. Phytoncides are the olfactory elements of the forest environment (Tsunetsugu, Park, and Miyazaki, 2010).
The research also focused on the psychological effects of the forest environment. 498 respondents visited the forest during the 4 days of the research. The research revealed that respondents' mood (hostility, depression) significantly improved on the day of visiting the forest compared to the day when respondents did not visit the forest environment.(Tsunetsugu, Park, Miyazaki, 2010)
The researchers further focused on the effects of the forest environment on immunological functions. They found that essential oil(s) or wood fragrances (e.g., cypress stem oil) significantly increased the activity of so-called natural killer cells (Tsunetsugu, Park, Miyazaki, 2010).

Methods
The aim of this route is to point out the importance of trees, which is mostly hidden, to offer visitors simple relaxation techniques that they can take back to their lives, to allow visitors to stop, rest and relax among the trees, to popularize scientific research concerning the importance of being in the forest on the physical psychological side of man, to communicate to visitors the importance of the arboretum and the ŠLP ML Křtiny as its manager.
The Forest Mind - Mind among trees route.
- The main message is
    - o "We believe that our life is much better when we can go among the trees. That's why we take care of them - to keep them there for us, and our children."
- The sub-message is:
    - o "We believe that our life is much better when we can go among the trees. Being among them recharges our "batteries", washes away stress and refreshes our whole body. Many scientific studies have shown why it is good to go to the woods regularly. A stop among the trees can be as much of a holiday for one person as a visit to a cathedral is for another."

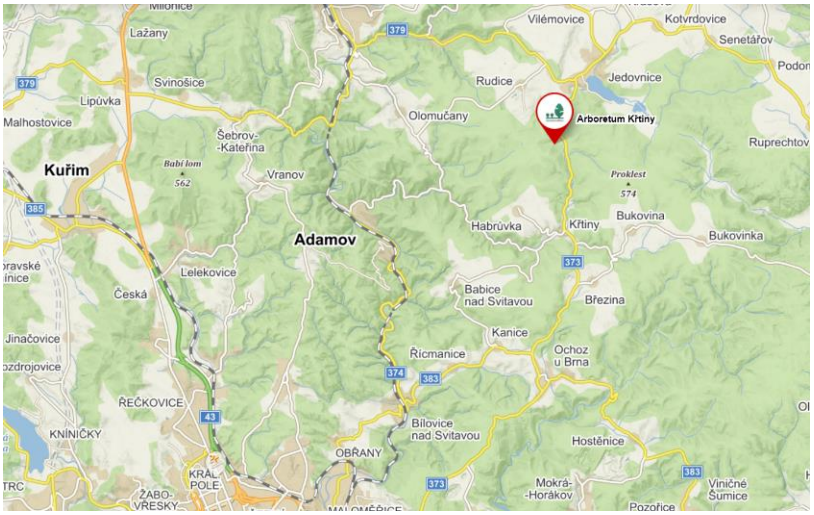

Fig. 1: Map with the location of Křtiny Arboretum (Mapy.cz)

Results
This trail is not educational and it is up to each of us what we take from it. Everyone can enjoy time alone on the path, or use it as an opportunity for deeper conversations with partners, older children or friends.
Duration: approximately 2 hours
Equipment needed: an open mind

Tab. 1: Stops on the trail

number	title
1	Magical breathing
2	Sounds of nature
3	Binoculars
4	Art of being present – back tree
5	Wish tree – thanksfulness tree

1. DID YOU KNOW... the smell of the forest heals?
If you want to lower your blood pressure, smell the Japanese cryptomeria. Scientists say it happens in just 40 to 60 seconds after inhaling the scent. Even the essential oils of other trees help us. For example, they give a feeling of security and help with breathing difficulties.

EXPLORE
The oldest sense and our memories
If you're in the mood and feel like it, try smelling something from your surroundings - dirt, bark, or leaves...
The smells we know can transport us back in time. Try to recall a smell you associate with the forest. What is it, and what memories do you associate it with?

The magic of breathing
The art of slowing down and calming the mind (icon)
1. Sit on a stump, bench, stone or lean against a tree.
2. Pay attention to your breathin
3. Then focus on your inhalation and exhalation.
4. Become aware of what is happening to your body as you breathe.
5. Watch your breathing calm down and slow down after a while.
6. Try to observe how energy and freshness return to your body with each breath.
7. You can do the exercise at the beginning when you enter the forest and at the end of your walk. What difference do you notice?

2. DID YOU KNOW THAT... Nature teaches us to concentrate?
We all sometimes have problems with concentration and attention. Swedish scientists have proven that we can regenerate them much better in nature than, for example, with relaxing music. There are also several studies that show the positive effect of greenery on improving the attention of children with so-called attention deficit hyperactivity disorder (ADHD).

EXPLORE
Holidays for the head
Want to slow down the constant flow of your thoughts? It helps if you start focusing fully on just one of your senses. It gives our minds a rest. We find it easier to concentrate in the woods than anywhere else.

Sounds of nature
The Art of Observation (icon)
1. Find a pleasant place in the surroundings.
2. If you don't mind, close your eyes

3. Listen to the sounds around you. Notice which sounds are coming from near and which from far? Be aware of how each sound affects you.
4. Which of these sounds are most pleasant to you and do you want to associate with your journey? Try to remember it.

3. DID YOU KNOW THAT... We can go into the woods for prevention?
Your immune system only flourishes in the woods. Being in the trees increases the activity of natural killer cells (natural killers of infected cells). These can then have a preventive effect against cancer.

EXPLORE
Binoculars
The art of relaxation and recharging (icon)
1 Imagine you are in the forest for the first time.
2. Make a telescope with your fingers and look around with it. Focus on a detail that catches your eye.
3. What caught your eye? What makes it beautiful, special?
4. Zoom in on the detail you are examining and examine all the little things that caught your attention. What natural forms do you see? What would you wonder if you were seeing this detail for the first time?
5. What surprised or intrigued you as you explored?

4. DID YOU KNOW THAT... The forest is like a pharmacy that never closes?
Some of the most common remedies - for pain - are due to the effects of willow bark. Today, the active ingredient - acetylsalicylic acid - is produced industrially, but it was the willow tree that was responsible for its discovery.
Other trees also have an irreplaceable role in medicine. For example, a medicine made from yew is one of the most promising anti-cancer drugs.

EXPLORE
Not just palms
One of our sense organs is touch, and most of the time our palms come to mind. But it's not just them. Our feet can do the same. Walking barefoot on a good surface is therapeutic and allows the soles of your feet to be naturally massaged.
Try walking for a while without shoes?

Lean your back against a tree
Art of being in the present – back tree
1 Find a tree you like.
2. Stand with your back to it and lean against it.
3. Look at a fixed point on the ground or close your eyes.
4. Become aware of the part of your body you are leaning on and stay that way for a while.
5. Finally, take a deep breath and continue walking.

5. DID YOU KNOW... we are happier among trees?
Everyone needs to reduce tension, anger, fatigue and relieve anxiety once in a while. And the forest can help. So it's no wonder that Scottish doctors, for example, give their patients a 'prescription' to stay in the woods.

EXPLORE
We may not realise it, but trees are part of our lives. Try to think of one particular tree that has played an important role in your life. For example, you may have climbed it as a child, had your first date under it, rested in its shade... What is your story?

Wish tree – thanksfulness tree
The art of looking for the good
1. Look around you and choose a tree that catches your eye.
2. Take a rest by it and then stand in a place from which you can see the whole tree.
3. Consider the things of today for which you can be grateful. Pay attention to the small things and the big things.
4. Imagine that you are placing all the "ornaments" of gratitude on the tree - one thought of gratitude per branch.

5. What is happening to your thoughts, feelings, body?

The leaflet can be downloaded here:
https://arboretum-krtiny.cz/wp-content/uploads/2022/03/letak_smysly.pdf

Fig. 2: Four leaflets for Křtiny Arboretum – different trails (Monika Pevná)

Fig. 3: Leaflet for the trail Mind among the trees

Fig. 4: People enjoying the tranquility of the arboretum (Jitka Fialová)

Fig. 5: Wish tree (Jitka Fialová)

Fig. 6: Some of the wishes – collected in the Křtiny Arboretum (not in proper place) (Jitka Fialová)

Conclusion

The authors of the article really believe that our life is much better when we can walk among the trees. Being among them will recharge our "batteries", wash away stress and refresh our whole body.
The Forest Mind Route, which is the first of its kind in the Czech Republic, is appreciated by experts not only in the Czech Republic but also abroad. So far, it has been implemented for the third year and the information about it is getting to people very slowly. Even students with specific learning disabilities and subject to stress can use the trail for their needs and calm their minds, work with ADHD and take advantage of everything the forest has to offer.

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Acknowledgement

We would like to thank our colleagues Bára Dvořáková, Petra Packová and Klára Bartošová for their cooperation.

Souhrn

Autorky článku opravdu věří, že náš život je mnohem lepší, když můžeme jít mezi stromy. Pobyt mezi nimi nám dobije “baterky”, odplaví stres a osvěží celé tělo.
Trasu lesní mysli, která je první svého druhu v České republice, oceňují odborníci nejen v ČR, ale i v zahraničí. Zatím je realizována třetím rokem a informace o ní se dostává mezi lidi velmi pomalu. I žáci se specifickými poruchami učení a podléhající stresu mohou stezku využít pro svou potřebu a zklidnit mysl, pracovat s ADHD a využít vše, co jim les nabízí.

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THE HIPOROUTES IMPLEMENTATION OPTIONS FROM ALTERNATIVE MATERIALS

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Abstract
These days, equestrian tourism is more and more popular. It is also called hipotourism. During this, the tourist is mostly riding a horse. A suitable way is needed for horses and their riders, of course. The hiporoutes usually use forest and field roads with gravel or asphalt cover. These roads are the ideal surface during times of drought. There are problems during strong or long-lasting rains and snow melting. The muddy surface of the roads is hazardous for horses because they can slip. The asphalt cover is unsuitable, of course. Concerning the increasing interest in hiporoute construction, and due to the lack of traditional building material, the search for more economical, technologically better solutions and minimalizing the effects on the environment is required. One of the possible solutions for construction is using recycled materials and secondary raw materials from industrial production. There were chosen several sorts of materials and binders for authorization of possibilities in using of alternative materials for road stabilisation due to the training of carriage horses in the National stud farm Kladruby n. Labem. The longtime target is observing changes in surface properties due to traffic, climatic condition and suitable cover of routes for horse training.

Key words:horse tourism, test section, recycled material, binder, recreation

Introduction

Equestrian tourism, called hipotourism, where you mostly travel on horseback, is currently a very popular leisure activity. The current lifestyle trend of spending leisure time in nature, creating a bond between people and animals, and a generally healthy lifestyle also contribute to the increased interest in this type of tourism.
It is essential to be aware that there may be a risk of damage to the surface of paths when using them for riding. Unpaved or only partially paved trails are prone to surface damage, especially in wet weather. Even though the horse is considerably lighter than agricultural and forestry machinery, the high weight over a small area (due to the hoof) puts more pressure on the road surface than is the case with tyres (Svoboda 2009).
When constructing horse riding trails, so-called hipotrails, and related facilities (horse stations, stabling and other facilities), it is necessary to select surfaces for horses carefully. How well a horse can move on the surface of the path depends on the slope of the path surface, friction, horseshoes, the distance of travel, and the surface material itself.
When selecting a surface material, it is necessary to consider how comfortable and safe the surface is for the user and how the material can withstand the forces that affect the life of the surface. All surface materials have advantages and disadvantages. For example, many materials present a slip hazard, especially when wet, snowy or icy. Whatever the choice, it is essential to make sure that the materials are suitable for the regional climate. For equestrian use, materials should be slip-resistant and able to withstand the impact of horseshoes. Reinforced surfaces provide little grip for horseshoes and are not recommended.
Likewise, natural materials have their advantages and disadvantages. Unpaved surfaces are attractive to horses. On the other hand, these surfaces can be damaged by rain or snow and some surfaces covered with e.g. slate, pine needles, damp moss or wet vegetation pose a slipping hazard. Asphalt surfaces are generally not recommended for horse trails as they provide little traction for horseshoes. The solution is using asphalt mixed with finely ground used tires, which provides more traction and is being used with some success in Arizona (0723 - 2816 - MTDC - Chapter 6 - Choosing Horse - Friendly Surface Materials). This idea has been used in the design of the road stabilisation test section at Kladruby National Stud.

Materials and methods

In 2006, a test section of road stabilisation was implemented in the National Stud Farm Kladruby n.L. in the length of 1500 m.

Within the test section, four sub-sections with different components were implemented and mixed into the milled aggregate layer of the existing roadway to a depth of 0.2 m (Fig. 1).

Fig. 1: Detailed view of the modified road cover.

On the first section, a mixture of 3.5% cement and 3.5% coarser rubber granulate was chosen. On the second section, a mixture of 3.5% cement, 3.5% asphalt emulsion and 3.5% fine-grained rubber granulate was chosen. For the third section, a mixture of 3.5% cement and 3.5% asphalt emulsion was used. For the fourth section, 3.5% cement was used.

The aim of the long-term monitoring of the layer in the test section was to answer whether the stabilised layer's properties do not change due to use and climatic conditions. The selection of appropriate field tests had to consider the technological possibilities and the difficulties of working in the conservation area (UNESCO site, work in operation). For the basic field test on the stabilised layer, the impact load test referred to as the light dynamic plate (hereinafter abbreviated as LDD) was selected in accordance with CSN 73 6192. The LDD measurements were carried out in the third and fourth test sections under 17 years of traffic, at a stationing interval of 50 m alternately in the left and then in the right wheeltrack, for the reason that in these parts of the roadway, the traffic loading was most significant. At the Kladruby National Stud Farm, carriage horses are trained in multi-passage, with horses moving side by side on the road and the traction of the carriage wheels is also carried out in two tracks of approximately 0,50 m width (Fig. 2).

Fig. 2: View of the quad training on the test section after 17 years of operation.

The measurements were performed with a lightweight dynamic plate ZFG 3000 GPS with a diameter of measuring plate of 300 mm and a weight of 10.0 kg (Fig. 3).

Fig. 3: View of the impact load test measurements on the pavement surface.

Before the actual measurement, the preparation for the measurement consisted in placing the load plate on the desired location and moving and rotating it to a horizontal position, followed by connecting the load plate to the measuring device with a measuring cable and loading the tested area with three preliminary shocks, followed by the actual measurement and finding the position of the measured point using GPS coordinates.

Results

The objective of the lightweight dynamic plate measurements was to determine the impact modulus of deformation E_{vd} (hereafter E_{vd}) of the stabilised cover layer. A total of 18 load tests were performed.

Tab. 1: Summary of LDD results on the road surface.

Section number	Average E_{vd} [MN/m]^2	Conversion coefficient	Average E_{def2} [MPa]	Catalogue sheet: PN 610	Soil stabilisation material
3	62,45	1,7	106,16	Does comply	3.5% cement + 3.5% asphalt emulsion
4	44,67	1,7	75,93	Does not comply	3.5% cement

The highest average impact modulus of deformation E_{vd} was measured in Section III, which was stabilised with 3.5% cement with 3.5% asphalt emulsion (Table 1).

Discussion

Using LDD, the values of the impact modulus of deformation E_{vd} of the stabilised cover were determined in the investigated sections III and IV. The modulus of deformation of the subgrade E_{def2}, to which the E_{vd} values were converted, is a better index to assess the bearing capacity of the stabilised cover. The results found were compared with the Catalogue of Field Road Pavements, specifically with the catalogue sheet: PN 610, where the cover layer is SCM - gravel partially filled with cement mortar; this cover layer is not identical to the covers assessed in sections III and IV, but is the closest in its properties to them. The catalogue of field road pavements does not contain the types of covers examined. The minimum required value measured on the surfaces of the investigated sections is E_{def2} = 90 MPa. This value was determined based on the thickness of the stabilised cover and the predicted values given for the individual structural layers according to the PN 610 datasheet mentioned above.

Conclusion

The aim of the long-term monitoring of the test section in the National Stud Stud Kladruby was to answer whether the stabilised layer's properties do not change due to operation and climatic conditions.

This research was created in response to the growing interest in equestrianism and horse tourism. The test sections were designed with careful consideration of several aspects. The first was the technological limits (sufficient strength and adequate flexibility). Another aspect was the economics - reducing costs and the environmental aspect - reducing the burden on the environment. At the same time, the durability parameter of the structure was monitored.

Finally, it should be noted that the presented results refer to the type of binder deposited in specific (geological) road construction conditions. In any case, the results presented cannot be applied to other binder sources without verification tests. It is always necessary to observe the principle of good functional drainage of the whole structure and to comply with the technological parameters.

Research on sections I and II, where rubber granules are mixed in the pavement cover, should focus not only on determining the bearing capacity of the pavement cover but also the extent of degradation caused by the loss of rubber granulate over time, e.g. macroscopic and microstructural analysis can be used for this purpose.

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Souhrn

Předložený článek je souhrnem výzkumu v oblasti využití alternativních materiálů pro stabilizace jezdeckých stezek tzv. hipostezek. V článku je stručně popsána problematika výstavby hipostezek, kdy je nutné pečlivě vybírat povrchy pro koně. Hlavní část článku pojednává o realizaci zkušebního úseku v Národním hřebčíně Kladruby, kde byly testovány „nové“ materiály pro tyto účely. Závěr článku poukazuje na skutečnost, že se jedná o důležité poznatky, které byly získány během dlouhodobého testování a které mohou obohatit odborné poznání v oblasti využití recyklátů, příp. druhotných surovin z průmyslové výroby v oblasti výstavby hipostezek, což potvrzují dosavadní předložené výsledky.

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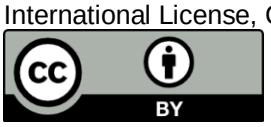

THE IMPACT OF THE CREATION OF A RECREATIONAL AREA BY RECLAMATION OF A SURFACE MINE ON PROPERTY VOLUE

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Abstract
The new lake Most with a water surface of 309 ha is an example that in some cases the damage to the landscape by human activity is not irreversible. A successful reclamation was a prerequisite for the preparation of a plan while mining was still under way in 1968. Since October 2008, the original mining pit has been filled with industrial water from the Nechranice dam. The surroundings of the future lake were also reclaimed, creating conditions for recreational use, not only beaches and facilities, but also sports equipment, playgrounds and piers to facilitate access to the lake.
The article examines the effect of the newly created recreational area on the price of residential property in the vicinity. Price data from the period before the lake filling and from 2020 to 2022 are used as a basis for the analysis of the current state of the residential real estate market.
The paper concludes by stating to what extent, and with what time lag, positive environmental change will take place in the formerly devastated area.

Key words: reclamation, lake, recreation area, residential property

Introduction

The town of Most is characterised by the devastation of the landscape and the disruption of the development of the urban area, which is typified by the relocation of the 16th century Gothic Church of the Assumption of the Virgin Mary. The end of mining and the construction of connecting roads will make it possible to reconnect the residential development with the recreational area and make the site more attractive. A specific feature of this area is the relatively insignificant development of detached houses and a large number of apartment blocks. The spatial planning documentation (Fig. 1) allocates a large area for the development of single-family homes in the vicinity of Lake Most.

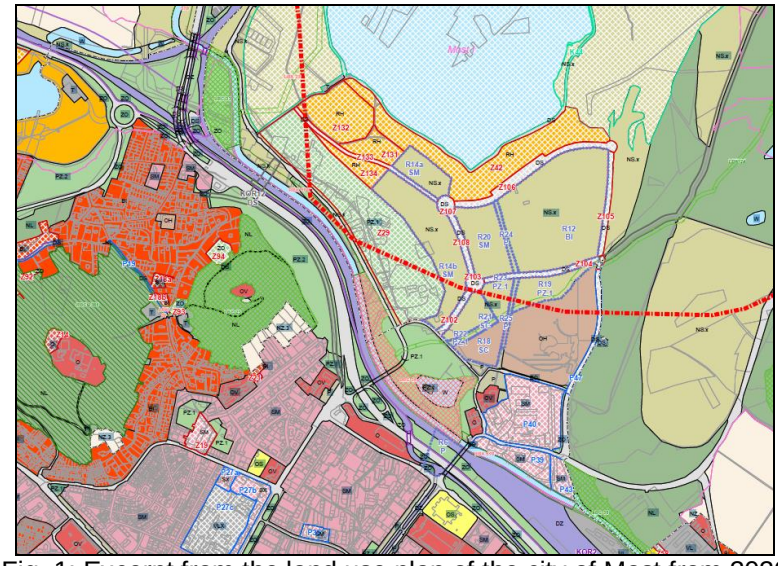

Fig. 1: Excerpt from the land use plan of the city of Most from 2020

However, it should be noted that an investment of CZK 3 billion was necessary, provided by the Ministry of Finance of the Czech Republic out of the CZK 15 billion earmarked for mitigating the consequences of mining activities throughout the Czech Republic.

Material and methods

Lake Most, with an area of 309 hectares, was created by flooding of the Ležáky lignite mine. Coal mining ceased in 1999, and reclamation and preparation of the lake bed by sealing it with a fill was

started. In the more permeable areas, up to 60 cm of sealing clay is layered on top, protected from drying out by another layer of soil, so that it does not crumble and crack before the lake is filled.
Since 2008, the filling with water has started. The lake is 2.5 kilometres long. After filling, the water level is 199.6 metres above sea level. The maximum depth is then 75 metres, more than in the Orlické Dam. Visibility is up to nine metres. The reclaimed area is 1 300 ha and the total volume of water is 70 500 000 m^3. The area of the lake is in four cadastral areas: Most I, Přidla, Kopisty, Konobrže. Ownership relations to the flooded land and the land around the reservoir will have to be resolved by the end of 2023. This means the cancellation of the right to dispose of the property of the state and the Statutory City of Most, which was granted to the state enterprise Diamo.
Despite extensive state investment and environmental improvements, the landscape and the city of Most are still not attractive for housing.

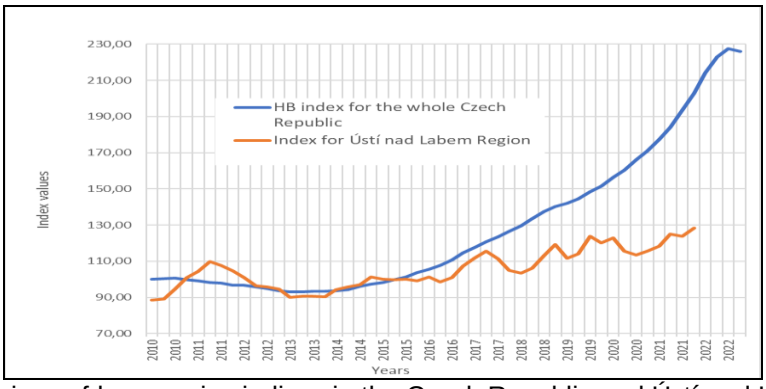

Fig. 2: Comparison of house price indices in the Czech Republic and Ústí nad Labem Region

Despite the expected improvement, housing prices in the Ústí nad Labem region have been almost stagnant since 2016, as can be seen in Fig. 2.
For the purposes of the research, all deposits into the Cadastre of Real Estate (hereinafter KN) cadastral area (hereinafter k.ú.) Most II are summarized from 2014 to 2022.

Year	Total number of deposits	Residential units total	Up to 45 m^2	Up to 60 m^2	Up to 80 m^2	Above 80 m^2
2014	862	648	160	263	190	35
2015	1 098	878	248	312	264	54
2016	1 397	1 095	344	383	319	49
2017	1 373	1 122	322	427	330	43
2018	1 302	1 230	376	412	386	56
2019	1 313	1 113	313	408	341	51
2020	1 236	1 052	289	432	293	38
2021	1 365	1 332	366	543	368	52
2022	1 103	968	273	402	256	37

Fig. 3: Number of sales in the cadastral area of Most II

These include 11,049 deposits, of which 9,438 are transfers of residential units (Fig. 3). Throughout the period under study, the most numerous sales are of flats with a floor area between 45 m^2 and 60 m^2, corresponding to a 2+1 layout.

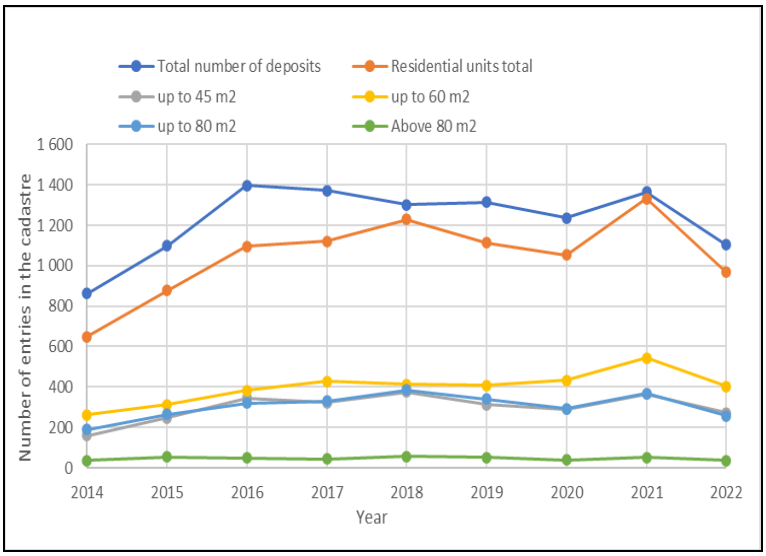

Fig. 4: Frequency of apartment sales in the k.ú.Most II from 2014 to 2022

On the website of the Czech Statistical Office, it can be seen that between 2019 and 2021, the largest number of flats with a floor area of 55 m^2 were transferred. For this type of dwellings, the effect of the newly created water area is further examined, including the supply price during 2022 (Fig. 5).

Results

The basic features for the possible development of recreation and improvement of the quality of life of the residents are fulfilled in the studied locality. A new water area with good water quality has been created, access from the public road is provided, the installed jetties make it comfortable to enter the water and other important tourist destinations have been connected, see Fig. 7, thus increasing the attractiveness of the area.

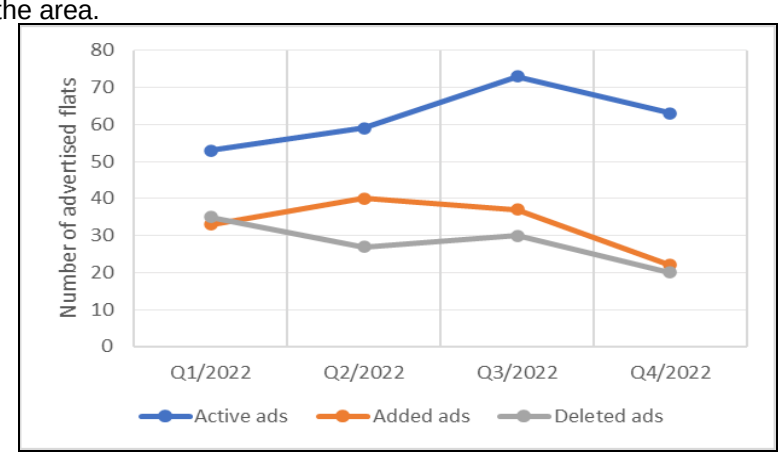

Fig. 5: Development of the number of offered properties within a radius of 5 km for flats of 46 to 68 m^2, in private ownership, in average condition

By examining residential property prices in the vicinity of the lake, no constant increase or decrease has been found; fluctuations in 2019, 2020 and 2022 are probably due to external macroeconomic influences, this is confirmed by the ownership relationships found by consulting the land registry; the owners of the flats reside in other cities and countries.

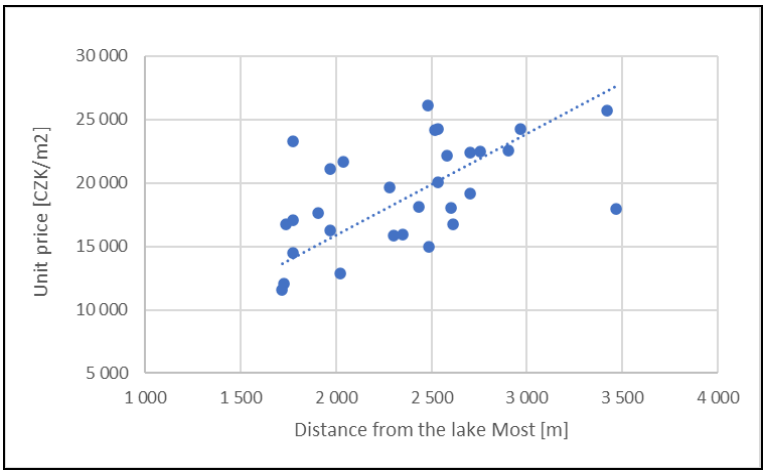

Fig. 6: Dependence of unit price on distance from the lake

Relatively specific are the continuities in the locality, the part with apartment houses is separated from the lake by a railway corridor and a busy road. The houses closer to the lake are also closer to the road and it is therefore questionable whether the negatively perceived impact of the traffic corridor will be offset by the positively perceived recreational area. Currently this is not the case (fig. 6). The closer the surveyed dwellings are to the lake, and also to the road, the lower the offer prices.
Nevertheless, depending on the ongoing reclamation and according to the master plan see fig. 1, it can be concluded that the site has a great development potential in the future.

Discussion
Detached houses were not investigated due to their low frequency and the fact that most of them allow relaxation in their own garden.
The most limiting factor to the increase in popularity of the site is the dangerously close mining boundary (Fig. 1) and the continuing concern about the possible expansion of the surrounding mining areas.
The problem of the lack of lake inflow and the small amount of rainwater that does not compensate for the high evaporation is so far solved by the Nechranice industrial water supply. The use of water from the Bílina mine or the Koh-i-Noor mine is being considered for the future.
The possibility of bank erosion is eliminated by appropriate bank hardening and the exclusion of motorised water sports.

Conclusion
Given the long period of lake filling, it could have been assumed that property prices would rise before 2022, but this assumption has not been proven and more long-term research is needed.


Fig. 7: Lake Most with other recreational and tourist destinations

The popularity of the location is increasing with the possibility of attractive recreation without the need to travel. And paradoxically, it may also be reflected in a reduction in the number of sales, as the needs of residents are met and the site functioning as a hostel becomes a full-fledged housing.

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Souhnr
Zdevastovaná krajina statutárního města Most a narušený vývoj městského prostoru po ukončení těžby získává novou možnost dalšího rozvoje. Jezero Most, o rozloze 309 hektarů, vzniklo zatopením hnědouhelného dolu Ležáky. Uhlí se přestalo těžit v roce 1999, byla zahájena rekultivace a příprava jezerního dna utěsněním výsypkou. V propustnějších místech je navrstveno až 60 cm těsnicího jílu, chráněného před vyschnutím další vrstvou zeminy, tak aby neproschl a nepopraskal před napuštěním jezera v roce 2008. Jezero má délku 2,5 kilometru. Po napuštění je vodní hladina 199,6 m nad mořem. Maximální hloubka je pak 75 metrů. Rekultivované plochy je 1 300 ha a celkový objem vody je 70 500 000 m^3. Plocha jezera je na čtyřech katastrálních územích: Most I, Přidla, Kopisty, Konobrže. Zatraktivnění lokality vznikem nové vodní plochy jezera Most je podmíněno vybudováním spojovacích komunikací, které umožní opětovné propojení rezidenční zástavby s novou rekreační oblastí. Územně plánovací dokumentace vyčleňuje v okolí jezera Most rozlehlou plochu pro zástavbu rodinných domů, kterých je ve srovnání s počtem bytových domů minimum.
Pro zahlazení následků důlní činnosti byla nutná investice ve výši 3 miliardy Kč poskytnutá Ministerstvem financí ČR. Přes rozsáhlé investice státu a zlepšení životního prostředí krajina a město Most není stále lákavé pro bydlení, ceny bytů v Ústeckém kraji od roku 2016 téměř stagnují, což je zjevné z Fig. 2.
Pro potřeby výzkumu jsou shrnuty všechny vklady do katastru nemovitostí pro katastrální území (dále k.ú.) Most II, a to od roku 2014 do roku 2022. Jedná se o 11 049 vkladů, z nichž je 9 438 převodů bytových jednotek (Fig. 2). Po celé sledované období jsou nejpočetnější prodeje bytů s podlahovou plochou od 45 m^2 do 60 m^2. Na stránkách Českého statistického úřadu je dohledatelné, že v letech 2019 až 2021 bylo převedeno nejvíce bytů o podlahové ploše 55 m^2.
Zkoumáním cen rezidenčních nemovitostí v blízkém okolí jezera, nebyl zjištěn konstantní nárůst ani pokles, výkyvy v letech 2019, 2020 a 2022 jsou pravděpodobně způsobeny vnějšími makroekonomickými vlivy.
Poměrně specifické jsou návaznosti v lokalitě, část s bytovými domy je od jezera oddělena dopravním koridorem. Domy bližší jezeru jsou také blíže koridoru a je tedy otázkou, zda bude tento negativně vnímaný vliv kompenzován pozitivně vnímanou rekreační zónou. V současné době tomu tak není (fig. 6). Čím jsou zkoumané byty blíže jezeru, a zároveň i koridoru, tím jsou nabídkové ceny nižší.
Vzhledem k dlouhé době napouštění jezera, se dalo předpokládat, že ceny nemovitostí porostou ještě před rokem 2022, nicméně tento předpoklad nebyl prokázán a je potřeba dlouhodobějšího zkoumání.
Oblíbenost lokality stoupá s možností atraktivní rekreace bez nutnosti cestování. A paradoxně se může projevit i snížením počtů prodejů, protože potřeby rezidentů jsou naplněny a z lokality fungující jako ubytovna se stává plnohodnotné bydlení.

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THE IMPLEMENTATION OF GIS TOOLS FOR PLANNING THE DEVELOPMENT OF RURAL TOURISM ALONG THE NETWORK OF OLD SHEEP-TRACKS

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Abstract
Rural tourism is progressively growing in several areas of the World, thanks to its characteristics to noticeably combine naturalistic, cultural and eno-gastronomic opportunities. In this framework, many old agricultural buildings have been successfully converted into new accommodations, typical restaurants or educational farms. Tourism activities related to these rural structures are currently expanding, so incentivizing the arrival of more tourists and valorizing the rural land. One of the elements of the rural landscape that could be improved to further spreading, is the network of old sheep-tracks. Indeed, these paths can be exploited for cultural and nature hiking activities since, in addition to often crossing rural areas, they are perfect places to immerse the tourist in the nature and surrounding landscape. The present study considers the Basilicata Region (Southern Italy) and its important network of old sheep-tracks, which have been included into a GIS database, specifically implemented to exploit these paths for touristic purposes. Thanks to this GIS tool - that allowed the creation of a complex georeferenced database, by entering all data related to elements of tourist and cultural interest - it has been therefore possible to plan suitable tourist routes, even aimed at the sustainable valorization of the rural landscape.

Key words: Rural landscape, public recreation, agro-tourism, hiking trials, ancient tracks

Introduction

Rural tourism could be defined as a type of tourism located in agro-forestry areas, identified by some key characteristics (location, between countryside and small towns; small accommodation facilities scale; close relations with the local population; interaction with the surrounding environment, history, culture, etc.) (Belligiano et al. 2021). Sheep-tracks ("*Tratturi"*, in Italian) and transhumant experiences are today considered above all as a cultural journey, through which communities become fully involved in the process of heritage valorization and planning of territorial development. The sheep-tracks are grassy, stony or rammed-earth paths, always with a natural bottom, originated from the passage and trampling of herds, used by shepherds to perform transhumance, *i.e.*, to transfer with seasonal cadence their flocks from one pasture to another, located at different altitude.
The term "*Tratturo*" comes from "*tractus*", past participle of the Latin verb "*trahere*", which means to drag, to pull. They have, in general, a north-south course and are connected by minor trail structures, arranged along smaller parallel tracks, such as the "*Tratturelli" (a diminutive of "Tratturi")*. Along the various paths, there are large grazing areas, intended for the resting of herds during transhumance. In Italy the sheep-tracks are mainly located in its southern regions (Abruzzo, Basilicata, Campania, Molise, Puglia and Umbria), their presence dating back to prehistoric times (Esposito et al., 2012). The Italian Law n.1089 of 1.06.1939 and several subsequent decrees and various regulations, including regional ones, attribute artistic, historical, archaeological, ethnographic, naturalistic, and landscape interest to these sheep-tracks. They could be considered, then, to be as an heritage legally classified as a public property, thus subjected to protection and attention by the authorities in charge. The Italian Ministry of the Environment, in agreement with several southern regions, proposed in 2006, for several sheep-tracks, their candidacy for the UNESCO World Heritage status.
The use of advanced technological tools may considerably support the protection of landscapes with high cultural and naturalistic value (Statuto et al., 2019), since they allow the implementation of multidisciplinary information, which may reveal crucial for a sound management of sites representing an heritage of outstanding value (Cillis and Statuto, 2018). The use of a Geographical Information Systems (GIS) is very helpful, since it allows several analyses, suitable for tourism purposes. Indeed, there are many examples of application of a GIS to implement territorial marketing strategies, or to valorize the sustainable development of rural tourism (Statuto et al. 2021).
In this paper, the case study of an old sheep-track located in the north-northeast part of Basilicata Region - Southern Italy is presented. Here, the network of sheep-tracks is extensive and could serve as a connection structure for the landscape and the valorization of historic rural buildings (Cillis et al., 2020; Picuno P., 2022). A GIS database has been here implemented, so as to relate all the

components characterizing the rural territory and thus make it usable to people involved in tourism enhancement, in particular in activities (*e.g.*: walking; horse riding; typical food preparing and/or tasting; *etc.*) which may constitute a specific experience, depending on the characteristics of the destination in terms of environment, agriculture, food, lifestyle, cultural heritage, *etc.*

Material and methods

Basilicata region is characterized by a vast rural land with great historical and cultural importance. Thanks to the varied morphology, including mountains, hills, plateaus and valleys, the territory offers a great offer of natural and cultural landscapes. Tourism has now become an important economic sector for Basilicata, with a growing interest in hiking and discovering the historical and cultural heritage associated with the sheep-tracks. The network of "tratturi" (fig. 1) have become a popular destination for lovers of hiking and outdoor adventure, because of their unique naturalistic and cultural features. Mostly in the "Alto-Bradano" area, characterized by soft rounded shapes and dominated by the presence of Mount "Vulture" (1326 m) - an extinct volcano which had a notable influence on the geographic, botanical, zoological and anthropological events of the surrounding natural environment - it is possible to see a dense network of areas of considerable historical, natural, landscape, archaeological and monumental interest (Picuno et al., 2019).

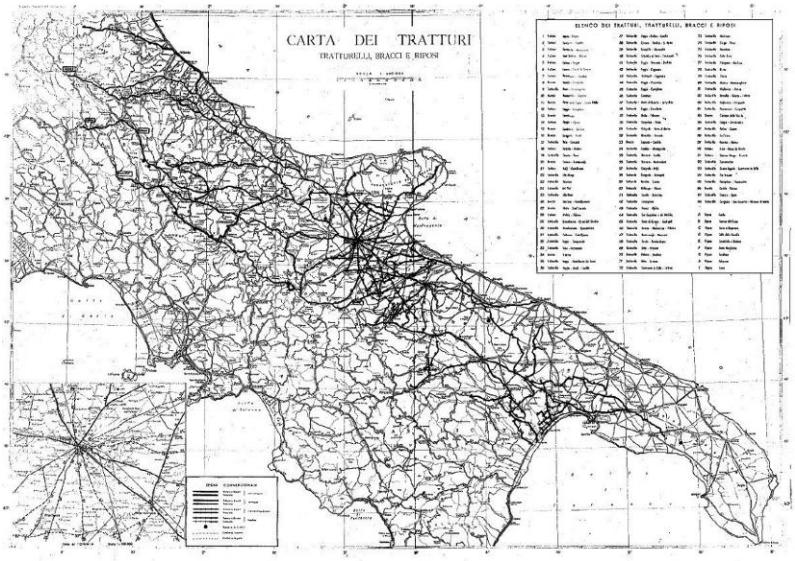

Fig. 1: Map with the representation of the network of Tratturi in the south of Italy (Year 1959).

In this study area, the territory of the Municipality of Acerenza (yellow circle in fig.2) and neighboring towns, is characterized by important assets with historical, architectural and archaeological value. This, can also be found in the Geodatabase "WEB GIS TUTELE" (fig. 2) created by the Basilicata Region.

Thanks to the possibility to download data from this WEB GIS in the form of vector files, these data have been imported into an open-source GIS environment (QGIS), so as to create a network of itineraries, which involves different points of interest (monuments, archaeological sites, historic rural buildings, nature areas, existing trails, etc.) and to analyze their possible enhancement for tourism and recreational purposes.

Results and Discussion

Thanks to the superimposition of the old historical cartographies with the new GIS system, it has been possible to create a complete database of all points of interest in the study area, giving to interested people the opportunity to take advantage from the various assets, through trails and itineraries aimed at enhancing the territory. In particular, as depicted in Figure 3, the sheep-track "*Tratturo dei Greci*" connects 3 characteristic points, *i.e.*, as many small churches located in the rural area. The small church *"Madonna del Cupo*" occupies an area of about 25 square meters, the roof is pitched with wooden covering, while what remains of a small bell gable, certainly later than the structure, surmounts the facade. A valuable element is the stone portal, datable to around the 13th-14th century. The other two churches are located near the *Fiumarella* stream and the *Bradano* river. These places are just some of the monumental assets in the frame of the identifying mark of the small village "*The Cathedral"*, located in the historic center, as well as a number of other small churches, historic

buildings and old stone portals. Travelling along this sheep-track, it is possible to gain information about a stretch of territory, rich in human history and artistic and natural evidence. The types of interventions, in relation to local characteristics, may have a different degree of transformability, enjoyment and protection, and allow, while respecting the preservation of integrity, the improvement of the identifiability and accessibility of the sheep-tracks. This, would achieve, through the recovery of the remaining testimonies (fig. 4), a compatible reuse of the sheep-track area, through enhancing the green system and educational and recreational pedestrian paths.

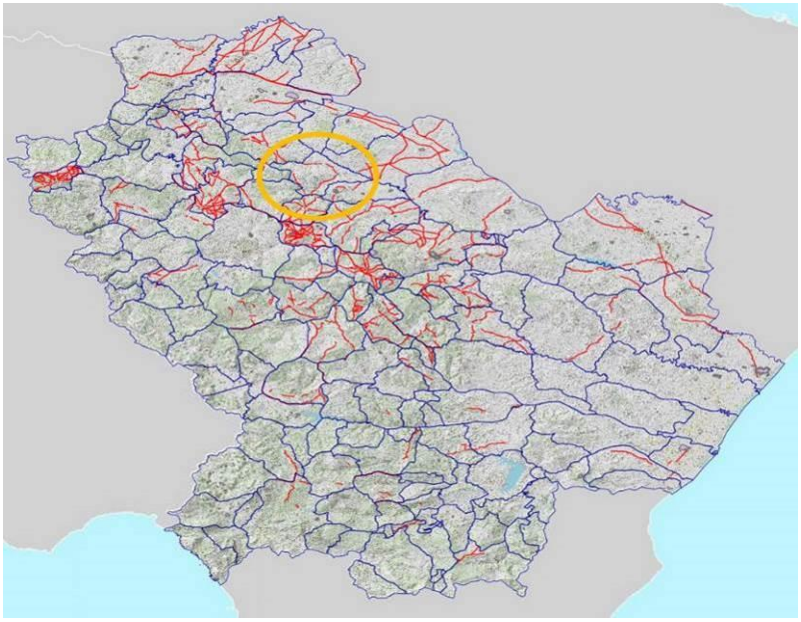

Fig. 2: Example of the WEB GIS TUTELE, representing the old sheep-tracks, archaeological and monumental area (in the yellow circle, the area of Acerenza).

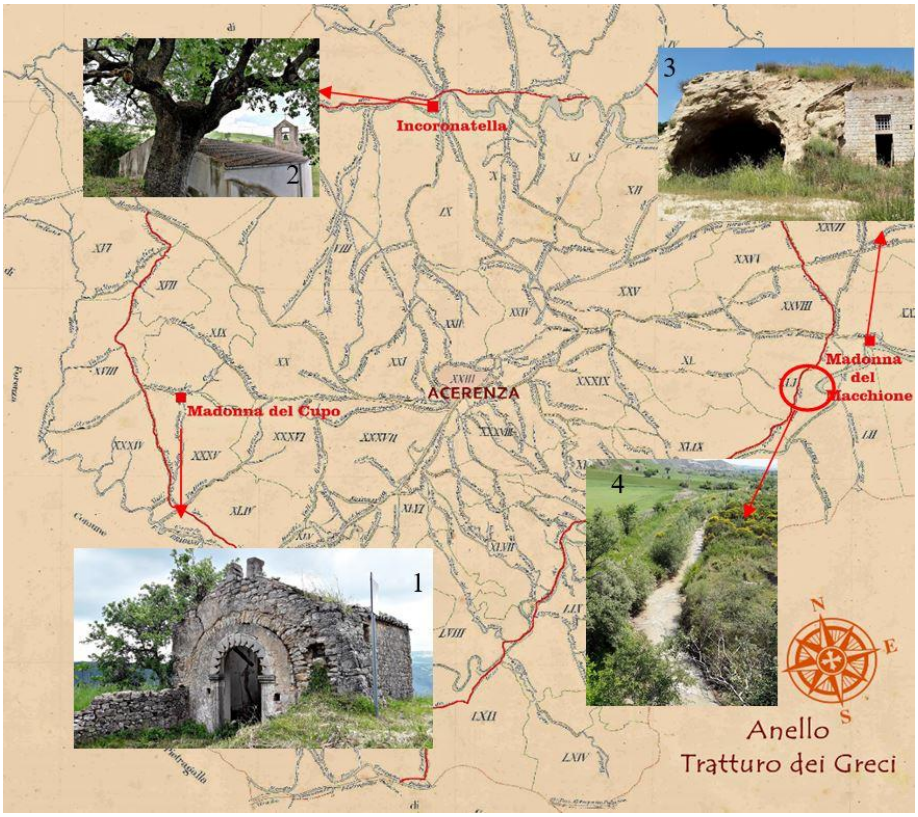

Fig. 3: Representation of “Tratturo dei Greci” and particular point of interest (n. 1, 2 and 3) and image of the sheep-track near the “Bradano” river (4)

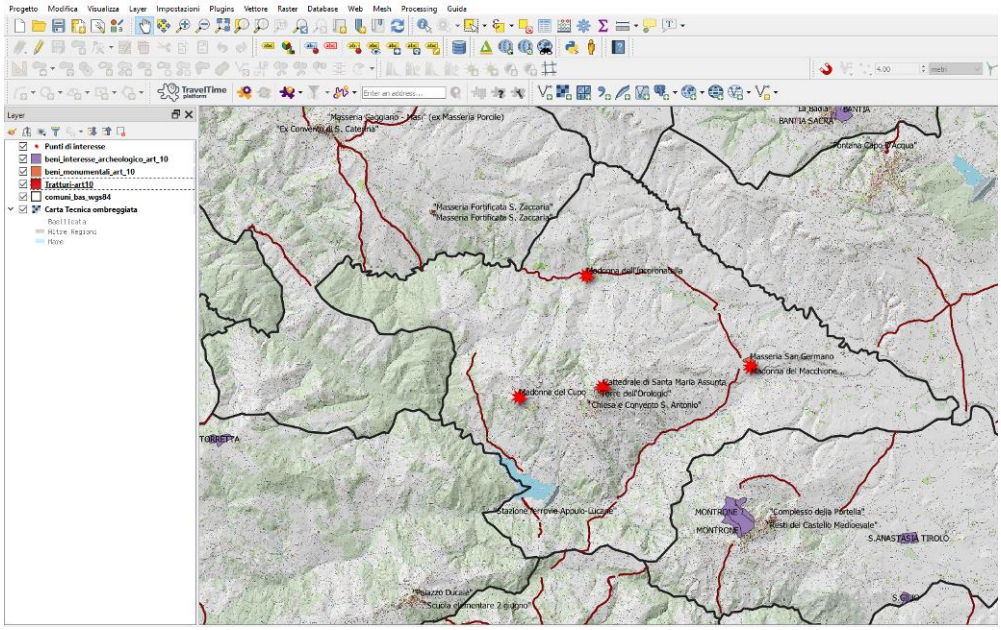

Fig. 4: Example of the GIS window showing old sheep-track and point of interest

Conclusion

The purpose of this paper was to enhance the value of the sheep-tracks, public state property of artistic, historical, archaeological, naturalistic, landscape interest, which constitute an heritage subject to protection and attention by the authorities in charge. Through the historical, cartographic and regulatory framework of the asset, a suggestive and fascinating itinerary located in the municipality of Acerenza may be proposed, which allows today to retrace places painted by nature and embellished by the hand of man. The evolution of the times has not demolished the essence of the road asset, but it has transformed its use as a primary structural element, combined with the possibility of enhancing it, in a particular landscape and environmental context.

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Souhrn

Na základě historického výzkumu bylo možné rekonstruovat trasu řeckých ovčích stezek, které byly v průběhu času chápány jako společné místo pro obchodní a kulturní výměnu. Získaný historický geoitinerář je grafickým znázorněním souboru informací (geohistorických toponym) a geograficko-cestovních map, na nichž byla trasa zakreslena. Současně s georeferencováním shromážděných

informací byl implementován také GIS (geografický informační systém) s využitím open-source platformy QGIS, z níž lze konzultovat veškeré geografické a historické informace spojené s fotografickými záběry. Soubor takto získaných časoprostorových informací (textových, kartografických a fotografických) nabízí klíče umožňující interpretovat realitu, která zdaleka nezanikla, a která naopak může poskytnout pochopení proměn, k nimž došlo v krajině a v referenčním územním kontextu. Ovčí stezka umožňuje získat informace o úseku zkoumané oblasti s bohatou lidskou historií, s uměleckými a přírodními doklady. Konkrétní poznávací poznatky o různých ovčích stezkách nacházejících se ve studované oblasti "Alto-Bradano", soustředěných zejména v obci "Acerenza", mohou vést k opatřením pro plánování, formulaci a realizaci cílů ochrany krajiny a posílení veřejné rekreace.

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THE IMPORTANCE AND FUNCTIONS OF RIPARIAN STANDS OF THE RECREATIONAL WATER RESERVOIR POČÚVADLO IN ŠTIAVNICKÉ VRCHY

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Abstract

The recreational water reservoir Počúvadlo, which was built in the years 1775-1779, is located in the Štiavnické vrchy Protected Landscape Area near the town of Banská Štiavnica. This water reservoir, as a part of the historical mining water management system, is the most visited and used for recreation out of the 26 preserved reservoirs in the vicinity of Banská Štiavnica. Počúvadlo water reservoir covers an area of 12.13 hectares and is a popular summer and winter recreation center and the venue for various cultural and sports events in this region. An important part of the Počúvadlo water reservoir are the riparian stands, which have several functions. These functions are mainly related to the protection of banks from erosion (abrasion), create suitable space and conditions for recreation and relaxation, affect the water quality in the reservoir, etc. In 1993, town Banská Štiavnica, together with the technical monuments in the vicinity (including the unique water management system of water reservoirs), was entered into the UNESCO World Cultural and Natural Heritage List.

Key words: lacustrine vegetation, erosion control, water quality, tourism

Introduction and issues

Riparian stands can be defined as a continuous forest stands or their parts, as well as groups, strips, rows of trees, shrubs and herbaceous vegetation that grow on the banks of watercourses and reservoirs and in their immediate surroundings (Valtýni 1981). Riparian vegetation have a whole range of functions in the country, especially in relation to adjacent water bodies. The functions of riparian vegetation can be generally divided into three basic functions: ecological, environmental and production. Among the ecological functions, we include the soil protection function, which includes the anti-erosion (anti-abrasion) and anti-slide function, and the water protection function, which includes the filtration, infiltration, shading and anti-deflation functions. Among the environmental functions (landscape use and protection), we include the health-recreational, landscape-creating (aesthetic) and protective (preservation of original natural ecosystems and biodiversity) functions.

When evaluating the functions of riparian vegetation, it is necessary to focus on solving two basic tasks:

- determination of the primary function of the riparian stands,
- proposal for optimal tending of riparian stands according to their primary function.

During the design and targeted support of the priority function of the riparian vegetation, it is necessary to take into account the location and habitat of the particular riparian stands. In places that are used as beaches for reasons of good access to the water (with low or moderate bank slopes), it is necessary to focus on supporting the recreational function of the riparian stands. Several authors dealt with the issue of the recreational function of riparian vegetation in various contexts (Valtýni 1981, Rasmussen, Padget 1994, Collective of authors 2002, Majorošová, Reháčková 2022, Saklaurs et al. 2022, Zingraff-Hamed et al. 2022, etc.). In places with a steep bank slopes with significant abrasion and poor access to water, the anti- erosion (anti- abrasion) function of the riparian stands should be a priority. The issue of the anti-erosion function of riparian vegetation has been addressed by several authors (Simon, Collison 2002, Šlezingr 2011, Jakubisová 2011, etc.).

From the point of view of water quality protection in Lake Počúvadlo, other functions of riparian vegetation are also important. The filtration function significantly affects the water quality in the lake. Riparian vegetation filters - mechanically captures products of erosion which are transported by surface runoff from adjacent slopes. The infiltration function allows surface runoff to soak into the soil and thereby reduces the risk of soil erosion caused by surface runoff. The shading function affects the microclimate primarily by reducing evaporation and increasing humidity in the immediate surroundings of the lake.

An integrated and comprehensive view of the ecosystem services of riparian vegetation was elaborated in detail by Riis et al. (2020) and Collective of authors (2002).

Material and methods

Lake Počúvadlo is located in Štiavnické vrchy Protected Landscape Area, about 10 km southwest of the town of Banská Štiavnica (Fig. 1).

Fig. 1: Map of the Slovak Republic with the location of Počúvadlo Lake

Počúvadlo Lake was built between 1775 and 1779 as part of the mining water management system. The lake has an area of 12.13 hectares and is located at an altitude of 677.64 meters a. s. l. Lake is formed by 5 separate dams, the main dam is 195.3 m long, 29.6 m high and 19 m wide at the base; the maximum depth of the lake is 10.8 m. The total volume of the reservoir is 745,000 m^3. Other characteristics of the area and the water management system around Banská Štiavnica are elaborated in articles published by Jakubis (2016, 2019). Lake Počúvadlo is the most visited of all 26 lakes of the historic water management system. It is predisposed to this by the wide possibilities of summer and winter recreation, tourism, sports activities, good accommodation options, and the organization of various sports and cultural events. In recent years, the number of domestic and foreign visitors to this area has been increasing. In 2021, we investigated in detail the species representation of individual trees in the riparian stands of Lake Počúvadlo.

Results

The individual functions of the riparian vegetation of the Počúvadlo recreational reservoir, to which we assigned a degree of significance (1 - highest degree, 2 - medium degree, 3 - lowest degree), are processed in Tab. 1. The species of trees in the riparian stands of the Počúvadlo Lake are shown in Tab. 2. We found that it is necessary to pay significantly more attention to the riparian stands and the overall condition of the coastal lands in the immediate vicinity of the reservoir in connection with their specific functions. According to the location of the riparian vegetation, it is necessary to determine its priority function. Through a field survey, we discovered a great diversity of species and quality of the shore vegetation of Lake Počúvadlo. We found that the deciduous woody plants significantly predominate over conifers. In recent years, a protected animal - the beaver (*Castor fiber*) - has been causing damage to the riparian stands of Lake Počúvadlo. This question will need to be solved in cooperation with conservation organizations.

Some proposals for riparian stands of Počúvadlo Lake tending

As part of the tending of riparian vegetation and the support of their recreational function, it is necessary to focus on the creation of a suitable recreational environment and conditions for the recreational use of the lake and the surrounding area. Autochthonous species of wood (*Quercus petraea, Alnus glutinosa, Carpinus betulus, Tilia cordata, Fagus sylvatica, Acer pseudoplatanus, Corylus avellana* etc.) should be used. It is important to carry out regular inspections of riparian vegetation and check their health status. From the point of view of the safety of vacationers, it is necessary to remove diseased, damaged and endangered trees, or their parts (Fig. 2).

Tab. 1: Functions of riparian stands of Počúvadlo Lake

Basic function	Particular function	Specific function	Content of a specific function **Degree of importance**
Ecological	Soil protection	anti – erosion (anti – abrasion)	They strengthen the soil on the banks with their root system and limit the occurrence of erosion (abrasion) **1 - steep eroded banks** **2 - beaches**
	Water protection	filtration	They mechanically filter, slow down or limit surface runoff from adjacent slopes, capture erosion products from around the reservoir **2**
		infiltration	They help soak surface runoff into the soil and limit the occurrence of erosion **2**
		shading	They shade the water level, reduce evaporation, increase humidity and positively affect the microclimate **2**
Environmental	Landscape creating, protection and use	health - recreational	They create a suitable environment for recreation and relaxation **1 – beaches** **2 – other areas**
		aesthetic and landscape creating	They create an interaction between the reservoir and the surroundings, improve the appearance of the landscape and its aesthetic value **1 - 2**
		protective (biodiversity and natural ecosystems protection)	They contribute to the stability of natural ecosystems and improve the conditions for biodiversity **1 - 2**
Production	Production of wood	Production of wood assortments and biomass	They provide a resource of wood and biomass **3**

Note on Tab. 1: 1 - highest degree of significance, 2 - medium degree of significance, 3 lowest degree of signifikance

Fig. 2: Some trees in riparian stands require adequate tending

Tab. 2: Woody plants species in riparian stands of Počúvadlo Lake

Woody plant	Number of pcs	Woody plant	Number of pcs
Quercus petraea	391	Salix caprea	10
Carpinus betulus	183	Malus sp.	8
Alnus glutinosa	111	Salix alba	8
Abies alba	79	Sambucus nigra	8
Fagus sylvatica	75	Acer campestre	7
Populus tremula	53	Fraxinus angustifolia	6
Rosa canina	35	Juniperus communis	6
Betula pendula	25	Picea abies	6
Corylus avellana	21	Crataegus monogyna	5
Syringa vulgaris	19	Hedera helix	3
Fraxinus excelsior	16	Acer platanoides	2
Acer pseudoplatanus	16	Rubus idaeus	2
Cerasus avium	15	Salix cinerea	670 m^2

Conclusion

The riparian vegetation on the banks of the Počúvadlo water reservoir is important from several aspects. The tending about riparian vegetation needs to be determined according to the specific location of the riparian vegetation. In places with low or moderate bank slopes and good access to water (beaches) without significant erosion, the recreational function of the riparian vegetation should have priority and support. In places with steeper slopes with signs of significant erosion (abrasion), the anti-erosion function of the riparian vegetation should have priority and support.

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Souhrn
Rekreační vodní nádrž Počúvadlo, která byla vybudována v letech 1775-1779, se nachází v Chráněné krajinné oblasti Štiavnické vrchy nedaleko města Banská Štiavnica. Tato vodní nádrž jako součást historického důlního vodohospodářského systému je nejnavštěvovanější a nejvyužívanější z 26 zachovalých nádrží v okolí Banské Štiavnice. Vodní nádrž Počúvadlo se rozkládá na ploše 12,13 ha a je oblíbeným střediskem letní i zimní rekreace a dějištěm různých kulturních akcí v tomto regionu. Významnou součástí vodní nádrže Počúvadlo jsou břehové porosty, které plní několik důležitých funkcí. Tyto funkce souvisí s ochranou břehů před erozí (abrazí), ovlivňují kvalitu vody v nádrži a vytvářejí vhodný prostor a podmínky pro rekreaci a relaxaci atd. Péče o břehové porosty je potřeba určit podle konkrétního umístění břehových porostů. V místech s nízkými nebo mírnými břehovými svahy a dobrým přístupem k vodě (pláže) bez výraznější eroze by měla mít prioritu a podporu rekreační funkce břehových porostů. V místech se strmějšími svahy se známkami výrazné eroze (abraze) by měla mít prioritu a podporu protierozní funkce břehových porostů. V roce 1993 bylo město Banská Štiavnica spolu s technickými památkami v okolí (včetně unikátního vodohospodářského systému vodních nádrží), zapsána na Seznam světového kulturního a přírodního dědictví UNESCO.

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THE ISSUE OF GEO-EDUCATION ON NATURE TRAILS IN THE FIRST SLOVAK GEOPARK BANSKÁ ŠTIAVNICA

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Abstract
Geopark Banská Štiavnica is the oldest geopark in Slovakia located in an area with remarkable historical and mining values. Within the area, there are several nature trails providing tourists with recreational education. This education focused on geosciences, called geo-education is a significant element of any geopark, as well as Geopark Banská Štiavnica. Geo-education can be carried out also on nature trails, specifically via interpretational panels. Multiple issues may arise, including the matter of information presentation, interpretation, and communication, or in the way of nature trail promotion. This article deals with the issue of geo-education by stating and addressing the obvious issues of wrong chosen interpretation, presentation, and promotion of geopark nature trails and the lack of available information both online and in situ. In addition, a good practice of UNESCO geoparks and practices of geotourism is given in comparison with the current situation of geopark geo-education.

Key words: geopark, geo-education, Banská Štiavnica, trail

Introduction

Geopark Banská Štiavnica is located in central Slovakia in the districts of Banská Štiavnica, Žiar and Hronom and Žarnovica on an area of 374 km^2. It is situated in the historic mining town of Banská Štiavnica (which with its nearby technical monuments belongs to the UNESCO World Heritage List) and the surrounding 17 municipalities in the region. There are 156 sites divided into 10 categories on the territory of the geopark, where the largest number of sites are independent montanistics sites in the number of 83, while geological or partly geological sites have a total of only 12 sites (Aktualizácia koncepcie geoparkov SR 2015), however with no much of information to what extent are they geological or other due to the lack of information and an absence of the website. No official geopark website makes it also difficult to visit the geopark, the (geo)sites, and thus also the nature trails, and deprives visitors of information based on which they could make a better decision when choosing a site, as well as recreationally educate themselves before the visit itself (Migoń 2018). The recreational form of education is one of the main priorities for geoparks, as it involves interpreting information about geological heritage in a tourism environment in a fun and bearable way (Stolz & Megerle 2022). In addition, each geopark must meet the principles of geotourism, which, among other things, place particular emphasis on education and the dissemination of the environmental message and geoscientific knowledge (e.g., Brocx & Semeniuk 2019).
Environmental education is carried out through effective presentation and interpretation, which can be carried out directly in the natural environment of the territory of the geopark, through educational trails and their information panels.

Material and methods

To point out the issue of geo-education, several information panels, which are part of the educational trails located on the territory of the geopark were evaluated. For this article, a typical geopark information board was evaluated on the nature trail Farárova Hôrka - Richnava, followed by an information board that wasn't built by geopark but it´s located in the area (and also promoted by geopark) on the nature trail Sitno, and finally an information board on the nature trail Lai Chi Wo in the Hong Kong Global Geopark as a member of UGGp for comparison and an example of good practice. The information about nature trails in Geopark Banska Štiavnica and their interpretation was processed from information available on the Internet on the website naucnechodniky.eu. Information about nature trails and the information board of Hong Kong geopark was carried out from a geopark´s website (geopark.gov.hk). The assessment was carried out according to the information on correct interpretation based on 36 questions which were set out and divided into 6 summary categories (recommendations) (Tab. 1).

Results and discussion

Three information panel in two geoparks were analyzed and compared with a) geopark interpretation recommendations and b) each other (Tab.1).

The main focus is on an information panel provided directly by a geopark situated on the nature trail Farárova hôrka – Richnava (NT FHR). At first glance, the panel looks uninteresting or provocative enough to capture the visitor's attention. Its text is written in a technical/ scientific style, the author addresses the tourist "Dear visitor" and continues in the style of a formal article, divided into sections with paragraphs, a diagram, image labels, scientific jargon, etc. It is very unlikely that a tourist who decides to recreate in nature will be willing to stop or look at such an expert-level panel. The theme of the panel is not summed up in a single phrase or catchy headline. Furthermore, the pictures on the boards represent a geological section of the territory (unreadable for the general-public tourist), a route of the nature trail on a satellite map, and a route of the nature trail on a geological map with explanations. If the panel manages to catch the visitors' attention regardless, they will find the information on the board incomprehensible. The issue is also the lack of interaction, questions, incitement to activity, visual value, and, finally, insufficient support for sustainability and no reference to the features of the territory. By assessment within the recommendations for the correct interpretation of the geological heritage, 33 out of 36 questions were answered. Positive results (yes) were present only in four cases, reflecting that: the board focuses on geosciences; falls under the same concept theme as the other panels; its goal is to educate; is located in a stable location. In five cases, the answer to the questions was "partially" and in as many as 24 cases the answer was negative (no).

The second evaluated panel is a panel that does not fall thematically under the geopark but is located on the nature trail Sitno (NT S) belonging to the territory of the geopark. Paradoxically, this panel provides a better interpretation than the information panel marked with the geopark logo. However, it is important to point out that this is the only geoscience-oriented information panel (out of 7) within the trail. Evaluated within the recommendations for the correct interpretation of the geological heritage, the information panel had 12 positive results, which is approximately 24.2% more than the information board of the Farárova hórka - Richnava trail. In six cases, the panel met the results "partially" and in 15 cases the results were negative, which, however, represents a 27.3% better result than the panel of the geopark educational trail. All without taking unanswered questions into account.

As the last board, the information board of the UGG Global Geopark in Hong Kong on the Lai Chi Wo nature trail (NT LCW) was evaluated. Compared to the panels in the territory of the Banská Štiavnica Geopark, it has significantly better results. There were 24 positive answers to questions regarding the interpretation of geological heritage out of 34 answered questions, which is 34.24% more than the information panel of NT Sitno and up to 58.48% more than the information panel of the geopark NT Farárova Hôrka – Richnava itself. As part of the negative answers, the NT Lai Chi Wo board only had them in five cases, which is 30.75% less than in the case of NT Sitno and up to 58.03% less than in the case of NT Farárova Hôrka - Richnava. Unanswered questions were again not counted with. In a matter of interactivity, an interesting approach was taken in Hong Kong Geopark – a Hing Chun Alliance Radio Drama which is an audio story with multiple episodes each for a different site, including Lai Chi Wo, however with no reference to it on the information board.

When evaluating both information boards, it is possible to determine which categories require more attention. In the case of the first board of the geopark, change, and improvement are needed in each category, but in the case of the second evaluated board, there is a lack primarily in the interaction with the visitor, the creation of entertainment elements, the promotion of sustainability, protection, the support of the region and other industries.

Tab. 1: Analysis of interpretation panels

Recommendations of the correct interpretation of geological heritage on interpretational panels on nature trails in geoparks				
Main recommendations	Questions leading to meet the recommendations	Nature trails		
		NT FHR	NT S	NT LCW
Be simple and clear without losing scientific significance	Is the panel´s primary focus on geosciences? Does it follow its scientific value?	yes	yes	yes
	Does the interpretation avoid technical language / scientific jargon?	no	yes	yes
	Does the panel avoid using more than 200 words, written in blocks, with lowercase letters or burdensome?	no	partly	yes

	Is the text divided into levels with different font size, color or thickness?	no	partly	yes
	Is the technical and overall text of the panel simplified to be comprehensible by the 12-year-olds?	no	yes	yes
	If the information is translated - is this translation correct and accurate?			yes
	Does the panel contain timelines, maps of the mountain range/area, stratigraphic parts, or cross-sections of the territory that are comprehensible to the lay public?	no	yes	yes
	Does the panel fall under the same concept/theme as the other panels of the trail/geopark?	yes	yes	yes
Provide education in creative and memorable way	Is the panel aimed at the lay public?	no	yes	yes
	Does the panel also provide information for more demanding visitors, or does it offer them the possibility to access this information (e.g., via QR codes)?	partly	no	no
	Do the pictures explain activities, phenomena, processes associated with the creation of heritage? Are these images comprehensible to the lay public?	no	yes	yes
	Is the goal of the interpreted information on the panel to educate and/or to spread a certain message?	yes	yes	yes
	Can the visitor access information about the educational trail and its topic, route, educational materials, or the panels themselves on the geopark website?	no	no	yes
	Do the fun and entertaining elements of the panel lead to learning?	no	partly	yes
Provoke a reaction and arouse an interest	Does the panel identify with the principles of Freeman Tilden (1957), which can be summarized as: provoking a reaction, connecting to visitors' experiences, revealing new contexts?	no	no	partly
	Is the main idea of the information panel expressed as a theme in a short strong visible sentence or phrase?	partly	yes	yes
	Does the panel contain pictures?	partly	yes	yes
	Is there an outdoor exhibition, an exhibit, a specific rock related to the theme of the board, a geological garden, a panorama, etc. near the panel?	no	no	no
	Is the panel focused both on the scientific and the visual value of the interpreted heritage?	no	partly	yes
	Does the panel use modern methods of interpretation? - technologies, QR codes, links to multimedia and audiovisual presentations of information?	no	no	no
Be based on relations with everyday life, or other fields	Does the panel explain the information? - so the information is not just provided without much of a context	partly	yes	yes
	Does it consist of knowledge from several fields (such as ecology, mining, history, etc.)?	no	no	
	Does the panel use a reference to people, our culture, comparison with people's lives or our abilities?	no	no	partly
	Is the panel connected to art, culture, emotions, or another element typical for the region?	no	partly	yes
Incite to questions and activities to increase the enjoyment	Does the panel contain interactive questions and/or prompts for activity?	no	no	yes
	Are the questions on the panel open?	no	no	no
	Does the panel include stimulating phrases such as: Look at me! Pick me up! Try me!, etc.?	no	no	partly
	Does the panel contain physical interactive elements (folding panels, etc.)?	no	no	no
	Does the natural trail have a leaflet about its content, route and viewpoints?	no		yes
	Is the panel part of an activity such as quest games, quizzes, geocaching, treasure hunting, etc.?	no	no	partly

Refer to sustainability and protection	Does the board refer to the protection of the territory and sustainability (e.g. for visitors to not to take home what they found in nature)?	no	no	yes
	Does the panel offer options and ways to protect the territory, a link to local volunteers, how to support the territory, a link to social networks of the territory, etc.?	partly	no	partly
	Does the panel encourage compliance with safety and prohibitions? (e.g. in case of bans on swimming in some lakes, providing information about possible water defects and risks for people)	no	no	yes
	Are the panels in a stable place? Are they resistant to weathering or vandalism?	yes	yes	yes
	Was the information presented on the panel evaluated beforehand so the possible issues that could be avoided were identified and taken into account?			
	Does anything on panel refer to local businesses, products, or other tourist attractions to support the region?	no	partly	yes

Conclusion

Successful geo-interpretation requires more than just providing information on an information board. It is a form of communication between the mediated information and the visitor, which is carried out by an appropriately chosen presentation and interpretation of the geological heritage (Macadam 2018). Within geoparks, one of the main goals of which is education in geoscience fields and passing on the environmental message, the way knowledge is interpreted is crucial. A suitable interpretation is intended to impress, evoke a certain emotion, change in attitude and thinking, arouse curiosity, and reveal new knowledge, which not only educates the tourist but also entertains and satisfies his mental needs (Al-Jarf, 2021; Farsani et al. 2018). Considering the results of the evaluation of two selected panels of educational trails of the Banská Štiavnica Geopark, it is possible to claim that the interpretation of the geological heritage is not communicated based on the recommendations of experts, the principles of geotourism, or the requirements of the UNESCO Global Network of Geoparks (UGGP), based on which the acquisition of new knowledge by tourists is considerably more difficult. Especially with the information board of the Farárova hórka - Richnava educational trail, it is clear that the information panel is not intended for the general public, which, however, contradicts the definition of a geopark and its understanding by the UGGp network, as well as the principles of geotourism as such. Education through these information panels can be thus suitable only for university students and other professionals, who, however, form a minority group of tourists, which might very probably not lead to the sustainability and development of the region. In addition, it is important to mention that for a complete and unequivocal assessment and drawing of conclusions, complete research involving the collection of data in the field and their complete analysis would be necessary.

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Souhrn
Environmentální vzdělávaní je uskutečňováno efektivní prezentací a výkladem, kterou lze realizovat přímo v přírodním prostředí na území geoparku, prostřednictvím naučných stezek a jejich informačních panelů. Pro tento článek byla vyhodnocena typická informační tabule geoparku Banská Štiavnica na naučné stezce Farárova Hôrka - Richnava a na naučné stezce Sitno Pro srovnání a příklad dobré praxe byl analyzován panel z naučné stezky Lai Chi Wo v Globálním geoparku Hong Kong. S ohledem na výsledky hodnocení dvou vybraných panelů naučných stezek geoparku Banská Štiavnica lze tvrdit, že výklad geologického dědictví není komunikován na základě doporučení odborníků, zásad geoturismu, ani požadavků Globální síť geoparků UNESCO (UGGP), na jejímž základě je získávání nových znalostí turisty podstatně obtížnější. Vzdělávání prostřednictvím těchto informačních tabulí tak může být vhodné pouze pro vysokoškolské studenty a další odborníky, kteří však tvoří menšinovou skupinu turistů, což není v souladu s udržitelností rozvoje regionu.

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THE ROAD FROM THE CITY TO THE FOREST. OR HOW FAR IS THE URBAN MAN FROM A FUNCTIONAL FOREST?

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Abstract

This paper presents results from an analysis of the frictional distance of urban development to the nearest functional forest. A functional forest is defined by natural forest habitats in the sense of the Catalogue of Habitats of the Czech Republic, which simultaneously meet the minimum area requirement. The distance to the forest is calculated using the modified distance to nature (D2N) method for all locations in the Czech Republic, described by a 10x10 m area. The direct distance is calculated using the Euclidean distance method without barriers, and the friction is given as a function of the naturalness of the intersecting habitats. Results - maximum and median distances are evaluated at county and state levels. The distances achieved are further compared to the direct distance to the functional forest and the distance to the nearest forest segment (regardless of quality and area).

Key words: administrative units, distance to nature, functional forest, GIS

Introduction

The forest performs several ecosystem functions (Pechanec et al., 2021, Machar et al., 2022) which are essential for humans. In addition to production and regulatory functions, it is also a recreational function (La Rosa et al., 2016). In many cases, it is recommended by many experts to "go to the forest" for its beneficial effect on human health (Došenović et al., 2017, Kilianová, 2020). How far do the inhabitants of towns and villages in different parts of the country have the forest? How do the maximum and average (or median) distances differ at the regional level? That is, at the level of administrative units where development planning for the respective region is actively taking place?

And which forest does one have at one's disposal? The average forest cover in the Czech Republic is 33.4%, and according to the annual reports of the Ministry of Agriculture (Ministry of Agriculture, 2021), the forest cover has been slightly increasing in recent years.

Is there any difference between the different types of forests (in terms of naturalness) and their distribution in the country?

Materials and methods

The area of interest for this study is the entire Czech Republic. The data of administrative division (state borders, regional borders and borders of municipalities with extended competence) are taken from the free available database ArcČR 3.3.

The category "natural forest" comprises segments of natural forest habitats defined in the Catalogue of Habits of the Czech Republic - code designation L1-L9.3 (Chytrý et al., 2010) and identified in the Detailed Combined Layer of habitats (DCL). DCL is a vector map layer processed at a scale of 1:10 000 in the extent of the Czech Republic. It describes vegetation cover at the level of habitats. It distinguishes 156 types of natural biotopes and 38 types of non-natural habitats. The whole territory is described by 3 397 852 segments. Several national and international datasets (mainly from the European Copernicus project) were used in its construction. The last update is from 2018. More information is described in Cudlín et al. (2020).

The "functional forest" category is a selection from the type "natural forest", provided that each segment meets (is greater than or equal to) the parameter of minimum area parameter of the respective habitat, indicating sufficient size for the full development of the habitat. Adjacent segments of function forests were merged, and the minimum area size was tested on the merged element. Minimum area values were taken from Seják, Dejmal et al. (2003). The categories of Contiguous and Discontiguous urban fabric (TAG 1.1.1 and 1.1.2) from Corine Land Cover Methodology define the urban environment. The data source was the 2018 vector version of the Corine Land Cover dataset, freely available from the repository http://land.copernicus.eu.

The frictional value was determined by the degree of naturalness of each habitat and normalized on a scale of 1-2. Distances to forest segments were calculated using the algorithm of the Euclidian and Cost distance without barriers in a raster representation with 10m/px resolution in ArcGIS Pro. The frictional value was included according to the D2N methodology (Rüdisser et al, 2012). Individual rasters of distance were disaggregation into administrative units and compared to each other using map algebra tools.

Results

The results show the variability of the proximity of forests to the urban environment in individual regions of the Czech Republic. The distance varies depending on the desired character of the forest environment. The results are presented in Table 1-3.

Tab. 1: Distances to the „forest“ category at the state and county level

Name	Direct distance (m)			Friction distance (m)		
	MAX	MEAN	MEDIAN	MAX	MEAN	MEDIAN
Czech rep.	1494.9	84.5	67.1	2942	168.5	132.8
Capital City of Prague	1015.1	215.4	176.9	1939.1	425.5	348
Central Bohemia Region	325.7	65	51	678.7	129.6	103.8
South Bohemia Region	527	79.2	67.1	955.4	157.9	136.6
Pilsen Region	336.2	76	60	667.9	151.7	121.3
Karlovy Vary Region	161.2	76.9	64	317.9	149.1	129
Ústí nad Labem Region	393.6	92.4	78.1	785.1	184.2	153.3
Liberec Region	351.7	60.3	53.9	731	117.7	104.7
Hradec Králové Region	433.8	73.6	67.1	901.1	146	130.1
Pardubice Region	386.3	80.2	70	788.4	159.3	133.1
Vysočina Region	331.2	85.1	76.2	649.1	170.8	149.6
South Moravian Region	1494.9	103.2	72.8	2942	207.8	151.4
Olomouc Region	608.3	85.8	70.7	1223.2	172.6	141.4
Zlín Region	413.4	83.9	76.2	831.7	168.3	150.8
Moravian-Silesian Region	575.7	63.3	50	1126	126.3	99.5

The analysis of the tabular results shows that for the territory of the Czech Republic, the category "forest" is at a maximum direct distance of 1,495 m with a median of 67 m, which means that any/average resident of the Czech Republic has a forest within 1,495 m of a town or village, with half of the distances within 67 m. When evaluating distance with friction, the distance category "forest" is 2942 m with a median of 133 m. This represents 50.8% of the maximum distance and 50.5% of the median value.

When evaluating the regions in terms of accessibility to the forest, the most favourable values for the maximum direct distance are the Karlovy Vary, Central Bohemia and Vysočina regions, with values of 161, 326 and 331 m, respectively. When considering the median of the maximum direct distance of the "forest" category from the urban area, the Moravian-Silesian (50 m), Central Bohemian (51 m), and Liberec (54 m) regions have the lowest values. In terms of the highest distances to the forest, the inhabitants of the South Moravian Region (1495 m), the Capital City of Prague (1015 m) and the Olomouc Region (608 m) have the furthest distances. However, the median distance is highest in the Capital City of Prague (177 m), the Ústí nad Labem Region (78 m) and the Vysočina Region and the Zlín Region (76 m).

The maximum distance to the "forest" influenced by friction is lowest in the Karlovy Vary Region (318 m), the Vysočina Region (649 m) and the Pilsen Region (668 m). In comparison, the highest values were reached by the South Moravian Region (2942 m), the Capital City of Prague (1939 m) and the Olomouc Region (1223 m). The results of the median calculation show that the lowest median values are in the South Moravian (100 m), Central Bohemia (104 m) and Liberec (105 m) regions, while the highest values are in the South Moravian (151 m), Ústí nad Labem (153 m) and Prague (348 m) regions.

The maximum distance reaches the lowest 48% of the distances with friction in the Central Bohemia Region and the highest at 55.2% in the South Bohemia Region. In comparison, the median rating

reaches the lowest value of 48% in the South Moravia Region and the highest of 52.6% in the Pardubice Region.

Tab. 2: Distances to the „natural forest“ category at the state and county level

Name	Direct distance (m)			Friction distance (m)		
	MAX	MEAN	MEDIAN	MAX	MEAN	MEDIAN
Czech rep.	4795.5	629.9	496.5	8400.1	1117.2	905.4
Capital City of Prague	1963.1	683	735	3579.9	1264.1	1348.5
Central Bohemia Region	3470.8	660.1	539.4	6031.6	1161.3	960.3
South Bohemia Region	2527.9	640.5	587.3	4285.7	1115.7	1024.9
Pilsen Region	1596.6	569.5	490	2674.2	998.5	889.2
Karlovy Vary Region	901.4	315.9	304.1	1588.6	552.2	530.3
Ústí nad Labem Region	2929.3	569.4	418.7	5067.6	1005.7	745.3
Liberec Region	841.7	302.4	260.8	1555.6	535.4	476.8
Hradec Králové Region	2125.6	541	449.1	3630.2	962	807.9
Pardubice Region	2218.9	571.7	460.3	3906.4	1014.4	868.6
Vysočina Region	2626.8	661.5	584.6	4236.7	1163.2	1088
South Moravian Region	4430.9	909.7	687.7	7657.2	1613.3	1237.9
Olomouc Region	4795.5	827.7	623.7	8400.1	1481.1	1133.4
Zlín Region	2319.3	575.1	440.5	4128.5	1030.5	792.5
Moravian-Silesian Region	2127.2	493.5	413.4	3558.6	879.8	728.3

For the "natural forest" category, the maximum direct distance from the urban area is 4,796 m with a median value of 497 m, for residents represent natural forest within 5 km of the urban area with half of the values within 497 m. The distance with friction is 8 400 m with a median of 905 m. The direct distance is 57.1% of the distance with friction; the median rating is 54.8%.

The "natural forest" category has the lowest values of maximum distance in the Liberec (842 m), Ústí nad Labem (901 m), and Pilsen (1597 m) regions, while the highest values are in the Olomouc (4795 m), South Moravian (4431 m) and Central Bohemia (3471 m) regions. When considering the median of the maximum direct distance of the category "natural forest" from the village/town, the lowest values are in the Liberec Region (261 m), the Karlovy Vary Region (304 m) and the Moravian-Silesian Region (413 m), while the highest values are in the Capital City of Prague (735 m), the South Moravian Region (688 m) and the Olomouc Region (624 m).

The maximum distance to the "natural forest", including friction, is lowest in the Liberec (1556 m), Karlovy Vary (1589) and Pilsen (2674 m) regions and highest in the Olomouc (8400 m), South Moravia (7667 m) and Central Bohemia (6032 m) regions. The results of the median calculation show that the lowest medians are in the Liberec (477 m), Karlovy Vary (530 m) and Moravian-Silesian (728 m) regions, while the highest values are in the Capital City of Prague (1348 m), the Olomouc Region (1133 m) and the Vysočina Region (1088 m).

The maximum distance reaches the lowest of the distances with friction in the Liberec region (54,1%) and the highest in the Vysočina region (62%), the median rating reaches the lowest value in the Pardubice region (53%) and the highest in the South Bohemia and Karlovy Vary regions (57.3%).

The category "functional forest" reaches a maximum distance from the urban area of 5,095 m with a median of 580 m. Distances with friction are 8,903 m and 1,031 m, respectively. The direct distance reaches 57.2% of the distances with friction; the median rating is 56.3%.

The analysis of the regions in the "functional forest" category shows the lowest values of the maximum distance in the Liberec, Karlovy Vary and Moravian-Silesian regions with values of 1011 m, 1528 m and 2133 m, while the highest values are in the South Moravian, Olomouc and Central Bohemia regions with values of 5095 m, 4795 m and 3652 m. The analysis of the median of the maximum distance of the category "functional forest" from the village/town shows that the lowest values are in the Liberec Region (303 m), Karlovy Vary Region (339 m) and Ústí nad Labem Region (445 m), while the highest values are in the Vysočina Region (850 m), the Capital City of Prague (835 m) and the South Moravian Region (812 m).

In terms of the maximum distance concerning friction, the lowest distances to the functional forest are in the Liberec Region (1655 m), the Karlovy Vary Region (2687 m) and the Moravian-Silesian Region (3561 m), while the highest distances are in the South Moravian Region (8903 m), the Olomouc Region (8400 m) and the Central Bohemian Region (6800 m). The results of the median calculation show that the lowest median values are in the Liberec (538 m), Karlovy Vary (585 m) and Ústí nad

Labem (814 m) regions, while the highest values are in the Capital City of Prague (1529 m), Vysočina (1508 m) and South Moravian (1437 m) regions.
The maximum distance reaches the lowest distances with friction in the Pardubice Region (55.5%) and the highest in the South Bohemia Region (66.3%). In comparison, the "median distance" reaches the lowest value in the Pardubice Region (53.9%) and the highest in the Karlovy Vary Region (58%).

Tab. 3: Distances to the „functional forest“ category at the state and county level

Name	Direct distance (m)			Friction distance (m)		
	MAX	MEAN	MEDIAN	MAX	MEAN	MEDIAN
Czech rep.	5094.8	732.8	580.1	8902.7	1286.8	1030.6
Capital City of Prague	2807.5	748.8	834.9	4904.7	1384.8	1529.1
Central Bohemia Region	3651.8	754	616.1	6500.3	1318.7	1081.6
South Bohemia Region	2843.5	754.3	680.1	4289.8	1297.5	1183.9
Pilsen Region	2471.8	709.8	612.2	4093.7	1226.3	1078.1
Karlovy Vary Region	1527.6	389.2	339.4	2687.3	666.7	585
Ústí nad Labem Region	2929.3	605.5	445.5	5067.6	1061.1	814.4
Liberec Region	1010.6	344.4	303.1	1654.5	601.2	537.5
Hradec Králové Region	2172.8	663.8	541	3778.4	1163.9	974.3
Pardubice Region	2218.9	683.3	529.5	4001.6	1194.3	983.2
Vysočina Region	3199	941	850	5407.4	1620.1	1508.3
South Moravian Region	5094.8	1030.3	811.5	8902.7	1818.2	1437.3
Olomouc Region	4795.5	931.7	692.3	8400.1	1659	1224.3
Zlín Region	2337.9	635.3	495	4192.9	1126.2	846.1
Moravian-Silesian Region	2133.2	555.2	466.9	3560.9	979.9	828.1

Discussion

In evaluating any analysis, the purpose should always be clearly defined. The research performed here is based on exact data but with a certain degree of subjectivity in the design of the entire analysis.
In this case, the maximum and median distance indicators were compared. Similarly, a more common average distance could have been used. The median was chosen because its value is not affected by the occurrence of outliers. The mean values were also calculated, and the results tables show them.
The critical point is the choice of the cost value for calculating the frictional distance. Here a naturalness value was used, with natural habitat having a resistance value of 1 and artificial habitat having a resistance value of 5 (Cudlín et al. 2020). This scale is based on assessing permeability to biological processes, which is significant in maintaining functional connectivity, the spread of diaspores in the landscape, etc. However, it is questionable to what extent today's typical person considers themselves a natural feature and would perceive the load in this way rather than an inverted scale where they would assume that they move more quickly through artificial habitats and least easily in real nature.
However, regarding the effect of recreation and relaxation, the preservation of nature and the degree of fulfilment of the ecosystem services involved are more important (Pechanec et al., 2021); therefore, the scale was used.

Conclusion

The paper shows the variability of the direct and frictional distance to the forest in individual regions of the Czech Republic and the value valid for the whole Czech Republic.
The distance is calculated from the urban area to the nearest forest segment, which is analysed at three functional levels - any forest, natural forest and functional forest. Distance is calculated by Euclidean (direct) distance and frictional distance, where the cost value is expressed by the degree of naturalness of the intersecting landscape segments.
According to the analysis results, the Liberec region performs best, having the shortest maximum distance to a functional forest at 1010 m, which is about five times closer than the value for the whole country. In the case of the distance of any forest, the Karlovy Vary region performs best at 161 m, compared to the national distance of 1494 m.

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Souhrn
Příspěvek představuje výsledky analýzy přímé a frikční vzdálenosti intravilánu k nejbližšímu lesa. Les je rozdělen do 3 kategorií veškeré les, přírodní les a funkční les). Funkční les je definován přírodními lesními biotopy ve smyslu Katalogu biotopů ČR, které současně splňují požadavek minimální rozlohy. Vzdálenost k lesu je vypočtena pomocí modifikované metody vzdálenosti k přírodě (D2N) pro všechny lokality v ČR, popsané plochou 10x10 m. Přímá vzdálenost je vypočtena pomocí metody euklidovské vzdálenosti bez bariér a tření je dáno funkcí přirozenosti protínajících se stanovišť.

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THE ROLE OF LAND CONSOLIDATION IN RURAL SPACE DEVELOPMENT

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Abstract
The primary goal of the land consolidation process is to create optimal conditions for agricultural management. Land consolidations spatially and functionally organize land in the public interest, merge or divide it, and provide the accessibility and use of land and the alignment of their borders to create conditions for rational farming. It is defined by law that soil, water and environmental conservation are important and publicly necessary aspects of any complex land consolidation. Hence, land consolidation creates a space for the design and implementation of soil, water and environment conservation measures (e.g., grassing, balks, tree belts, reservoirs, …). Land consolidation plans are supported by the government and EU funds are accessed for the implementation of protective and ecological measures. Using concrete examples, the article shows how built multifunctional measures (incl. tourist rest points) contribute to the improvement of non-production functions of the agricultural landscape, its aesthetics and recreational potential.

Key words: Rural countryside, land consolidation, nature close measures, landscape non-production functions, landscape aesthetic, recreational potential

Introduction

The process of land consolidations has been taking place in the Czech Republic since 2002 and is governed by valid legislation (act no. 139/2002 and decree no. 13/2014). We distinguish between two forms of land consolidations - simple and complex. Simple land consolidation usually solves a smaller area, or a partial specific problem in the area. Complex land consolidation mostly covers the entire cadastral territory of the municipality. Its goal is not only to clarify ownership relationships and to adjust and make the land available so that it meets the requirements of rational agricultural management. As part of the common facilities plan, measures for soil and water protection are proposed in the territory (i.e., measures to limit soil degradation, water and wind erosion, to improve water retention in the landscape, flood control measures, ...). These measures are polyfunctional, nature close and they reflect principles of land use plan. So they contribute not only to the protection of environment, also to improvement of ecological stability and landscape aesthetic.
A significant advantage of land consolidations is the enabling and financial guarantee of the implementation of proposed measures. Municipal authorities are also involved in the implementation, and they can enforce additions that meet the requirements for increasing the tourist attractiveness of the cadastre. This is, for example, a modification of field paths for cyclists, a construction of rest areas, benches, viewing points, an adjustment of reservoirs shores for swimming, etc.

Material and methods

Several examples of successfully designed and implemented complex land consolidations were chosen for purpose of this article. Some of them received the measure of the year award, which is bestowed annually by the State Land Office to the best implemented measures that meet demanding technical requirements for their effectiveness (anti-erosion, anti-flood, …), but also are sensitively set in the agricultural landscape, considering the protection of various environment components and they complement the landscape scenery. The documentation of land improvements and the documentation of the evaluation commission provided by the State Land Office were used.

Results and discussion

The purpose of the **water reservoir Nenkovice** (Fig. 1), built as one of results of local complex land consolidation, was to create a bio-centre with a water area in an intensively agricultural landscape. The construction consists of a water reservoir including all necessary functional objects, landscaping around the reservoir and water pools. In the upper part of the reservoir, there is an extensive littoral zone for amphibians with a shallow water depth complemented by gently sloping banks. As a result of the retention volume, there is a favourable regulation of runoff conditions during floods. At the same time, the reservoir, with its space, ensures the maintenance of the current flow of the existing water course. After the construction and connection of the bio-centre, the development of aquatic and

wetland communities in the reservoir and its surroundings, both animal and plant, can be expected. An increased occurrence of other small animals, game and birds can also be expected. The implementation of the project created a walking area with the possibility of swimming for the residents of the surrounding villages and tourists.

Fig. 1: Water reservoir Nenkovice with a resting point

Project of measures on the Luha stream in **Bělotín** was implemented as a summary of water management, anti-erosion and ecological measures, which arose from the plan of common facilities of the complex land consolidation in the Bělotín. It is a system of wetlands, water reservoirs and ponds, including the planting of a bio-corridor and bio-centre and construction of field roads with accompanying avenues between intensively cultivated soil units. This complex of measures mainly fulfils the function of retaining water in the landscape, supports biodiversity, and has an important aesthetic and landscape-forming function. The place in Fig. 2 has become a frequent destination for outings of residents from the surrounding area.

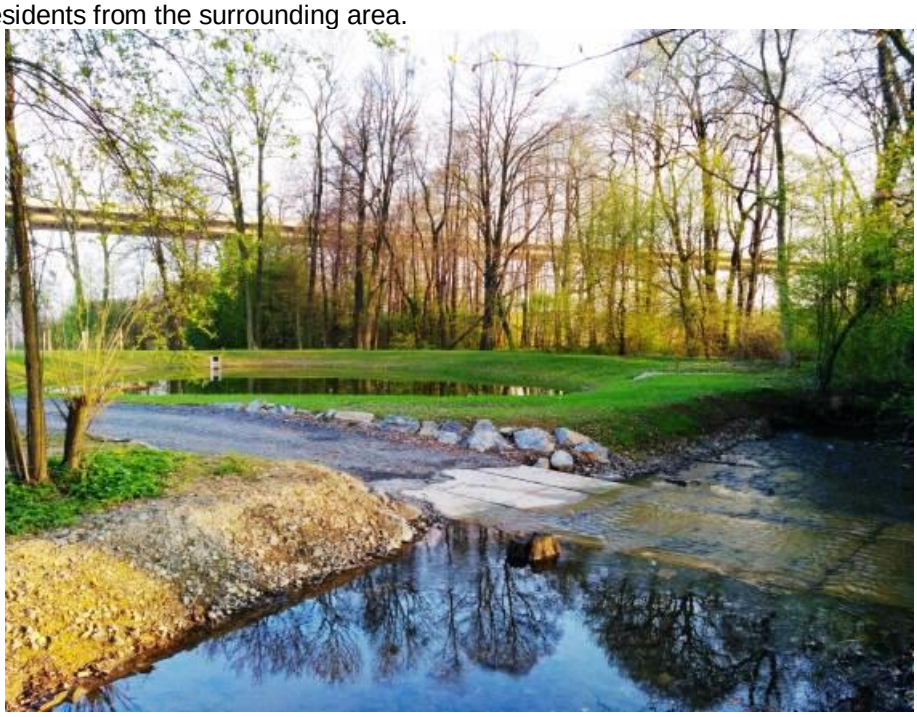

Fig. 2: Water bio-centre in Bělotín

Thanks to the land consolidation in **Kuřimské Jestřábí**, revitalization of the valley of the occasional stream, including the reconstruction of the dam and supplemented by the construction of a gully was implemented (Fig. 3). By removing the deposits of the muddy bottom from the pond, the volume of retained water increased. A meandering bed of a small stream was created with new bank plantings of

native trees. Access to the locality is provided by the newly modified grassed field road. This complex of measures mainly fulfils the function of retaining water in the landscape, supports biodiversity, and also has an important aesthetic and landscape-forming function. The location has thus become a pleasant quiet zone and it is used by the public for rest and relaxation in a natural environment.

Fig. 3: Pond and resting point in Kuřimské Jestřábí

Fig. 4: Retention reservoir in Sloup

As a part of the complex land consolidation of **Sloup** in the Moravian Karst, a bypass water reservoir with a littoral zone and a pool above the reservoir was built (Fig. 4). The purpose of the water reservoir is mainly to retain water in the landscape, slow down runoff, increase ecological stability and strengthen the environmental and aesthetic function of the landscape. Furthermore, a paved road (4 km long) was built to the reservoir, which is currently widely used by hikers, cyclists and, in winter, cross-country skiers. On the bank of the reservoir, the municipality built a fireplace and a shelter.

Fig. 5: One of ponds on Mušalecký stream with a sitting place

The construction of the water reservoir on the Mušalec stream was a part of the implementation of the first phase of the measures based on the plan of common facilities, prepared as a component of complex land consolidation in the cadastral territory of **Třanovice**. The restoration of the historically functional system of Mušalecký ponds represents a comprehensive water management arrangement with an important landscape-forming function, where new conditions were created for the development of plant and animal communities influenced by the water system. The construction created a natural, peaceful, and relaxing zone with a sitting (Fig. 5), presenting itself as a certain counterbalance to negative interventions in the area, evoked mainly by the construction and subsequent use of expressways with connections. No less important is the water management function of the work, which consists in retaining water in the landscape, slowing down surface runoff, possibility of influencing floods and in eliminating subsequent damage. In conclusion, it is a complex element with a high aesthetic value and strong recreational potential.

Perception of land consolidation process has been changing in the time. In the beginning, the main goal was to clarify land ownership and create conditions for the management of new private farms and small farmers. The opportunity to change the face of the agricultural landscape in this way, to improve its ecological characteristics and make it more beautiful for the people, gradually gained importance (Pochop et al. 2016, Konečná et al. 2018). Similarly, for example in Poland (Kupidura et al. 2014), a traditional pattern of a utilitarian approach to the value of land in the consolidation procedure has the potential to change due to a developing awareness that optimally shaped landscape may contribute to attracting visitors and allow recreation activities.

Conclusion

Land consolidations represent an important tool for the implementation of measures for environmental protection and the creation of an agricultural landscape. Currently, the State Land Office registers almost 3 thousand completed complex land consolidations and another 1 thousand in progress. As a result, they bring more greenery and water areas, wider road net and tourist resting points to the rural landscape. In this way land consolidation process and measures implementation increases landscape attractivity, space for sport and relax activities and extend recreational potential of the area.

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Souhrn
Primárním cílem procesu pozemkových úprav (PÚ) je vytvoření optimálních podmínek pro zemědělské hospodaření. PÚ prostorově a funkčně uspořádávají pozemky ve veřejném zájmu, slučují je nebo rozdělují a zajišťují dostupnost a využití pozemků a vyrovnání jejich hranic tak, aby byly vytvořeny podmínky pro racionální hospodaření. Zákon stanoví, že ochrana půdy, vody a životního prostředí jsou důležitými a veřejně nezbytnými aspekty jakékoli komplexní pozemkové úpravy. PÚ tak vytvářejí prostor pro návrh a realizaci opatření na ochranu půdy, vody a životního prostředí (např. zatravnění, pásy stromů, vodní nádrže, …) a ke zlepšení kvality života na venkově. Plány PÚ jsou podporovány vládou a na realizaci ochranných a ekologických opatření jsou využívány fondy EU. Článek na konkrétních příkladech ukazuje, jak realizovaná multifunkční opatření (vč. turistických odpočívadel) přispívají ke zlepšení mimoprodukčních funkcí zem. krajiny, jejího estetického a rekreačního potenciálu.

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THE ROLE OF WETLANDS IN FLOOD PROTECTION PROCESSES IN THE LANDSCAPE – CASE STUDY

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Abstract
In the past, in Slovakia, from the point of view of flood protection, riverbeds were modified with technical elements. The most common solution was the so-called channelization of the riverbed. This modification of the channel straightening, removed the natural meanders of the river, increased the longitudinal slope of the riverbed, and accelerated the outflow from the threatened area. Nowadays, from the point of view of water retention in the country, only the revitalization of riverbeds may not be sufficient to achieve water management during droughts, but also during floods. The design of wetlands in the territory of old, historical, and forgotten riverbeds can create a system for retaining water in nature, thanks to the regulated flood wave, regulation of the inflow and outflow of water from the wetland to existing as well as restored branches of a river. Wetlands, as a valuable ecosystem, can also have recreational and educational value for the wider public, either in the form of tourist-educational trails, lookout towers with the aim of observing bird territories or as part of cycling tracks.

Key words: flood defence measures, flood hazard map, revitalization, recreation, Slovakia

Introduction

Wetlands are defined in the legal system of Slovakia in Act no. 543/2002 Coll. on the Preservation of Nature and Landscape as amended. According to § 2 letter g), Act no. 543/2002 Coll. a wetland is an area with swamps, fens or bogs, a wet meadow, natural flowing water, and natural stagnant water, including a water course and water surface with ponds and water reservoirs (2002).
The most common definition of a wetland in Slovakia is based on the Ramsar Convention on Wetlands. Under the text of the Convention (Article 1.1), wetlands are defined as; areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters (Ramsar, 1971). According to the above-mentioned document, five major wetland types are recognized:

- marine (coastal wetlands including coastal lagoons, rocky shores, and coral reefs)
- estuarine (including deltas, tidal marshes, and mangrove swamps)
- lacustrine (wetlands associated with lakes)
- riverine (wetlands along rivers and streams)
- palustrine (meaning “marshy” - marshes, swamps, and bogs).

State nature protection has a smaller division of wetlands according to importance: Nationally Important Wetlands (N), Regionally important wetlands (R) and Locally significant wetlands (L) This organization also defines Wetland mapping methodology in Slovakia. The inventory of wetlands has been taking place in the Slovak Republic since 1992. Its methodology is based on Ramsar categorization and Ramsar criteria, it was prepared simultaneously with the methodology for habitat mapping and uses some similar approaches. The inventory of wetlands in the current phase enables the identification of some important sites, but the overall inventory of wetlands is a long-term program that will continue for several years. The methodology is prepared by summarizing several years of experience in evaluating data from this inventory. Formularies for the inventory of wetlands were issued by the Slovak Union of Nature and Landscape Protectors in 1992 and will be supplied on request by the Wetlands Mapping Centre, where, if necessary, map documents can also be obtained.
There are two starting situations when mapping the wetlands:

- we have a certain wetland processed for the last year(s) and we need to enter the results into the formulary sheet.
- we have only selected the wetland location and we are waiting for research (botanical or zoological, or both). Only as a supplement to the field survey, we recommend the processing of data about the given location from the literature, with appropriate citation of the literary source.

We currently do not have targeted methodology about artificial (human made) wetlands or their usability from the point of view of flood protection. The aim of the study is to point out the possibility of using the retention properties of potential wetlands along rivers and streams but does not to prove the error of old or historical proposals or to challenge their roles. On the contrary to point out improvements to the current changes and rules, whether from the point of view of hydrology, ecology, ichthyology, or biodiversity of the areas addressed. To clarify this statement few examples are given:

- not every resolved build-up had a proposed flow adjustment for the same flood condition, and the targeted n-year flow values differed. Nowadays, almost all designs are evaluated for event of 100-year flow flood.
- riverbeds were modified with technical elements as semi-vegetative or concrete blocks.
- so-called channelization of the riverbed. This modification of the channel straightening, removed the natural meanders of the river, increased the longitudinal slope of the riverbed, and accelerated the outflow from the threatened area.

Material and methods

Various solutions for surface water flow management are currently being sought. The critical problem is not only solving the runoff conditions during extremely high flows during floods, but also the opposite, retaining water in nature during droughts. It is wetlands that can play a key role in reducing the water volume of a flood wave and subsequently ensuring the distribution of water during dry periods.

First, we must explain the issue of the state of flood defence measures near or in town-residential area of cities in Slovakia. The most frequently used type of protection in the given built-up areas are stream-channel regulation, a river levee (dike), or a protective wall if the areas for construction are so small that the body of a river levee does not fit into the given line (Fig. 1).

Modern trends try to avoid these criteria as much as possible. It is obvious that the built-up density of cities plays a key role in the design decision-making process.

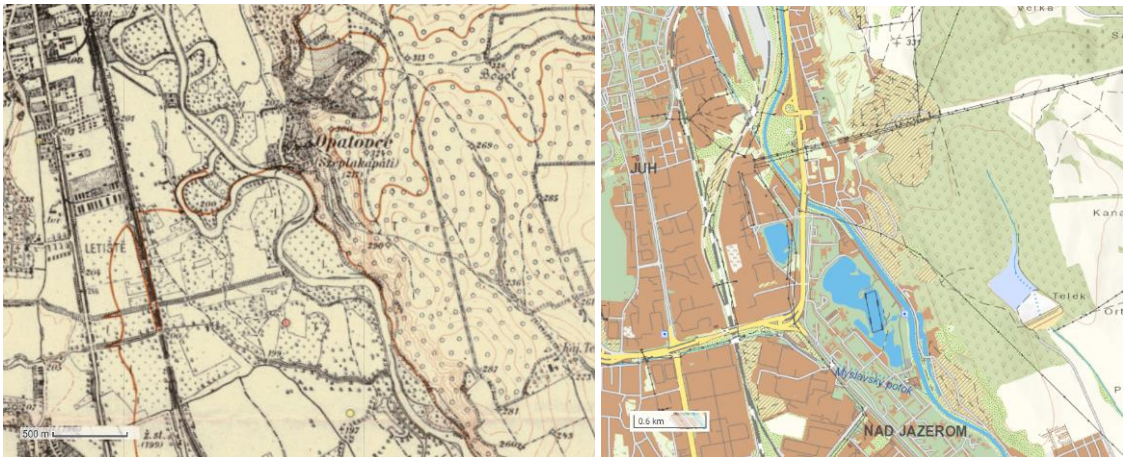

Fig. 1: Comparison of stream-channel regulation of the Hornád river in the Košice. (Left map: The military mapping in 1920 – 1950. Right map: ZBGis map 2023)

The aim of the research is to point to more modern environmental solutions that can increase safety and protection against floods. Artificial wetlands can be one of the options for modifying (or even part of the repairing) existing flood protection measures. Similar to controlled flooding area, wetlands would be designed upstream above the proposed built-up area. Finding the right location for swamps should be an open debate with all affected state authorities and professional organizations dedicated to the issue. The second most important input information when searching for a location can be historical sources and map documents, in which it is possible to find mentions of wetlands or at least trace the alignment of the riverbed before it was channelled. Terrain depressions, old riverbeds (which may already be filled in or reclassified as agricultural land), have an impact on the future development of the wetland, both in terms of the ability to retain water in the country, but also the usability of its retention volume.

Results

The first and basic task is to solve the existing regime of the water level around interest for targeted flow of the flood. As a result, the maps of the flood hazard should correspond to the corresponding

volumes of flood waves during extreme flows. Example of the flood map can be shown in Figure 2., where part of such document is publicly accessible in the map portal of the Slovak Water Management Corporation. If these maps and information about the flood in a specific area are not accessible, it is necessary to evaluate them in a hydrodynamic model.

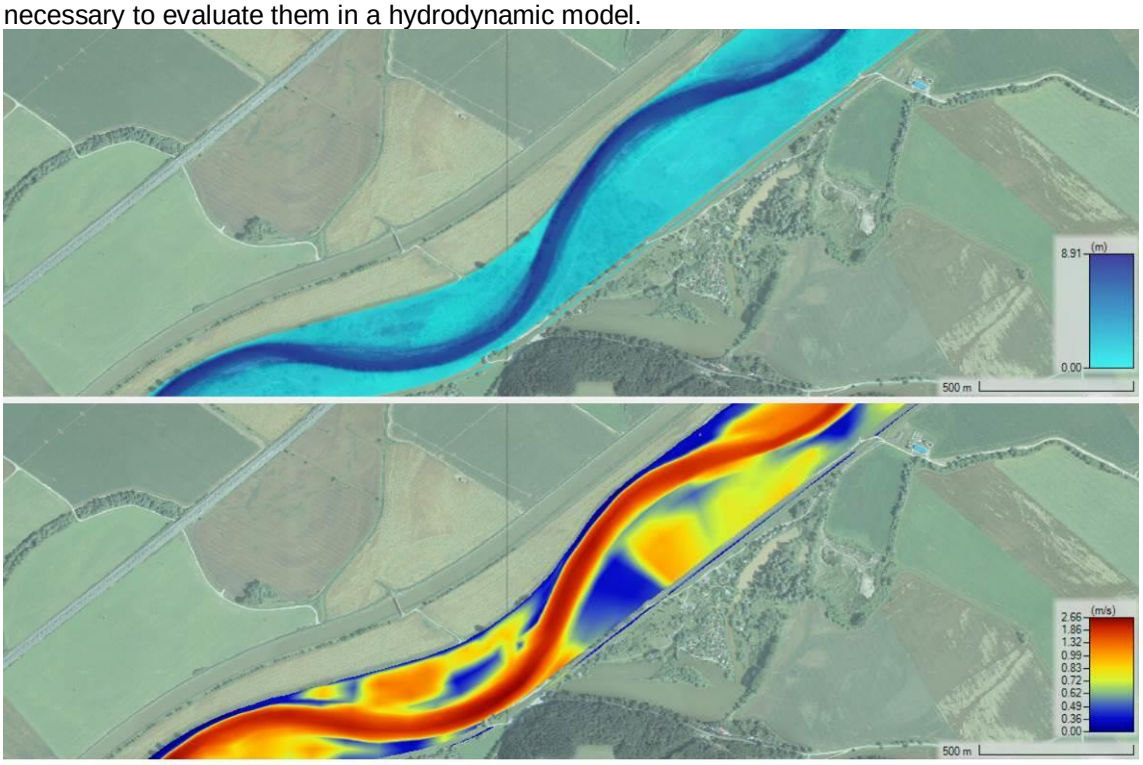

Fig. 2: Example of the flood map, evaluated in a hydrodynamic model for targeted 100y-flow.

The second step should be the characterization of the territory for the design of an artificial wetland, which would include three basic parameters: water withdrawal for the wetland, the maximum volume of water per area of the treated territory and, finally, the possibility of manipulating the water level. Manipulation of the water level either from the point of view of the flood protection or subsidizing the flow during dry periods.

Water withdrawal for the wetland would be adapted to the surrounding terrain, needs and circumstances as and especially when water retention is necessary. For instance, a modified, regulated riverbed, which partially fulfils flood protection, can supply water for the wetland through an inlet structure or some regulation through flood protection structure as the wall or the levee. An important calculation and design in this part will be the process and time interval of filling the wetland retention space so that it is safe and non-destructive. At the same time, to maximize the given space, but not to create new potential flood threat for the study area.

The debate about the retention properties of wetlands should be divided into parts in terms of not only extreme conditions but also for normal daily operation. This would be the readiness of the water level regime either for the expected decrease in precipitation defining the dry season, but also the possibility of lowering the water surface elevation with the aim of maximizing retention during ongoing flood. The requirement to completely drain and dry the wetland must be feasible if necessary.

The method of releasing and draining flood waters from the wetland must be safe and gradual so as not to create new dangerous flood scenarios. The use of excess flood water can help to revitalize historical, currently dried branches, or support the flow of existing river or stream branches. Like the withdrawal of water to a wetland, the regulation of the water surface elevation around the wetland can also be set by an outlet structure.

The last step could be beatification of wetland, as a valuable ecosystem, which can also have recreational and educational value for the wider public with lookout towers with the aim of observing bird territories. New protective levees can form of tourist-educational trails or cycling tracks.

Conclusion

Whether in Slovakia or in other countries that want to solve the problem with floods, we are also looking for new, more ecological solutions than we did in the past. The terminology of artificial or human-made wetlands is still a fresh topic, but more attention is being paid to it. The restoration of

branches and wetlands near large rivers, such as the Danube, is a priority in our territory. However, we can see the potential of these artificial wetlands in smaller lowland streams, where the volume of the flood wave may not have high values, but the low longitudinal slope of the stream ensures a slow outflow from the territory. The untargeted and unregulated spill-over of water from riverbed into agriculturally used zones can be replaced by staged filling of wetlands with a positive result and increased protection against flood (Zeleňáková, 2015, 2018). We are aware that the retention values of wetlands are not equal to the values of reservoirs and controlled flooding area. However, a system of several wetlands, whose level regime will be interconnected with each other but also with the river, can reduce the critical peak of the flood wave to such an extent that the threat from spill-over is minimal or non-existent.

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Souhrn

V minulosti se na Slovensku z hlediska protipovodňové ochrany upravovala koryta řek technickými prvky. Nejčastějším řešením byla tzv. kanalizace koryta. Tato úprava napřímila koryto, odstranila přirozené meandry řeky, zvětšila podélný sklon koryta a urychlila odtok z ohroženého území. V dnešní době nemusí z hlediska zadržování vody v krajině stačit k dosažení vodohospodářského efektu v době sucha, ale i při povodních, pouze revitalizace říčních koryt. Návrh mokřadů v území starých, historických a zapomenutých říčních koryt může vytvořit systém pro zadržování vody v přírodě, a to díky regulované povodňové vlně, regulaci přítoku a odtoku vody z mokřadu do stávajících i obnovených ramen řeky. Mokřady jako cenný ekosystém mohou mít i rekreační a vzdělávací hodnotu pro širší veřejnost, ať už v podobě turisticko-naučných stezek, rozhleden s cílem pozorovat ptačí teritoria nebo jako součást cyklostezek.

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THE UNFINISHED HITLER'S MOTORWAY – A HERITAGE IN THE CONTEMPORARY LANDSCAPE

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Abstract
The unfinished extraterritorial motorway A88 Breslau – Wien, also known as Hitler's motorway, was a strategic construction of the German Reich connecting major centres through the territory of Czechoslovakia (later Protectorate of Bohemia and Moravia). Within the present-day territory of the Czech Republic, work on the Hitler Motorway began in April 1939 and was halted in April 1942, with a total of 85 km of the motorway being built out of a total of 320 km. In 80 years, only three short, isolated sections have been completed as highways or roads. Most of the completed part of the route is kept as a zoning reserve for the construction of a capacity road from Brno to Moravská Třebová. In addition to standard agricultural areas, there are relatively attractive green infrastructure elements in the landscape in several places. They are represented by shrubs, tree vegetation or meadows. Two sites are currently protected as nature reserves and natural monuments. From the point of view of recreation and tourism, some preserved technical infrastructure objects are also attractive, e.g. motorway bridges, culverts, earthworks on notches. The aim of this paper is to evaluate the heritage of the unfinished motorway in the current landscape, with an emphasis on its potential in green infrastructure of the landscape and its use in local and regional tourism and recreation.

Key words: Motorway, history, landscape, green infrastructure, recreation

Introduction

Technical Cultural Heritage represents an important group of tourist attractions. The specific group are transport infrastructures (Hall, 2004), which also contribute to a large extent to the shaping of the landscape. Tunnels, bridges and other technical structures related to transport infrastructure attract and are often visited by specific groups of visitors. As they are often living structures that are still in use, there is a risk from a safety perspective due to trespassing (Skládaná et al., 2016). This is eliminated in the case of remnant transport infrastructure. Former transport corridors are often located in intensively used open landscapes with a lack of greenery, forming a line of abandoned land, as there is usually no immediate reuse of the area for a new function. These areas are subject to spontaneous development and can easily become a biodiversity sanctuary in an agricultural desert despite the inferior quality of the primary successional plant cover as they provide alternative habitat for many species, especially invertebrates, small vertebrates or birds (Denner, 2017; Dylewski et al., 2022). The importance of developing and maintaining green infrastructure is key to improving landscape functions, particularly in agricultural landscape types (Skokanová, González, Slach, 2020; Skokanová et al., 2020).

Historical context

The new transport system based on motorways ("Reichsautobahnen" in German) was intended to be a demonstration of Germany's modernity in the interwar period for the propaganda of the Nazi dictatorship. Standards for German motorways at that time were in many ways superior even to the design parameters for motorways today. This was not only in the radius of curves or gradients, but also in the extraordinary emphasis on integrating the linear construction into the existing landscape (Zeller, 2007). The first section was put into operation in 1935 and by the end of 1941 the length of the network had reached 3,860 km, with another 2,500 km under construction (Weingroff, 2017).
Following the annexation of Austria in the spring of 1938, there was a German demand to connect Breslau (now Wroclaw) and Vienna through Czechoslovakia with a new A88 motorway. The requirement for its construction was included in the Munich Treaty in September 1938.
Within a few months, the project for the entire 320 km long A88 route was ready, 65 km of which were located in the territory of the Protectorate of Bohemia and Moravia (the follow-up of Czechoslovakia after the German occupation in March 1939). Construction started in April 1939 and a total of 83 km of

the route was gradually built (Janda, Lídl, 2008). The activity was completely halted in April 1942, along with all other non-military construction throughout the Third Reich leaving a lot of traces in the landscape in various levels of completeness.

Objective

This paper seeks to find out what the remains of the construction are in the landscape and whether it is possible to visit them at present. The second question is to find out if the phenomenon of the unfinished highway is commemorated in any way to enhance tourist attraction of the area. Last but not least, the aim is to check the significance of the physical remains of the motorway body for the blue-green green infrastructure of the landscape and ecological network in general.

Methodology

The northern section of the A88 construction from the northernmost point near the village of Městečko Trnávka to the intersection with the I/43 road southwest of Svitávka, 29 km in length (out of a total of 83 km under construction), was chosen as a model area (Fig.1) of which 1.5 km is currently in use as a class II road.

In the screening phase physical sites remains of the unfinished motorway (further referred as POI) were selected using literature (Janda, Lídl, 2008) and a web application (Sedlák, 2019) and indicated at least minimal significance according to the cultural heritage assessment methodology (Matěj, Ryšková, 2018). Mapping of the current land use was carried out using recent aerial imagery but the extent of the study area was defined using aerial images from around 1950 showing the state of the unfinished motorway not long after its abandonment. MInimal mapping unit was set at 0.02 ha and a total of 13 land use categories were mapped according to Jandova et al. (2020).

The field survey focused on current tourism use including verification of the accessibility of the POI for hikers, cyclists, and tourists using individual cars. At the same time, awareness of sites of interest was monitored through information signs or electronic applications (e.g. geocaching). In addition, refinement of land use mapped from aerial photographs was conducted as well as photo-documentation of the current status of POI and the motorway corridor in the landscape. Subsequently, the recreational and conservation potential of the unfinished motorway features was assessed based on mapping, archival sources, information from spatial plans, protected site records and field survey.

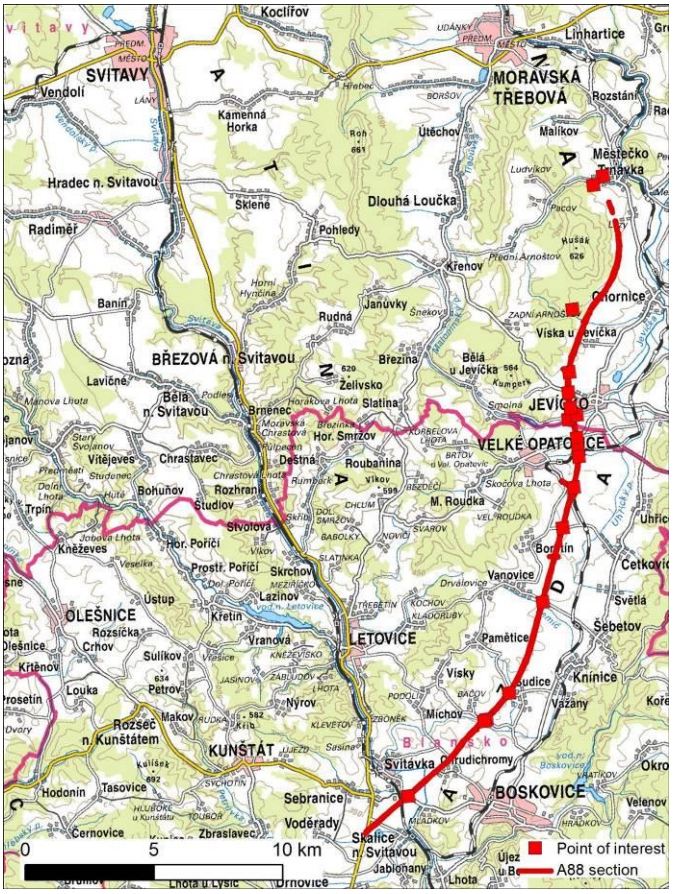

Fig. 1: Northern part of the unfinished A88 motorway and POIs identified

Results & Discussion

In the study area, we identified a total of 19 POI (see Fig. 1), of which the majority - 16 (84.2%) - were various bridge structures (Fig. 3-5), mostly at a higher stage of completion, lacking only the completion of the roadway. The remaining POI are 2 sites associated with work camps and the final site is the northernmost point of the construction works. Most of the POI are well accessed via paved roads, 12 (63.2%) in total, further 4 (21.1%) are accessible via unpaved roads and only 2 sites (10.5%) are not located on any road or trail. Five POI (26.3%) are located on a marked hiking trail and 7 POIs (36.8%) are on a marked bike trail. Despite the relatively extensive accessibility of various POI, only one site (Soviet POW cemetery - see Fig. 2) is commemorated and marked with information materials. Contrary to this informational gap is the popularity of the POI among geocaching enthusiasts, where as many as 8 of the 19 identified POI have a thematic cache with their listings containing much information about the history of the motorway.

Fig. 2: Soviet POW cemetery

Fig. 3: Bridge over road W of Jevíčko

Fig. 4: Two-span bridge

Fig. 5: Parabolic bridge SW of Sudice

As seen in Table 1, forest is currently the predominant land use category (66.59%) in the area of interest, with other categories with high proportions being shrub, bush (14.66%) and permanent grassland (7.66%). All of these land use categories have a high potential for improving landscape functions through green infrastructure. Some of the land in these sections of the highway is now used as arable land or fruit orchard with grassing. The other areas are mainly made up of temporary landfills for construction materials and timber.

There are roads with an asphalt surface in the impermeable surface category, semi-paved roads and unpaved roads that run through the motorway body and connect the surrounding land or run directly along the axis of the motorway section. Water bodies are also provided to improve landscape functions in agricultural landscapes. Wetlands and smaller water bodies have been created in the cuts on several sections and have the potential to support some specialised animal species (amphibians, birds, insects).

The course of the motorway alignment has a high potential for enhancing landscape functions, specifically as green infrastructure features in the landscape. Especially in the sections where the new motorway will already be routed, the addition of green infrastructure to the territorial system of ecological stability, possibly as small-scale specially protected areas, is appropriate. Similarly, two protected areas (natural monuments) in the vicinity of Brno and Kuřim are already used for nature protection. There are 10 local biocentres, 5 significant landscape elements, 8 ecologically significant landscape segments in the evaluated section A88. More than half of the sections of the motorway are identified in the spatial plans as local bio-corridors, i.e. linear elements of green infrastructure. At the

same time, the vast majority of the motorway is also classified as a mixed area in undeveloped land with a predominantly natural function. Most sections of the motorway thus have a high potential for improved functions after 80 years, especially in agricultural landscape types. They are key habitats for animal migration and refugium (see Fig. 6). Some of the water bodies and wetlands in the profile of the highway corridor provide suitable habitat for amphibians, birds and insects. Unfortunately, however, it was confirmed during the field survey that some wetland and water body sites are affected by illegal dumping of waste (see Fig. 7).

Tab. 1: Current land-use of areas affected by A88 construction

Land use category	Area ha	Share %
Arable land	5.95	3.69
Fruit orchard with grassing	2.06	1.27
Permanent grassland	12.36	7.66
Clearing, windfall	0.09	0.06
Shrub, bush	23.66	14.66
Forest	107.46	66.59
Unpaved road	2.42	1.50
Semi-paved road	0.44	0.27
Railway	0.09	0.05
Other area	2.54	1.57
Impermeable surface	3.22	1.99
Water area	0.14	0.08
Built-up area	0.96	0.59

Fig. 6: Vegetated body of motorway

Fig. 7 Wetland - waste dump

Future outlook

The construction of an expressway from Brno to the north is planned for a long time in the A88 axis, using the unfinished A88 as much as possible. Therefore, only those sections where the expressway will no longer follow the original 1939-1942 route have the potential for nature and landscape protection. Specifically, the sections near the villages of Chrudichomy and Sudice and the entire northern part between Víska u Jevíčka and Městečko Trnávka. These sections can thus serve as green infrastructure for the landscape. The semi-natural sections also have potential for local recreation such as walks for local residents and also to improve the permeability of the landscape.

Conclusion

After more than 80 years, the unfinished sections of the A88 motorway offer recreational and nature conservation uses for both local residents and tourists. However, the tourist potential is not fully exploited at all the objects of interest, many objects cannot be accessed using existing tourist routes, and the surviving transport structures of bridges and tunnels usually lack information signs. With regard to current land use in sections of the motorway, it would be useful to link elements of semi-natural greenery and water bodies to the planned ecological network and to work on appropriate management of the greenery. Current information on planned new road construction indicates that some sections of the motorway carriageway will not be utilised. It is desirable that the cultural and historical heritage and nature conservation potential of these features is safeguarded.

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Souhrn

Nedokončená exteritoriální dálnice A88 Breslau - Wien, známá také jako Hitlerova dálnice, byla strategickou stavbou Německé říše spojující hlavní centra přes území Československa (později Protektorátu Čechy a Morava). Na území dnešní České republiky byly práce na dálnici A88 zahájeny v dubnu 1939 a zastaveny v dubnu 1942, přičemž se stavělo celkem 83 km dálnice z celkových 320 km. Jako modelové území byl vybrán severní úsek stavby A88 od nejsevernějšího bodu u obce Městečko Trnávka po křižovatku se silnicí I/43 jihozápadně od Svitávky v délce 29 km (z celkových 83 km ve výstavbě).

Jako hmotné pozůstatky nedokončené dálnice alespoň minimálního významu bylo podle metodiky hodnocení kulturního dědictví identifikováno celkem 19 zájmových bodů. Většina bodů zájmu je dobře přístupná po zpevněných komunikacích (63 %), 5 bodů zájmu (26 %) se nachází na značené turistické trase a 7 bodů zájmu (37 %) na značené cyklotrase. Pouze jedna lokalita, hřbitov sovětských válečných zajatců, je připomínkována a označena informačními materiály.

Převažující kategorií využití půdy v modelovém území je les (66,6 %), dalšími kategoriemi s vysokým podílem jsou keře, křoviny (14,7 %) a trvalé travní porosty (7,7 %). Všechny tyto kategorie využití půdy mají vysoký potenciál pro zlepšení funkcí krajiny prostřednictvím zelené infrastruktury. V kategorii nepropustných povrchů se nacházejí komunikace s asfaltovým povrchem, polopropustné komunikace a nezpevněné komunikace, které procházejí tělesem dálnice a propojují okolní pozemky nebo vedou přímo v ose dálničního úseku. Pro zlepšení krajinných funkcí v zemědělské krajině jsou k dispozici také vodní plochy. V zářezech na několika úsecích byly vytvořeny mokřady a menší vodní plochy, které mají potenciál podporovat některé specializované druhy živočichů (obojživelníky, ptáky, hmyz), a to i přesto, že některé lokality mokřadů a vodních ploch jsou zasaženy nelegálním ukládáním odpadu, jak bylo potvrzeno během terénního šetření.
V ose A88 je dlouhodobě plánována výstavba rychlostní komunikace z Brna na sever, která v maximální možné míře využívá nedokončenou A88. Potenciál pro ochranu přírody a krajiny mají proto pouze ty úseky, kde rychlostní silnice již nebude sledovat původní trasu z let 1939-1942. Tyto úseky tak mohou sloužit jako zelená infrastruktura pro krajinu. Polopřírodní úseky mají také potenciál pro místní rekreaci, například pro procházky pro obyvatele, a pro zlepšení prostupnosti krajiny.

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TRADITIONAL COPPICE MANAGEMENTS AT THE LANDSCAPE LEVEL ALONG WITH RECREATIONAL USE

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Abstract
Our current goals in forestry involve safeguarding the land and environment, optimizing the forest's ability to absorb CO_2, maintaining the health and integrity of forest ecosystems, and preserving biodiversity and landscape variety. Ensuring the long-term productivity, socio-economic viability, and environmental functions of European forests and woodlands, including coppice woodlands, is crucial. Addressing these challenges can be effectively achieved by utilizing a combination of various management methods. The main focus of this study is on traditional forms of management such as coppicing, grazing, and litter raking. To facilitate this research, designated plots were established within the Training Forest Enterprise Masaryk Forest Křtiny. These plots, where sheep grazing and litter raking have been implemented since 2018, are exceptional and provide exemplary illustrations of diverse coppice management practices in Central European coppices.

Key words: standards, grazing, litter raking, biodiversity, recreational value

Introduction

Numerous cultural landscapes throughout Europe have been molded by centuries of coppice forest management. As the oldest form of forest management, coppicing has a long and rich history. Today, it is estimated that over 20 million hectares of forest in Europe are currently managed using coppice techniques. In the Czech Republic, coppicing was once a prevalent form of forest management, along with grazing and litter raking. However, this practice was eventually abandoned in the 19th century due, in part, to the shift towards using fossil fuels. Following World War II, coppicing was completely discontinued. During the early Communist period in the 1950s, many forestry researchers viewed coppicing as a "capitalist" approach that focused solely on maximizing wood production, even if it meant depleting soil nutrients and ultimately leading to soil degradation and decreased wood production capacity. Consequently, this led to the demise of the three traditional non-timber forest uses: coppicing, grazing, and litter raking, which were once widely practiced.

Today, with new information and perspectives, many European countries view coppicing differently. Coppice management practices are now recognized for their numerous benefits, including minimal soil damage during harvest (in the case of coppice with no standards), reduced need for weed management, physical protection of the site on sloping terrains, reduced risk of windthrow, and long-term soil stability. Additionally, where markets for coppice products exist, this management method can provide a financial return for landowners, particularly for those who own small forest properties.

Coppicing also provides crucial environmental benefits such as carbon sequestration, as well as conservation of water, soil, and biodiversity. This management practice supports a diverse range of forest species, and it also holds significant cultural and spiritual value. Furthermore, we should not overlook the recreational value of coppicing and grazing, which have become increasingly important in recent years. It is worth noting that tourist and recreational use of forests is one of the newest forest functions. Tourism and recreational activities in forests are highly popular in the Czech Republic. However, forest visitors are often conservative in their views and lack an understanding of new forest management practices. To address this, efforts are being made to educate both the public and professional communities about coppicing and to shift their perspectives towards this management

method. According to Stanturf (2015), reintroducing sheep grazing in forests can be viewed as a means of restoring a mosaic landscape, and it may enhance the appeal of specific forested areas. There is now a growing effort throughout Europe to maximize the benefits of this currently underutilized management system.
Coppicing is a valuable form of forest management that should be recognized as such. By promoting a diversity of forest management practices over space and time at the landscape level, biodiversity can be significantly enhanced, and heterogeneity can be restored to production forest landscapes. In fact, increasing the diversity of forest management practices is an effective approach to adapting to global change, according to Duflot et al. (2022).
The primary objective of this research is to assess the effects of traditional forest management practices on forest ecosystems, with a particular focus on biometric, pedological, and geobiocenological perspectives.

Materials and methods

The study conducted at the Training Forest Enterprise Masaryk Forest Křtiny involved the establishment of 15 plots, each measuring 40 × 30 m. These plots were established to evaluate the effects of traditional forest management practices and differ from each other based on the type of management treatment applied. The prevailing slope aspect and inclination at the study site is W-N and 5-10°, respectively, at an altitude of 275-325 m above sea level. Due to differing loess admixture (even more than 0.5 m of continuous layer on steeper western slope) in granodiorite bedrock, soil protection includes minimization of mineral soil exposure and continual plant cover. The set of research plots was established in 2017. Twelve of the plots were subjected to strong thinning, resulting in only 80 trees per hectare being retained as standards. Three plots were left without any further intervention as control plots. Dendrometrical measurements of the circumference of oak standards at breast height were carried out at the beginning and end of each growing season. The relative growth ratios (RGR) were computed using the formula provided by Cotillas et al. (2009), as shown below:

$$RGR = \frac{x_i - x_{i-1}}{x_{i-1}} * 100 \quad (1)$$

where x_i is the circumference at breast height in time i (end of the growing season) and x_{i-1} is the circumference at breast height in time $i-1$ (beginning of the growing season).
The study compared the RGRs of oak standards among five different treatments (control plots, plots with only coppice, and three treatments with coppice combined with litter raking, grazing, or both) over six years (with 2017 used as a control year before any treatments were applied). The ANOVA and post hoc multiple comparison Tukey tests were used to analyze and compare the RGRs.
Parametric ANOVA and post hoc multiple comparison Tuckey tests were used to analyze the concentrations of soil mineral nitrogen forms (ammonia NH_4^+ and nitrates NO_3^-) in fresh samples collected during 2017-2021, as assessed by Kučera et al. (2013). The statistical analysis was conducted at a significance level of 0.05.
Geobiocoenological sampling, as described by Randuška et al. (1986), was conducted on all the plots. The sampling was carried out on permanent geobiocoenological plots measuring 15 × 15 m and mainly included the composition of plant species and their estimated cover.

Results and Discussion

The dendrometrical measurements of oak standards in the coppice plots revealed that there was an increase in the circumference growth, as expected. The maximum increment in circumference was observed four years after the start of the experiment, following which there was a decline in the increment (Figure 1). This could be attributed to the release of canopy and reduced competition resulting from the initial harvesting of trees. The results were consistent with the hypothesis proposed by Jones and Thomas (2004), which suggests that the diameter increment of trees released from competition is initially high but later becomes similar to the values before the release.

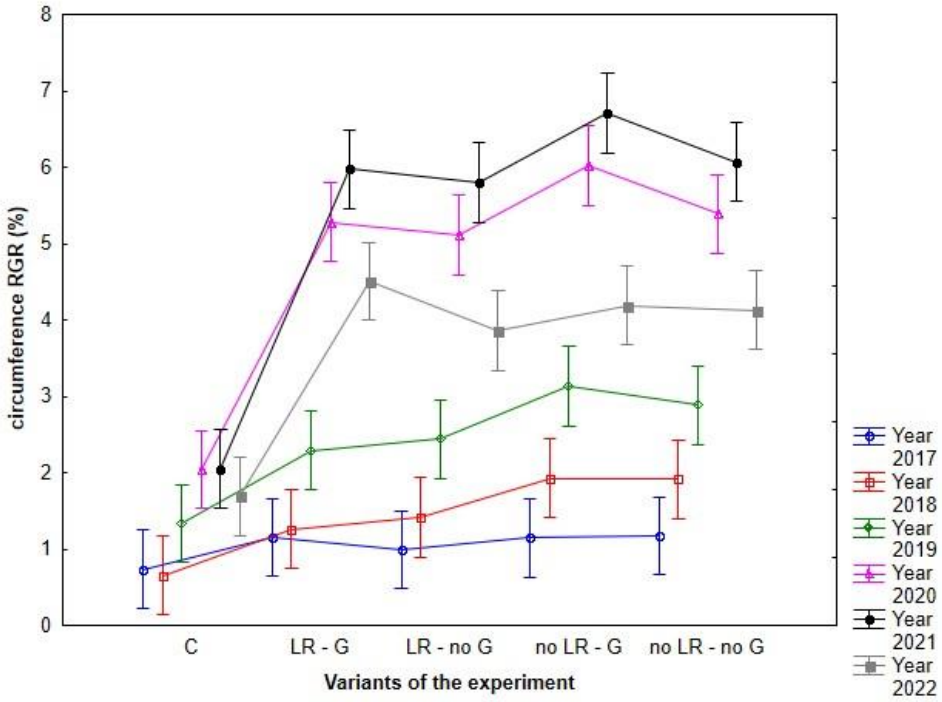

Fig. 1: Mean values (significance level α=0.05) of circumference relative growth ratio of oak standards in years 2017-2022 compared between different treatments. RGR (%) – relative growth ratio of oak standards, C – control plots, LR – litter raking plots, G – grazing plots (Adamec et al., 2022).

Pedologically, the results indicate an increase in ammonia nitrogen concentration during the first year after disturbance, as shown in Figure 2. The most intensive treatments, involving coppicing, litter raking, and grazing, resulted in concentrations more than five times higher compared to the control plot. From 2019 to 2021, the concentrations of ammonia nitrogen, as well as the differences among treatments, systematically decreased to the same level as in 2017. In contrast, nitrate nitrogen concentrations were consistently higher in 2018, with the highest concentration observed in the treatment combining all three management practices. Over time, nitrate concentrations continued to increase systematically. The concentrations of nitrate form result from the mineralization process following disturbance and inputs through faeces from grazing. Both forms can be utilized by nitrophilous plants, but nitrates are susceptible to leaching.

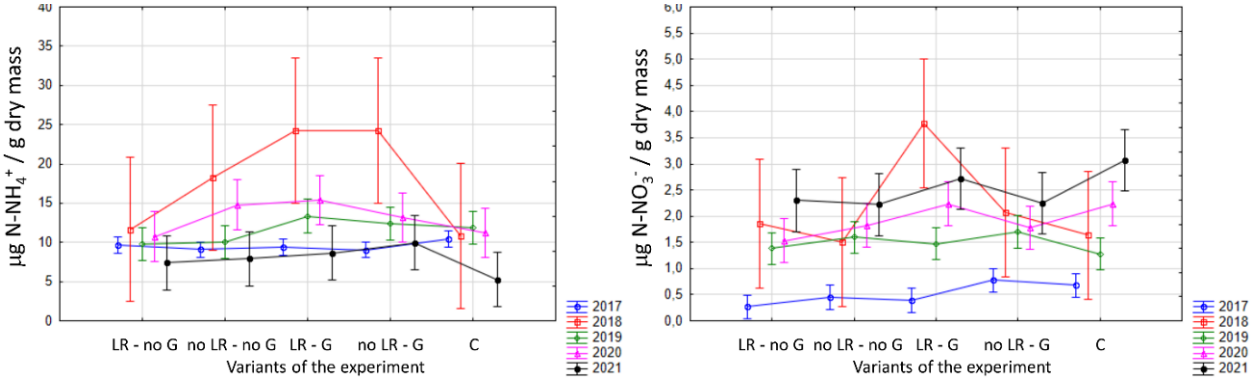

Fig. 2: Mean values of ammonia (left) and nitrate (right) forms of nitrogen in years 2017-2021. C – control plots; LR – litter raking; G – grazing (Adamec et al., 2022).

From a geobiocoenological perspective, our findings indicate that the reintroduction of traditional management practices resulted in a significant increase in the number of species in the herbaceous layer. Prior to the treatments, the number of species identified ranged from 7 to 26, with an average of 17 species per plot. Following the treatments, this number increased to between 61 and 117 species (excluding control plots) with an average of 86 species per plot in 2018, and to between 75 and 103 species with an average of 88 species per plot in 2019.

Figure 3 displays the average number of species per plot over time for each of the different treatments. The figure clearly shows that the combination of all three treatments (coppicing, grazing, and litter raking) resulted in the greatest increase in the number of species in the first year, followed by a decline in subsequent years. In contrast, the other treatments (coppicing alone, coppicing and raking, or coppicing and grazing) resulted in a lower increase in the number of species in the first year, but this increase continued in the following year. Two years after the treatment, the number of species, regardless of the treatment, started to converge. However, the most intensive treatment (i.e. the combination of coppicing, grazing, and raking) still maintained a higher species richness compared to the other treatments (see Fig. 3 and 4).

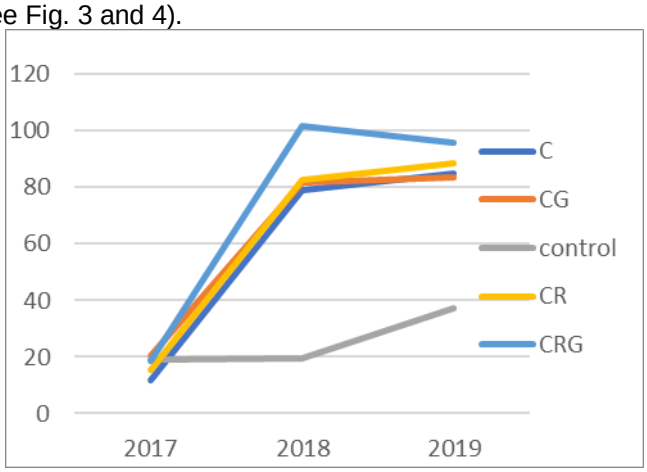

Fig 3: Growth of the mean number of species according to treatments between years 2017–2019. C = coppicing, R = litter raking, G = grazing.

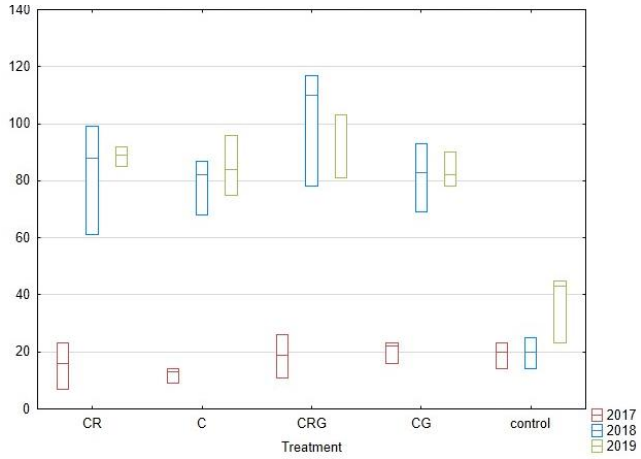

Fig. 4: Change in the median number of species according to treatments between years 2017–2019. C = coppicing, R = litter raking, G = grazing.

Conclusion

This contribution presents the results of an experiment conducted at Training Forest Enterprise Masaryk Forest Křtiny in the southeastern part of the Czech Republic. The experiment involved applying coppicing, litter raking, and grazing to research plots. The results indicate that the released oak standards showed an increase in circumference increments during the first years of the experiment. The treatments also increased the concentrations of ammonia and nitrate forms of nitrogen, which can be beneficial to nitrophilous plants. Furthermore, the treatments increased the number of species in the herbaceous layer. However, further monitoring is needed to determine if the treatments differ from the control plots in the long term. Overall, these management practices can help increase the diversity of forest types at the micro-scale level and contribute to landscape diversity.

The ongoing project at TFE Masaryk Forest not only provides valuable insights into the effects of traditional forest management methods on forest ecosystems, but also offers a unique opportunity for visitors to witness practices that are no longer common in Czech forests due to legal restrictions. The project also aims to raise awareness about the importance of traditional forest management methods and their potential for enhancing forest biodiversity. With the research plots located near popular

tourist routes, it is expected that the project will attract a larger number of visitors to the area, thereby increasing public awareness about sustainable forest management practices.

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Souhrn

Daný příspěvek vznikl v rámci probíhajícího projektu na ŠLP ML Křtiny, kde se zkoumá vliv řízené pastvy a hrabání opadu na stav pařezin. Dílčím cílem je separace těchto vlivů a kvantifikace jejich účinku na stav pařezin. Přičemž pařezina (les nízký) může být vnímána jako jeden z tvarů lesa se specifickým managementem, který vede k diverzifikaci způsobů hospodaření v čase a prostoru, a to na úrovni celé krajiny. Projektem sledované faktory (pastva a hrabání opadu a jejich vzájemné ovlivnění) v minulosti přispěly k negativnímu povědomí o pařezinách u odborné, ale i laické veřejnosti. V současné době se snažíme o nový náhled na tyto tradiční způsoby hospodaření.

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TRANSFORMATION OF GARDEN SETTLEMENTS INTO A RESIDENTIAL ZONE

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Abstract
The content of this paper is research on gardening settlements. These are special urban areas that, as recreational spaces for city residents, contribute to the maintenance of their mental and physical condition. At the same time, from the point of view of environmental and ecological urbanism, they are a specific ecosystem of so-called green infrastructure, whose importance is seen, for example, in the prevention of overheating in urban areas in the summer months. At the same time, the economic aspect cannot be overlooked, namely the savings in the city budget for the maintenance of greenery. For the purpose of this research, the gardening settlements in Brno were monitored. The paper deals with the gradual transformation of these settlements into residential space. It analyses the economic factors and looks for parallels in the construction of emergency colonies in the 1920s in Brno. The article draws attention to the disruption of the local ecosystem and its transformation, the disappearance of the recreational zone and the benefits of urban green infrastructure.

Key words: Recreation zones, green urban islands, shanty town, Brno

Introduction

Garden settlements are a traditional part of the Czech urban space. They have social, psychological, environmental, and economic significance for the whole society living in cities.
Ecological urbanism mainly addresses the type and percentage of green space and water features (Ostarek 2021). It aims at sustainable urban development and building healthy and functional settlements. Green islands (isolated green areas) and whole green infrastructure (connected green spaces) are important in reducing the temperature of urban areas during the summer months and preventing so-called heat islands. For example, a study from China shows that unshaded areas reach up to twice the temperature of shaded areas. Shading urban areas with green space is also of high importance in terms of protection against noise, dust, and emissions (Yang et al. 2021). Research in Brno on green spaces and water areas has also shown that these areas have the potential to improve the urban climate (Kliment et al. 2022).
The planning of functional cities is undoubtedly related to a healthy society and the influence of green spaces on the human psyche. Appropriate use of green space within urban space has a safe, optimistic, and calming effect on people. At the same time, they are largely areas for recreation and leisure activities. Gardening settlements are areas for individual recreation that provide their users with the opportunity for active recreation and partial food self-sufficiency.
Green infrastructure is also important for biodiversity. A 2007 article by Czech scientists points out that elevated temperature, imises, the proportion of calcium in buildings and readily available food sources cause high biodiversity for certain groups of organisms (Švecová et al. 2007). Areas of green infrastructure, which provide similar conditions for the life of individual species as their natural habitats, show the highest organic diversity (Benedikt, McMahon 2001). These benefits of green space can be applied to the gardening settlements that were established en masse in the Czech Republic after World War II (Klika et al. 2020).
It is worth pointing out that this article does not take into account the transport solutions of cities or their urban design as a dynamic whole.

Material and methods

This article aims to highlight the importance of garden settlements from a social, environmental, and economic perspective. It supports the gradual transformation from individual recreational zones to residential zones with research data and uses this data to find parallels in the construction of the emergency colonies of the 1920s. The primary source for the analysis of the current situation was data obtained from the publicly available part of the Land Registry (hereinafter KN). In a survey of several garden colonies, it was found that there are 3 basic types of existence of buildings:
- Structures not registered in the KN and traceable only on orthophotos (Fig. 1)
- Building not registered in the KN but with a plot of land
- Building registered in the KN with a evidencional number (hereinafter referred to as ev. no.)

Comparison of the map parts of the current and future master plan allowed the authors to clearly quantify the transformation of garden settlements.

Fig. 1: Traceability of unregistered buildings - see red framed plots (cuzk.cz)

More detailed research was carried out in the localities of Velká and Malá Bosně (c.t. Medlánky), Výšiny (c.t. Jundrov), Travní (c.t. Nový Lískovec), Rakovec (c.t. Bystrc).

Tab. 1: Garden settlements in urban areas (gis.brno.cz)

Garden settlements in urban districts	Area [m^2]	Surveyed area [m^2]
Líšeň: u ul. Jateční, nad Mariánským údolím, u Kostelíčka, u Zetoru	259 597	
Slatina: Stránská skála	98 734	
Židenice: JZ svah Vinohradského kopce, mezi ul. Rokytova a Kuldova	352 300	
Maloměřice: ul. Hády, ul. Podzimní	318 709	
Obřany: na východní a západní hranici městské části	746 238	
Sadová	579 328	
Brněnské Ivanovice	61 213	
Černovice	154 452	
Nový Lískovec: Travní	**284 064**	**126 632**
Bosonohy	408 870	
Žebětín	378 792	
Jundrov: Výšiny	**281 391**	**281 391**
Bystrc: Kamechy, západní břeh přehrady	**652 952**	**154 000**
Kníničky	39 793	
Komín	462 213	
Medlánky: Velká Bosně, Malá Bosně, kolem letiště	**293 677**	**56 042**
Královo Pole	435 149	
Řečkovice	90 710	
Ivanovice	158 051	
Total areas	**6 056 233**	**618 065**

For the selected surveyed areas, it was found that there are 28 recreational facilities with registered permanent residence on the area of 618 065 m^2 (Tab. 1). Based on a generalisation of this data, it can be assumed that there are at least 274 officially permanently inhabited recreational buildings in all the garden settlements of Brno. The areas did not include garden settlements which still exist, but were already in the buildable areas in the 1994 Master Plan, e.g., garden settlement on Žlutý Kopec.
The City Budget states: "We have allocated 27.6 million for the maintenance of green areas for 2022. CZK" (source: Press release: Municipal district Brno-central). Based on this input, the potential savings in public finances are calculated.

Results

A survey of the impact of the existence of functional garden settlements on the city budget is quantified in Tab. 2. This is a potential saving, where the costs approved for the maintenance of the green space in Brno-Central for 2022 are put into proportion with the area of green space maintained by this urban district. As the maintenance requirements for green areas in the centres are generally higher, this amount has been proportionally reduced to 1/3 for green areas outside the centre. The reduced amount was multiplied by the approximate area of the garden settlements and the potential savings of over 62 million CZK were calculated. Approximately this amount would have to be spent if the town had maintained the allotments itself as green areas.

Tab. 2: Potential savings of the City of Brno due to recreational activities of gardeners

Brno-city	Area [m^2]	Cost [Kč]
Greenery in Brno - centre	859 306	26 700 000
Cost per 1 m^2/year 2022 in the centre of Brno		31,07
Theoretical cost per 1 m^2/year outside the centre of Brno		10,36
Approximate area of garden settlements	6 056 233	
Potential savings		62 725 588

For research on the gradual transformation of garden settlements, spatial planning documentation is a suitable basis. The approval of the draft of the new master plan was preceded by debates over the various options – some areas of the garden settlements were newly allocated for predominantly residential development (Klika et al. 2020). The most significant change was in the Kohoutovice/Jundrov area, however, as can be seen in Fig. 2, the plan has been reconsidered. In 2022, the Final Draft of the Master Plan was published.

Fig. 2: Draft Local Plan for Kohoutovice/Jundrov from 2020 and Final Draft Local Plan from 2022 (gis.Brno.cz)

In the introduction, the benefits of greenery on the city's climate were mentioned. It is clear from Fig. 3 that wooded areas and the Svratka River reach significantly lower temperatures than paved and built-up areas, e.g. the Pisárky depot (bottom right corner).

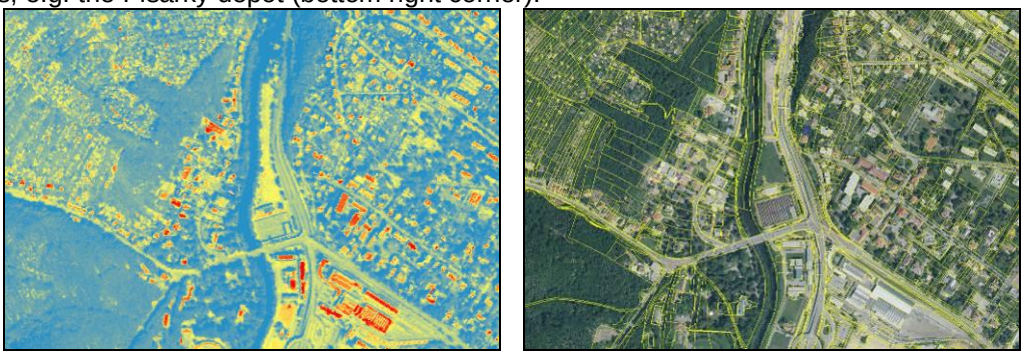

Fig. 3: cutout from the temperature map - Jundrov/Kohoutovice (gis.Brno.cz)

Discussion

Given the poor accessibility of individual plots in the garden settlements, their lower standard of accommodation and their remoteness from other residential buildings, it is possible to find a parallel between the former shanty towns that were established in the 1920s in the city of Brno. These were slum buildings in the basic formula of "kitchen + room", which were built mainly from bricks recovered from demolition sites. The buildings were characterised by a great variety of materials. This heterogeneity of materials can be noticed when walking through the garden settlements. Another parallel is the economic situation of the inhabitants of the emergency colonies and garden settlements. Whereas historically it was an economic crisis that led to companies cutting jobs or reducing hours, today it is an economic crisis caused by high inflation and soaring energy prices. The number of people below the poverty line then and now has increased exponentially.
The clear advantage of allotments is the improvement of the microclimate, but all the above-mentioned positives are conditional on land users respecting the rules and the landscape. Otherwise, uncontrolled development can occur, and the lack of reseeding (absence of sewerage) leads to a change in soil composition.

Conclusion
Garden settlements have long been a part of Czech cities and the new Brno city plan shows that this will be no different in the future. Thanks to orthophoto images in the KN, a higher number of buildings that are not registered is visible, surprisingly even on land owned by the Statutory City of Brno. The benefits of functional garden settlements from the point of view of the municipal budget are the low economic cost of maintenance of green areas that improve the urban climate and, from the point of view of biodiversity, the existence of wild areas that are absent in urban parks. An unpleasant reality is that, despite the existence of scientific studies, the recommendations of experts are very slow to be put into practice.

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Souhrn
Zahrádkářské osady mají význam sociální, psychologický, enviromentální i ekonomický. Jedná se o plochy pro individuální rekreaci, které poskytují svým uživatelům možnost aktivního odpočinku a částečné potravinové soběstačnosti.
Zelená infrastruktura je důležitá i z hlediska biologického, a to zejména s ohledem na biodiverzitu.
Výzkum postupné transformace individuálních rekreačních zón v residenční je doložen daty z veřejně dostupných zdrojů a na jejich základě hledá paralely ve výstavbě nouzových koloniích 20. let 20. století a zamýšlí se nad dopady jejich zániku. Při průzkumu několika zahrádkářských osad bylo zjištěno, že jejich součástí jsou stavby neevidované v KN a dohledatelné jen na ortofoto snímcích,

stavba neevidovaná v KN ale s vyčleněnou stavební parcelou a stavby evidované v KN s evidenčním číslem.Detailnější výzkum proběhl v lokalitách Velká a Malá Bosně, Výšiny, Travní, Rakovec.
Pro vybraná zkoumaná území bylo zjištěno, že na ploše 618 065 m^2 se vyskytuje 28 rekreačních objektů s evidovaným trvalým bydlištěm. Na základě zobecnění tohoto údaje lze předpokládat, že ve všech zahrádkářských osadách města Brna se nachází minimálně 274 oficiálně trvale obydlených rekreačních objektů. Pro posouzení vývoje zahrádkářských osad je vhodným podkladem územně plánovací dokumentace, která se také transformuje.
Ekonomické hledisko výzkumu ukázalo potenciální úsporu v rozpočtu města Brna na údržbu zeleně. Na základě údaje o schválených nákladech na údržbu zeleně v Brně - střed pro rok 2022 byla vyčíslena potenciální úspora cca 62 mil. Kč. Mezi zahrádkářskými osadami a nouzovými koloniemi z 20. let 20. století lze nalézt paralelu. Stavby v nouzových koloniích se vyznačovaly velkou materiálovou různorodostí obdobně jako chatky zahrádkářských osad. Další paralelou je ekonomická situace obyvatel nouzových kolonií a zahrádkářských osad. V historii i dnes ekonomická krize způsobila skokový nárůst lidí ocitajících se pod hranicí chudoby.

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UNDERGROUND SPACES IN BOSONOŽSKÝ HÁJEK NATURE RESERVE AND THEIR GEOEDUCATION IMPORTANCE

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Abstract
Bosonožský hájek Natural Reserve (Brno, South Moravia) is a very important site from the Earth Science point of view, however, its geodiversity values have been rather overlooked and omitted in the past (the object of legal protection is the occurrence of well-preserved forest ecosystems and endangered species). In the last decades, a series of field work and geophysical measurements has been carried out and the Earth Science phenomena have been identified and described here. These are represented by a dense network of gullies that developed in Pleistocene loess and that are both of natural and anthropogenic origin (some gullies probably developed along the old paths) and specific underground spaces (so called dugouts). Until now, the dugouts in South Moravia have been investigated mainly by archaeologists and those in Bosonožský hájek NR have not been described in detail yet. This brief contribution brings new information about three underground landforms and their possible relationship to the age and development of the gullies. The possibility of different interpretations of the origin of these specific landforms can be considered an opportunity in the field of Earth Science (geosciences) education and as an interesting complement of tourist and recreational activities on site.

Key words: gully network, loess, dugouts, Earth Science education

Introduction
Bosonožský hájek Natural Reserve (NR) is an area situated in the western part of Brno City (South Moravian Region, Czech Republic). From the nature conservation point of view, it is a very valuable area: the subject of the legal protection (NR declared in 1985) are forest ecosystems (ancient forests) including the thermophilic plant species. Thanks to its lithological and morphological diversity, the area is also significant from the Earth Sciences point of view. Specific features are represented by both natural and anthropogenic landforms: especially gullies (both of natural origin and related to or induced by anthropogenic activity) and underground spaces (dugouts) that have been dug in the Quaternary loess. The research on the origin and distribution of these landforms has been carried in the last years and the possible interpretations provide an interesting contribution to the knowledge of the relationships between geodiversity, biodiversity, culture and economic activities in the area.

Material and methods
Geomorphologically, Bosonožský hájek NR belongs to the Bobravská vrchovina Highlands (Figure 1). It is practically a flat ridge of 360 – 370 m.a.s.l. that inclines towards East and South-east. The ridge is built of Proterozoic granodiorites (cca 590 Ma) of the Brno Massive and the slopes are covered with Quaternary loess (up to 9 m of thickness).
In the loess and loess loams, a dense network (or system) of gullies originated being a subject of multidisciplinary research in the last decades (Münster 2005, Buček 2008, Kyclová 2010, Kirchner et al. 2011). These gullies have been researched by using numerous methods: field work, geomorphological mapping, drilling, non-destructive geophysical methods, geoarchaeological surveys, GIS methods, analysis of historical maps and LiDAR (Kirchner et al. 2018). In the south-eastern part of the study area, the system of underground spaces (dugouts) is situated. For the analysis of their distribution, the geomorphological mapping and 3D laser scanning was used (ground laser scanning using the Leica C10/BLK360 device in combination with the Leica GS08 GNSS receiver for linking to the S-JTSK/Bpv coordinate system). Based on this, a picture of the distribution and structure of the dugouts was acquired.

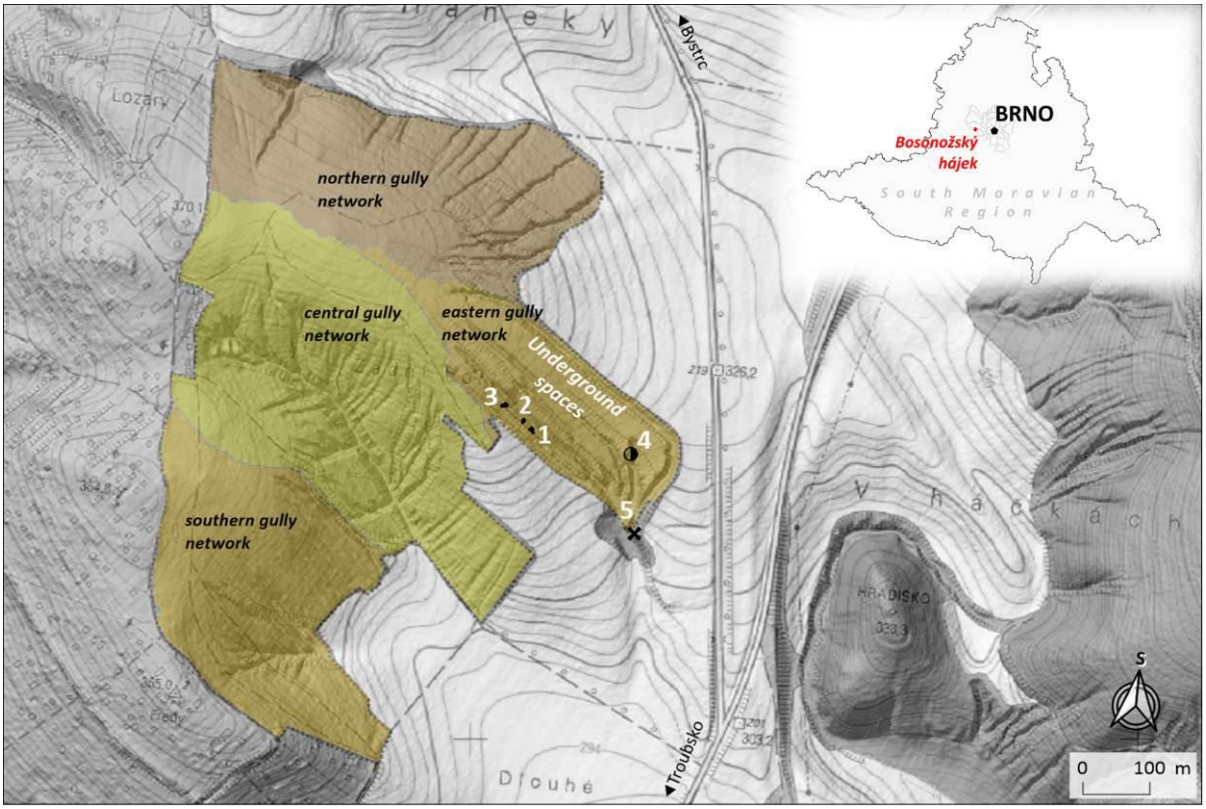

Fig. 1: Situation map of Bosonožský hájek NR showing particular gully networks. The dugouts are marked with a number (1, 2, 3 – accessible dugouts, 4 – mostly buried dugout, 5 – naturally or intentionally collapsed dugout)

Results and Discussion

Confirmed by previous research (Münster 2005, Kirchner et al. 2011), there are four gully systems situated in southern, central, eastern and northern segments of the study area (Figure 1). The sum of the lengths of particular gullies is 18 354 m with a density of 39.25 km.km^{-2} which represents an area with the highest gully density in the South Moravian Region.

Based on existing knowledge, there is a real assumption that the foundations of the gully network in the most of the area (especially central segment) already existed before the loess sedimentation, most probably the new generation of gullies have been inserted into the old valley network (Kirchner et al. 2018). The present forest ecosystems show the typical characteristics of long-term continuous development of the ancient forests (Buček 2009), so this fact can be seen as a supporting argument for a higher age of the gullies.

On the contrary, the gully system in the eastern segment has different morphology and genesis. The longest gully has 613 m with a superelevation of 62 m and deepening max. 5 m. The gullies in this segment run parallel, they have different deepening which is related to the loess thickness and age of the gully. The genesis of these gullies is linked to and influenced by the past anthropogenic activities, especially presence of hollow ways in the Middle Ages (e.g. hollow ways near the extinct village of Kominec) creating the so called “bundles of hollow ways”). Another agent related to the gully formation (or the intensification of their formation) is represented by agricultural activity and forest management.

In the loess ridges that divide particular gullies in the eastern segment, the underground spaces (dugouts) have been discovered. The first appearance in the scientific literature (photos of the entrances to the underground spaces) occur in Münster (2005). Later, Buček (2008) describes the entrances in two parallel gullies. Kynclová (2010) presents four entrances on her topographic map. Our research has been focused on the specification and clarification of the position of the known underground spaces and discovering other dugouts. Also, the elaboration of the schemes and analysis of the relationships of the dugouts to the surrounding landforms has been done. Currently, three accessible underground spaces are identified, the fourth one is mostly buried and the fifth one is naturally or intentionally collapsed (Figure 1). The area of accessible underground spaces is in the order of tens of square meters (Dugout 1: 12.3 m^2; Dugout 2: 8.8 m^2; Dugout 3: 17.1 m^2). The height of entrance corridors reaches of around 0.6 m, main spaces are up to 1.9 m high (Figure 2). The

traces of the tools on the inner walls confirms the sophisticated way of digging and shaping the spatial disposition, but every dugout is quite specific. While Dugout 1 is formed by two rounded cavities, Dugout 2 and 3 are rather square. Dugout 2 has remained unfinished according to the horizontal excavations on the back wall, which would probably serve as ventilation or a second entrance. In Dugout 3, horizontal boreholes are incorporated perpendicular to the direction of the entrance corridors, and with regard to current knowledge, they thus lead into the unknown. For now, it is not excluded that they can connect to other, yet undiscovered spaces.

Fig. 2: Dugout 1 - northeastern entrance (on the left) and its inner spaces (in the middle); Dugout 3 - inner spaces with a stove niche (right)

Generally, the dugouts in Southern Moravia have been already researched by archaeologists and anthropologists (Unger 1987, Kos 2005) who define them as cavities dug in the loess serving usually for storing the foodstuffs or as a shelter in the times of war. Based on the current knowledge, the underground spaces in our study area may be with certainty classified as “dugouts” and according to the typology provided by Kos (2005), they belong to the Type I (underground cavity with direct corridor with small niches and ventilation channels). The majority of the dugouts in South Moravia were built in the Middle Ages, but there are also dugouts dating back to the 19th and 20th centuries – these underground cavities mostly served as a shelter and from a functional point of view, they are completely similar to medieval dugouts. Most often, they were created during the Second World War in relation to threats to the inhabitants of municipalities. Similar shelters were created, for example, in loess around Kníničky village (Hluboček valley, Koňská zmola gully) at the end of World War II (Anonymous 1996). Probably, this is the case of the dugouts in Bosonožský hájek NR as well, Buček (2009) also assumes that the dugouts were created in one of the turbulent periods of the 20th century. Nevertheless, in future, specific (urban) legends about the origin of these underground cavities may occur or can be artificially created (Kirchner and Kubalíková 2015).

Conclusion

The presence of the gullies both of natural origin and anthropogenically induced (or more generally, the presence of one type of landform, but with multiple or different origin) makes the Bosonožský hájek NR unique. In a certain sense, we can consider the anthropogenically induced gullies as a part of so called secondary geodiversity (Kubalíková et al. 2017, 2019). Within the concept of the secondary geodiversity, the artificial underground spaces (dugouts) may be also included. Thus, based on the knowledge of differences of the gully networks in the central and eastern segments and thanks to the existence of specific underground spaces, the Bosonožský hájek NR can be considered an interesting site where the environmentally educative activities (including the excursions for students of high schools and universities) may be developed. In the future, the research will continue with the aim of supplementing knowledge about the age of the gullies and, in particular, gaining knowledge about new underground spaces in loess. The use of different methodological geoscientific approaches will allow to obtain relevant data that will be applied in the formulation of hypotheses about the origin and significance of underground spaces. The possibility of different interpretations of the origin of these specific landforms can be also considered an opportunity in the field of Earth Science (geosciences) education and as an interesting complement of tourist and recreational activities on site. Moreover, thanks to the presence of specific forest ecosystems (ancient forests) and past human activity, the area is a good example of the site where geodiversity, biodiversity and culture (or history) meets. This fact may be also seen as a solid foundation for integral promotion of the natural and cultural heritage of the area.

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Souhrn
Přírodní rezervace Bosonožský hájek na západním okraji Brna představuje modelový příklad vztahů biodiverzity (zastoupené lesními porosty a teplomilnými druhy rostlin), geodiverzity (geologicky podmíněný rozsáhlý systém strží s vícefázovým vývojem) a antropogenních aktivit (výmladkový les, svazky úvozů, podzemní prostory). Minimum informací o stáří nebo účelu zdejších podzemních prostor, tzv. lochů, kterým jsme nově věnovali pozornost, pak umožňuje realizaci výzkumných záměrů (morfografickou a morfometrickou dokumentaci) stejně jako geoedukační aktivity s poukázáním na různé interpretace konkrétních procesů a jevů v krajině. Ty pak mohou být, společně s integrovaným přístupem k propagaci přírodního a kulturního dědictví, jedním ze základů geoturistických a rekreačních aktivit v zájmovém území.

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URBAN AGRICULTURE – ECOSYSTEM AND CULTURAL FUNCTIONS OF ORCHARD VEGETATION

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Abstract
The phenomenon of urban agriculture has lately become a much discussed issue. The idea of food production in cities seems to be in a striking contrast with the character of urban life, however, orchards are very suitable for urban agriculture by their nature. Apart from ensuring production functions (fruit production), they provide a whole range of ecosystem and cultural functions. Orchards are not a typical agricultural monoculture. Vegetation for non-production use is grown under the fruit trees. The orchard vegetation plays a role in anti-erosion function, which is mainly performed by perennial grasses (*Lolium perenne, Poa pratensis* etc.), it is a food source for pollinating insects (*Medicago lupulina*, *Onobrychis viciifolia* and *Vicia sativa*), and a habitat for medicinal herbs (*Plantago lanceolata, Rosa canina, Urtica dioica*). The occurence of diverse plant species affects the functioning of the ecosystem positively and can also be used for touristic purposes.

Key words: tourism, plant biodiversity, urban orchards, medicinal herbs

Introduction

The phenomenon of urban agriculture has been a much-discussed issue in recent years. The idea of food production in cities seems to be in a striking contrast with the character of urban life. However, food production in cities is just as old as cities themselves. The only circumstance that differs is the motivation. In the past, the main need was to ensure enough food at affordable prices, nowadays, there are extra drivers such as the social effect (community gardens), the support of regional food and local food security. Apart from that urban agriculture completes the urban landscape and is reflected in the structure of cities. In built-up areas, urban agriculture can be found both in the city center and in the suburban area, e.g. in gardens near houses, in backyards, in gardening colonies, on the remains of agricultural land in new developments, and recently also on the roofs or facades of buildings (green roofs and facades). The location of agriculture within the city can be economically advantageous and attractive due to the proximity of consumers and the existence of an organized market. Growing vegetables, herbs, and especially fruits is very popular in the world (Armanda et al. 2019, Horst et al. 2017, Langemeyer et al. 2021, Loker, Francis, 2020, Pimbert, 2019, Bhattarai, Conway, 2021, Ortiz et al. al. 2021, Grochulska-Salak et al. 2021, Nowysz et al. 2022.

Material and methods

The studied orchard is located in the cadastral territory of Bohunice district (Brno-city, South Moravian region). The orchard is managed in an organic farming regime and is run by the Ovocnářské družstvo company with the trade mark Sady Líškovec. The orchard can be divided into three parts based on the age of the planted fruit trees. In all three parts of the orchard, the middle row is mowed twice a year and herbicides are not used.

Young orchard – planting of fruit trees took place in 2018. The area is 3.64 ha. Stone fruits, namely plums and apricots, were planted there. The middle row was sown with a species-rich mixture of crops.

Production orchard – fruit trees were planted in 2010. The area is 5.83 ha. Apple trees of the Gala variety were planted there. The middle row was sown with a grass mixture.

Overgrown orchard – fruit trees were planted in 1980. The area is 0.61 ha. Apple trees of the Rubín variety were planted there. The middle row was left to self-greening.

The method of phytosociological sampling was used to evaluate the vegetation. A vegetation survey was carried out in all three parts of the orchard the same day (in July 2021). The coverage of identified plant species in the sampling plots was estimated. The plant species were divided into groups according to their biological properties.

Results

A total of 50 plant species was identified in the young orchard consisting of 21 native species, 21 archaeophytes (plants introduced to the present territory by expansion before the beginning of the modern age, i.e. until the end of the 15th century) and 8 neophytes (species introduced to Europe after the discovery of America). Dominant species were *Lolium perenne, Convolvulus arvensis, Amaranthus retroflexus, Papaver rhoeas, Conyza canadensis* a *Onobrychis viciifolia.* Following plant species can be included among the commonly occurring: *Hordeum murinum, Polygonum aviculare, Geranium pusillum, Taraxacum sect. Taraxacum, Bromus hordeaceus, Bromus sterilis, Poa pratensis, Festuca pratensis, Dactylis glomerata, Chenopodium album, Medicago lupulina, Erigeron annus, Lactuca serriola, Plantago major, Myosotis arvensis, Trifolium repens, Lathyrus tuberosus, Trifolium pratense, Arenaria serpyllifolia, Linaria vulgaris* a *Lepidium draba.* 21 taxa with rare occurrence were recorded.

A total of 41 plant species were recorded in the production orchard comprising of 20 native plant species, 16 archaeophytes and 5 neophytes. The dominant species were *Lolium perenne, Hordeum murinum* a *Erigeron annus.*

17 commonly occurring plant species were recorded which are the following ones: *Polygonum aviculare, Convolvulus arvensis, Bromus hordeaceus, Bromus sterilis, Poa pratensis, Festuca pratensis, Papaver rhoeas, Medicago lupulina, Elymus repens, Plantago major, Myosotis arvensis, Trifolium repens, Calamagrostis epigejos, Plantago lanceolata, Arenaria serpyllifolia, Cirsium arvense* a *Securigera varia.* 21 taxa with rare occurrence were identified.

49 plant species were identified in the overgrown orchard. These were composed of 24 native plant species, 20 archaeophytes and 5 neophytes. Species with dominant occurrence were: *Lolium perenne, Hordeum murinum, Arrhenatherum elatius* a *Conyza canadensis*. Commonly occurring plant species were: *Polygonum aviculare, Bromus sterilis, Poa pratensis, Festuca pratensis, Dactylis glomerata, Achillea millefolium, Vicia sativa, Lotus corniculatus, Amaranthus retroflexus, Chenopodium album, Plantago major, Myosotis arvensis, Trifolium repens, Calamagrostis epigejos, Papaver rhoeas, Medicago lupulina, Erigeron annus* a *Plantago lanceolata.* 24 taxa with rare occurrence were registered.

Discussion

Orchards are very suitable for urban agriculture by their nature. In addition to ensuring production functions (fruit production), they provide a whole range of ecosystem and cultural functions. Orchards are not a typical agricultural monoculture, and vegetation for non-production use is grown under the fruit trees. The non-production vegetation of the fruit orchard mainly ensures the anti-erosion function, but it is also a source of food and a shelter for a number of animals. The plant species composition of the orchard vegetation is decisive for providing the ecosystem functions (Vignozzi et al. 2019; Pfiffner et al. 2019; Denan et al. 2020; Sofo et al. 2020).

Higher species vegetation diversity creates a prerequisite for a successful provision of these functions. It is essential to perceive the vegetation of fruit orchards as a part of the orchard and we need to realize that the orchard as a whole has its own functions such as ecosystem services, but also cultural services (Fagerholm et al. 2016, Winkler et al. 2023). Fruit trees have aesthetic and cultural values, carrying a legacy from our ancestors who bred varieties and planted fruit trees (Baumgärtner and Bieri 2006).

Orchard products can be consumed directly or can be further processed (ciders, jams). These products find their utilization in local tourism. Urban orchards can serve for education in the field of fruit growing and urban agriculture, but also in the area of the protection of the nature, directly in practical conditions.

Conclusion

Plant biodiversity affects a number of ecosystem functions which are important also for the urban environment. Urban orchards can be viewed as an association of plants where apart from planted fruit trees other types of plants grow too.

Orchards with a diverse vegetation composition can represent an attractive touristic place. The environment of urban orchards can be used both for touristic so for educational purposes. Urban

orchards represent an interesting area where urban agriculture, biodiversity conservation and tourism meet.

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Souhrn

Fenomén městského zemědělství je v posledních letech velmi diskutovanou otázkou. Myšlenka produkce potravin ve městech se zdá být v nápadném kontrastu s charakterem městského života. Ovocné sady jsou svým charakterem velmi vhodné pro městské zemědělství. Vedle zajišťování

produkčních funkcí (produkce ovoce) poskytují celou řadu funkcí ekosystémových a kulturních. Ovocné sady nejsou typickou zemědělskou monokulturou a pod ovocnými stromy je pěstována vegetace pro neprodukční využití. Vegetace ovocného sadu zajišťuje řadu ekosystémových funkcí, jako jsou protierozní funkce, kterou zajišťují především vytrvalé trávy (*Lolium perenne, Poa pratensis* aj.), zdroj potravy pro opylující hmyz (*Medicago lupulina, Onobrychis viciifolia* a *Vicia sativa*) a mohou být také léčivými rostlinami (*Plantago lanceolata, Rosa canina, Urtica dioica*). Výskyt mnoha druhů rostlin působí příznivě na fungování ekosystému a může být využíván i pro turistické využití.

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VALORIZATION OF AN OLD SHEEP TRAIL AS A NEW OPPORTUNITY FOR SUSTAINABLE PUBLIC RECREATION: A CASE STUDY IN SOUTHERN ITALY

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Abstract
Within the valorization process of rural landscape for public recreation, an increasing interest is currently registered on ancient sheep-tracks. Indeed, these paths constitute the historical infrastructure of the transhumance system, that covered all over Europe thousands of kilometers, forming the routes of shepherds, merchants, warriors and pilgrims. In Italy, these tracks - known as "*tratturi*" - are landscape-bound, while the practice of transhumance has recently been included in the intangible UNESCO World Heritage. In addition to their cultural and scenic value, today some old sheep-tracks are being rediscovered as new rural hiking trails. However, they present some technical drawbacks, that make them barely usable by tourists for walking in the nature. Taking as a case study an old sheep-track connecting the two cities of Matera and Montescaglioso (Basilicata Region - Southern Italy), a GIS approach was applied, to evaluate the possibilities to use this path as an hiking trail, highlighting the difficulties to be solved for its valorization. The final results showed how, thanks to a GIS tool, it is possible to compare different types of data, from historical to modern ones, so relating the route with all elements of tourist interest, evaluating its potential for excursion purposes as well.

Key words: Landscape protection, sheep-tracks, rural hiking, nature walk, GIS tools

Introduction

Rural tourism is an activity currently growing in different parts of the world, thanks to its ability to greatly combine naturalistic, cultural and food&wine opportunities. In this context, many old agricultural facilities have been successfully converted into new accommodations, restaurants or educational farms (Ayazlar & Ayazlar, 2015). Tourism activities related to these rural facilities are currently expanding, encouraging the arrival of more and more tourists, hence enhancing the value of rural land. One of the elements of the rural landscape that could be furtherly valorized, is the network of old sheep-tracks, once used for grazing flocks. Indeed, these trails can be exploited for cultural and nature hiking activities since, in addition to often crossing rural areas, they are perfect places to immerse tourists in the surrounding nature and landscape. However, to make the best use of existing sheep-tracks and make them accessible to tourists, it is necessary to implement appropriate planning and management tools (Belliggiano et al., 2021). In recent years, GIS (Geographic Information Systems) technology is becoming increasingly important for rural tourism planning. In particular, the mapping of old sheep-tracks is attracting the attention of tourism operators in many parts of the world. The possibility of using GIS tools to plan and manage rural tourism development along these ancient roads, offers great potential for rural communities (Mastronardi et al., 2021). The use of GIS tools can help manage rural tourism along sheep-tracks in a sustainable way, helping to assess the environmental and social impact of tourism activities along the trails. This, can help tourism operators to manage the flow of visitors, while minimizing the negative impact on nature and the local community (Cillis & Statuto, 2018). In this paper, the case study of an old sheep-track connecting the two cities of Matera and Montescaglioso (Basilicata Region - Southern Italy) is presented. The network of sheep-tracks is extensive in this area. It could serve also as a connection for the valorization of historic rural buildings (Statuto & Picuno, 2017) and hiking activities, aimed at the discovery of the surrounding rural landscape. A GIS database has been so created, usable by actors involved in tourism enhancement, to relate all components characterizing the rural territory.

Material and methods

The Basilicata region is characterized by a vast rural land with great historical and cultural importance. The territory has a varied morphology, including mountains, hills, plateaus and valleys, offering a great variety of natural landscapes. One of its distinguishing features are the "*tratturi*" a network of ancient roads used for animal grazing and trade, stretching for miles across the region's countryside and mountains (fig. 1). These routes are becoming a popular destination for lovers of hiking and outdoor adventure, because of their unique naturalistic and cultural features. Tourism has become an

important economic sector for Basilicata, with a growing interest in hiking and discovering the historical and cultural heritage associated with the sheep-tracks as well.

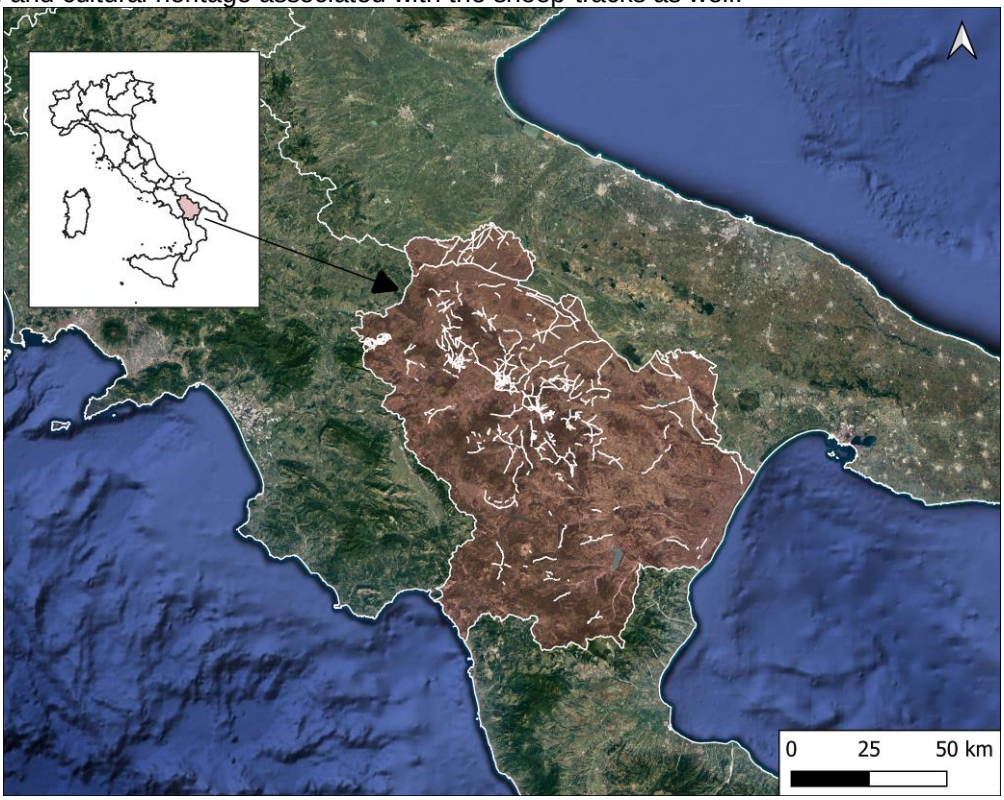

Fig. 1: Location of study area in Italy and Basilicata Region and location (in white) of old sheep tracks ("tratturi").

The first part of the analysis has been based on the survey of the network of sheep-tracks in the Basilicata region (fig. 2), achieved by using different cartographic sources, such as the open-source online geo-database "*OpenStreetMap*", joined with historical topographic maps (Cillis et al., 2021). The sheep-tracks were not treated as a linear datum, but as a polygonal one, so a polygon database was created to take into account the actual sheep-track location. The Basilicata Region made these data open to be accessed, so they can be used – both for scientific and planning purposes – providing that the source is cited.

The delimitation of the sheep-track sites of cultural interest (Italian legislation - art. 10 and 13 of Legislative Decree 42/2004) is the result of the digitization of the elements delimiting the perimeter of the constrained areas deduced from the cadastral planting maps, the tracts subject to protection (on the basis of the List of Municipal Tracts), and the original maps on a cartographic basis of the Italian Military Geographic Institute (IGMI). Digitalization was done, using the geometries of the vector cadastral sheets as a support.

The second part of the analysis, involved the implementation of the entire database of rural, cultural and landscape heritage, thus achieving an effective picture of the areas that can also be enhanced from a hiking point of view (by taking advantage of existing sheep-tracks), and for which few interventions are needed to improve their usability. The databases have been standardized in terms of format, topology and coordinate system, with data organized into macro-categories for optimal results. A field research has been also conducted, to collect any necessary missing data. Unique identification numbers (ID) have been assigned to each element in the database for an easy consultation, management, and updating. Hence, the geo-database was used to assess ancient sheep-tracks, and the most interesting ones were selected and modified, to align with the previously created database and current land use. Finally, cultural sites along these paths have been also connected, except for routes crossing fragile natural areas.

Fig. 2: Example of a sheep-track (called “Tratturo della marina”) used for transhumance from inland mountains to areas near the sea.

Results and Discussion

The use of a GIS has revealed an indispensable tool, both for the purpose of reconnaissance of the ancient sheep-tracks, as well as for the assessment of their linear and areal extension. It has even enabled the creation of a prototype geodatabase, that could serve as a tool to support decisions about possible tourism and recreational activities. Figure 3 shows how the GIS approach serves these purposes, allowing different types of data from different databases to be put together. In fact, it has been possible to collect not only data on sheep tracks, but also the location of monuments, archaeological sites, historic rural buildings, nature zones and existing trails (Cillis et al., 2020) in the study area.

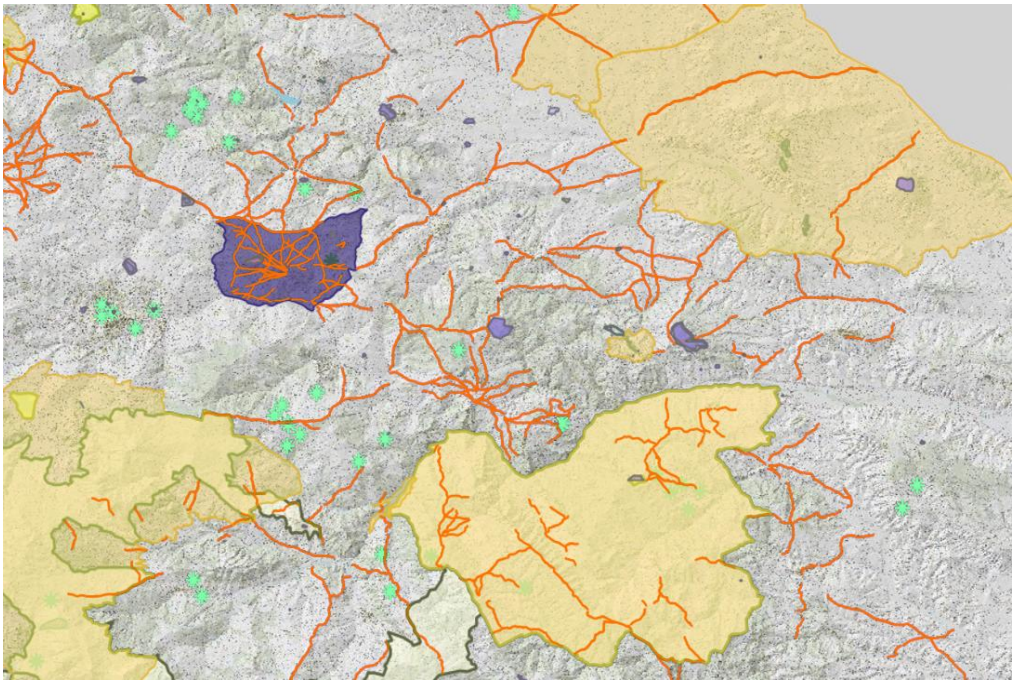

Fig. 3: Screenshot of the geodatabase with sheep-tracks and rural/cultural heritage

The new GIS tools ensure that even people without high technical skills can carry out geographic analyses in a simple and immediate way. In addition, there are more and more freely available online data on rural, cultural, and natural heritage, that can be managed and analyzed in a way that provides specific support to different stakeholders or planners (Meini et al., 2018).

Finally, as a preliminary analysis on the sheep-tracks that could be potentially used for tourism purposes, a survey has been carried out, based on the concentration of tourist attractions and

proximity to a specific sheep-track already showing a well-defined boundary, without needing any arrangement work. The sheep-track identified is the "*Regio Tratturo Matera - Montescaglioso*" which is about 27 km long and runs along the "*Gravina*" stream, joining the towns of the two municipalities of Matera and Montescaglioso. The GIS approach (fig. 4) made it possible to identify all tourist attractions and accommodations in the vicinity of the sheep-track, so as to provide additional exploitable information for more detailed and appropriate planning analyses.

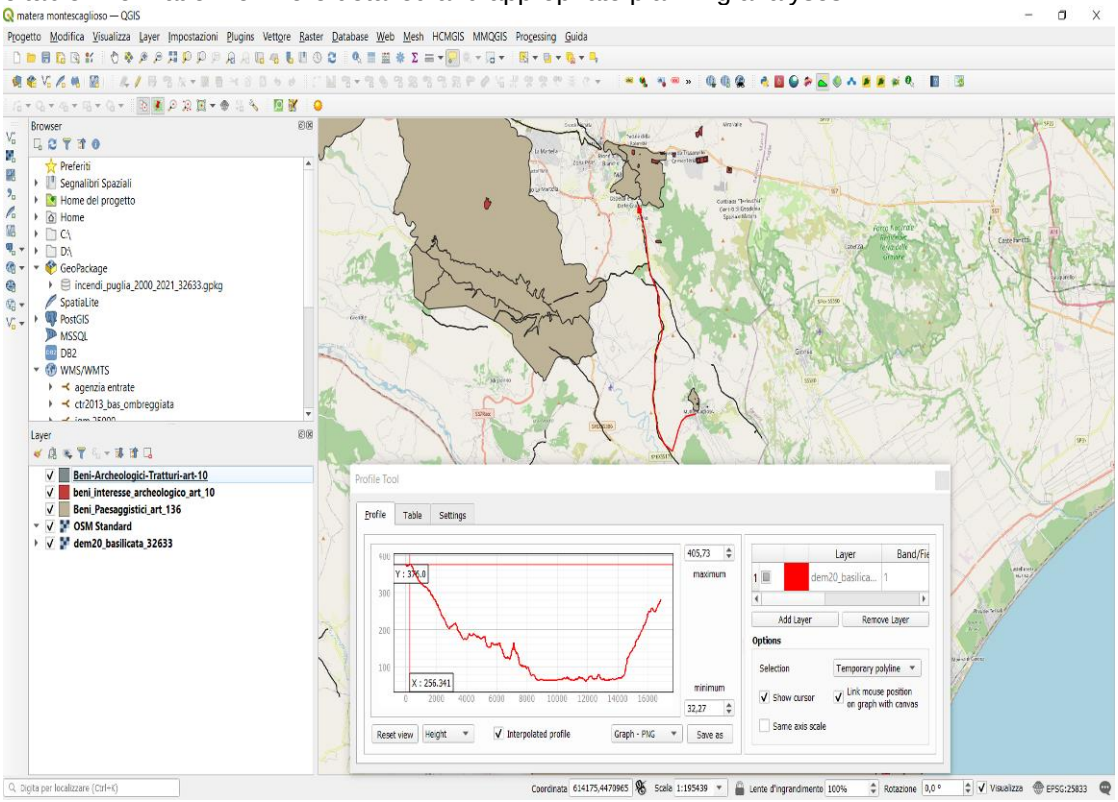

Fig. 4: Example of the application of the GIS approach to the Matera - Montescaglioso sheep track.

Conclusion

In conclusion, the use of GIS for the enhancement of sheep-tracks for tourism purposes represents a great opportunity for the promotion of the area's cultural and environmental heritage. Thanks to this technology, it is possible to create personalized tourist routes, integrating information about local traditions, history, local flora and fauna. This, promotes the creation of a more complete and engaging travel experience for tourists, who can learn and appreciate in a deeper way the peculiarities of the visited area. In addition, the use of GIS makes it possible to preserve the memory of the sheep-tracks, creating a shared cultural heritage and enhancing local history and culture. It is therefore important to encourage the use of GIS for the enhancement of the sheep-tracks, so that public recreation becomes a tool for sustainable development of the area, ensuring a better future for local communities and next generations.

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Souhrn
Venkovská turistika je celosvětově rozvíjející se aktivitou, která spojuje přírodovědné, kulturní a gastronomické možnosti. Stará zemědělská zařízení se přeměňují na nové ubytovací zařízení, restaurace nebo vzdělávací farmy a rozšiřuje se řada turistických aktivit spojených s těmito venkovskými zařízeními. Pro zvýšení valorizace venkovské krajiny lze staré ovčí stezky využít pro kulturní a přírodní turistické aktivity. Pro plánování venkovského cestovního ruchu, konkrétně pro mapování starých ovčích stezek, je stále důležitější technologie GIS. V regionu Basilicata byla vytvořena databáze GIS, která propojuje všechny složky venkovského území využitelné pro posílení cestovního ruchu. Síť starých cest sloužících k pastvě zvířat a obchodu - v Itálii tradičně známých jako "tratturi" - se stala oblíbenou pro pěší turistiku a poznávání historického a kulturního dědictví regionu. Pro průzkum ovčích stezek byla vytvořena polygonová databáze a vymezení míst kulturního zájmu bylo digitalizováno s využitím vektorových katastrálních listů jako opory. Nástroje GIS mohou pomoci řídit venkovskou turistiku podél ovčích stezek udržitelným způsobem a posoudit environmentální a sociální dopady turistických aktivit podél těchto stezek.

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WHERE NATURE MEETS ADVENTURE: TOURIST ACTIVITIES AT DOBROGEI GORGE NATURE RESERVE, ROMANIA

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Abstract
Nature offers the other more landscapes, many of them with the possibility of being used for tourist, recreational purposes. The present study aims to analyze the impact that the Dobrogean geographical area is, where the unique unique deera rhines. The method of analysis is an empirical one, of the questionnaire, which was applied to both the residents and the tourists who visited the Dobrogea Gorges. The results highlight the advantages offered by these geological formations in the satisfaction of consuming tourists of such tourism (adventure, landscape and recreational). The presence of tourists adds income for the locals, who seem to be satisfied with the obtained (local products obtained in the household). The limits of the study are given by the lack of information for a longer duration and official data on the quantities of products sold during a month or year.

Key words: natural landscape, local economy, tourism, calcare

Introduction

The relief of the Central Dobrogea Plateau has a smooth aspect, without great differences in altitude. This aspect is the result of external shaping factors. The central segment of the Casimcei Plateau or Central Dobrogea, reaches higher values in the northern (central) segment. The altitudes decrease slightly in the NW-SE direction. Geological formations are visible as a result of erosion processes created by the valleys. The density of relief fragmentation is low in the wide interfluvial spaces, reaching 0.20 km/km^2. In the Casimcea basin area, the fragmentation density is higher, reaching 2.5-3.5 km/km^2. This higher fragmentation can be explained by the presence of post-cretaceous epiprogenic movements that led to the deepening of the valleys (Popescu & Ielenicz, 2003). The Casimcea Plateau presents a varied aspect. Heights gradually decrease towards the south, reaching 150 m. The Casimcea valley creates a distinct gorge relief as it passes through the Jurassic limestone area, hence the common name "Dobrogei Gorges".
This geographical area of Dobrogea is a great tourist attraction, offering those interested in tourism a special landscape. The exploitation of all the existing resources in this area can only be achieved through a tailored publicity and a consistent involvement (Zeleňáková et al., 2017). The natural formations have been a permanent resource for tourism. Existing rural localities in their vicinity, by default, should be involved in the tourism offer (Teodorescu, 2009; Pintilii et al., 2017; Dincă et al., 2015). The non-involvement or involvement in the tourist exploitation of the resources of a given geographical area is determined both by the mentality of the population and by the local administration and management capacity (Teodorescu et al., 2019).

Material and methods

The methods used were empirical questionnaires,78 questionnaires for locals and 143 for tourists. The complex multi-perspective approach of local development through touristic exploitation of existing natural resources led us to adopt a mixed method using qualitative techniques through semi-structured interviews. These were oriented, in the case of the locals, towards the main products that are being exploited and, in the case of tourists, towards what attracts them particularly to this geographical area. Due to the significant time resources required to perform the fieldwork in order to obtain results, as well as the extensive interview-based surveys conducted in July 2022, led us to select only one touristic attraction - the Dobrogea Gorges, as a representative territorial sample for Dobrogea.
This case study strategy is considered particularly useful in the social sciences when collecting and analysing empirical evidence on a topic and focusing on descriptive and explanatory aspects for the investigated phenomenon, as in our research.

Results

" Dobrogei Gorges" is a protected area. This karst relief, more than two million years old, represents a geographical area whose touristic attraction is unique for Romania (fig. 1). The Dobrogea Gorge offers an impressive landscape due to its geomorphological, palaeontological, botanical and faunal features.

The rural area of Dobrogea can also represent an attraction for tourists, but this has not been a priority. In recent years, there has been an attempt to adapt the concerns of the inhabitants towards tourism, by offering services and goods for those who transit the area or for those who wish to visit this karst region, the Dobrogea Gorges.

Any human activity has as a primary result the improvement of the life quality. Part of economic well-being is received income. Most of the locals are low-income earners and farmers (who are oriented towards raising animals and growing plants on fairly sparse areas). They manage to produce enough in order to sell their products to the tourists who visit these places.

The relationship between nature and human is admirable. Nature offers through the created landscape all that could be called tourism in this part of Dobrogea.

The income earned by the residents encouraged them to improve their offer more. The traditional activites is breeding sheep and goats and production of cheese. The most important incomes mentioned by the locals are those related to the provision of meal services, but also the incomes obtained from the selling of some produc as organic preserves made in their own farms (fig. 2).

This seems to be the most important source of additional income for the rural population in the vicinity of the Dobrogea Gorges. Cheese is a product that attracts income for the population. Its characteristics are provided by the quality of the milk produced by the animals raised locally (sheep and goats).

What attracts tourists is this unique karst relief, the caves and the local natural landscape. From discussions with tourists who have visited this geographical area, most seem to be attracted by the landscape and the possibility to practice sports.

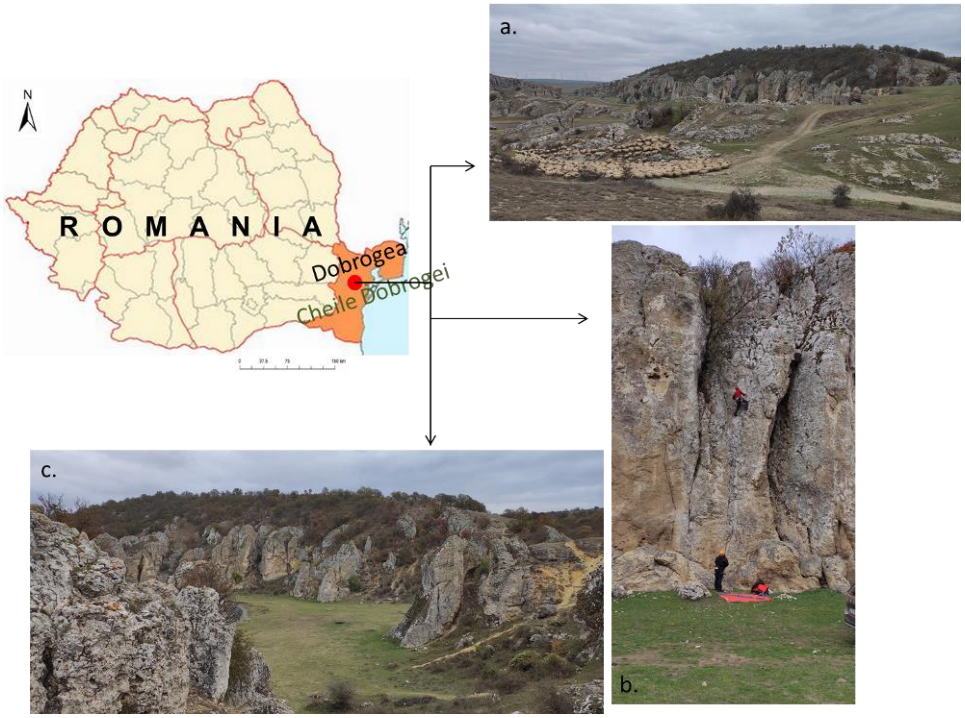

Fig. 1: Localizarea arealului Cheile Dobrogeisi principalele activitati si atractii

Climbing is a good option considering the low altitude, but also very accessible for those who want to try this sport (fig. 3). Local products are also an attraction for the visitors.

Discussion

Dobrogea, this eastern geographical region of Romania, located between the Danube and the Black Sea, has been and still is a touristic attraction for its historical vestiges, the Danube Delta and the coastal area. The Dobrogei Gorges Reserve has not been a particular touristic attraction. In recent years, investments have been made in infrastructure, thus facilitating access to this attraction. This

aspect increasing the possibility to develop an important economic field: tourism. The combination of the historical offer and the natural setting can create the most powerful and sustainable form of tourism. Both categories interviewed (locals and tourists) are interested in the development of tourism.

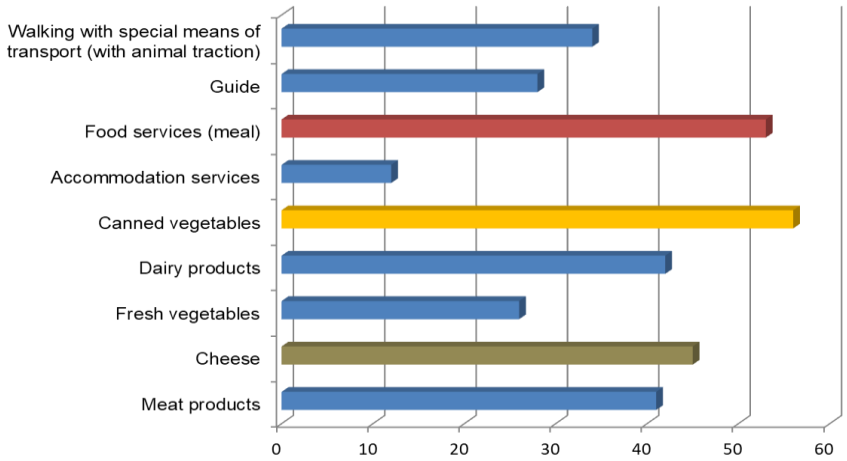

Fig. 2: The importance of the amounts obtained by locals for services and products offered to tourists (78 people)

Fig. 3: The main reasons why tourists visit the Dobrogei Gorges (143 people). Many offered multiple attractions.

Answers of residents and tourists following the interviews:

"We live thanks to tourists! I used to work in a canning factory in Tulcea. Now, I am retired and my monthly income is very low. I produce canned food and cheese that I sell to tourists. It's a reason to want more and more tourists to come. I would raise more animals, produce more and earn more!"

(Yusuf, 68 years old, resident of Casian village, retired)

"We're glad people can see how beautiful it is here! Young people, children and old people can come. They can all enjoy what nature has created for us and them! "

(Mihaela, 32 years old, Gura Dobrogei village, teacher)

"This is our first time in Dobrogei Gorges. It is beautiful! We are glad we came and we will definitely return"

(Cristian, 26 years old, Bucharest,plumer)

"We come to the Dobrogea Gorge for the climbing and to enjoy the scenery. We are delighted that the road has recently been paved and new improvements that have been made. The local people are wonderful, and also the nature that they knew how to protect. They know how to keep us coming back!"

(Laura, 48 years old, Slobozia, nurse)

Conclusion

Tourism is one of the main activities in Dobrogea Plateau that is based on natural resources. The natural landscape of Dobrogea Gorges is unique in Romania. Despite this uniqueness, the economic benefits brought to the local population are not consistent.The support from the local community is almost non-existent. The effects of demographic ageing and decrease in industrial economic sector are noticeable here, both in services and local agriculture. Services are an economic alternative for the North-Dubrogean area, but the lack of human resources capable of carrying out this activity means that this natural landscape is not developed and exploited at an appropriate standard.

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Souhrn

Příroda a obyvatelé určité zeměpisné oblasti mohou vytvořit předpoklady pro turistickou oblast. V případě naší studie jsme si jako případovou studii vybrali soutěsky Dobrudže. Jedná se o přírodní rezervaci, kde vápence staré více než dva miliony let mohou nabídnout nejkrásnější a nejatraktivnější důvod pro rozvoj služeb a cestovního ruchu. V této zeměpisné oblasti je zaznamenána situace, kdy dochází k demografickému procesu stárnutí obyvatelstva. V důsledku nedostatku pracovních míst je zde cítit i nedostatek příjmů. V tomto případě přichází příroda s životaschopnou alternativou: udržitelným cestovním ruchem. V tomto případě tak můžeme jasně hovořit o přírodě a její turistické nabídce.

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WHERE THE SQUARE MEETS THE STREAM: RE-DESIGNING THE RURAL SQUARE IN VEĽKÝ KÝR, SLOVAKIA

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Abstract
The Saint John of Nepomuk Square is the main central open space in the historical core of the rural municipality Veľký Kýr (Western Slovakia, Nitra Region, Danube Lowland). The square has a direct spatial relation to Malá Nitra, a side stream of the river Nitra. The main historical and architectural landmark is the Roman-Catholic Church of the Exaltation of the Holy Cross. The square is framed by two cultural centres, the municipal office, a supermarket, and other buildings. An important element is the statute of Saint John of Nepomuk, on the main compositional axis of the square. The design challenge was to develop design ideas and solutions how to unify the square visually and spatially and make it greener, and more pedestrian friendly. Master students of landscape architecture elaborated four different design solutions with diverse ideas and proposals for enhancing this important open space and making it more sustainable, functioning, and attractive for residents and visitors. The designs were presented to local inhabitants, members of the municipal council and the mayor. The design process initiated discussions on the local level and the square renewal process. The main outcomes of the analytical and creative thinking process are presented in this paper.

Key words: Countryside, Green Infrastructure, Landscape Architecture, Open Space, Waterfront

Introduction

Green infrastructure (GI) is a cross-scale planning and design strategy that is being applied both in urban and rural spatial contexts (Tóth, 2022a), and is strongly integrated in contemporary landscape architectural approaches and practices (Fornal-Pienak and Bihuňová, 2022). GI is also referred to as part of the Fourth Nature concept (Čibik, Back Prochnov et al., 2020), which thanks to its multifunctionality (Halajová et al., 2016) can offer a wide range of ecosystem services (Schneider et al., 2020), such as mitigation of negative impacts of climate change (Rózová et al, 2020), recreational services (Tóth et al., 2014; Šinka et al., 2019) and an overall enhancement of the quality of living environment and well-being (Bihuňová et al., 2021). Furthermore, application of GI can boost a sustainable redevelopment of unused and/or abandoned urban landscapes (Back Prochnow and Čibik, 2022). When designing GI, it is important to reflect mutual relationships between people, spaces, and contemporary technologies (Čakovská et al., 2019).

GI as a strategy has a significant relevance to planning and designing rural landscapes, with a strong focus on transformation of central zones and historical centres (Čibik, Kuciaková, Štěpánková, 2020). It plays an important role in discovering potentials and local identities of rural spaces (Štěpánková and Bihuňová, 2012) linked to specific places, such as main squares and churchyards (Tóth, 2022b), waterfronts (Bihuňová et al. 2017; Čibik et al. 2019), as well as open landscapes with unique cultural (Tóth et al., 2021) and environmental features (Tóth et al., 2018). One of the important design attributes of rural landscapes is represented by woody plants that have a substantial spatial role in forming public open spaces (Bechera et al., 2022).

Planning and designing rural landscapes, their green and open spaces belong to the core competences of landscape architects. This competence is being acquired through several subjects, including design studios. Teaching landscape architecture in the form of design studios simulates a professional studio experience, where students can learn from existing problems, challenges, and assignments in the landscape, while getting into a mutual interaction with real stakeholders, such as municipality representatives and residents (Tóth, 2019). This form of teaching has a long-term tradition in landscape architecture education worldwide (Tóth et al., 2022). This paper presents the main outcomes of the analytical and creative thinking process of a design studio with the task to re-design the main square in the rural municipality of Veľký Kýr, near Nitra (Slovakia). The design challenge was to develop design ideas and solutions how to unify the square visually and spatially and make it greener, and more pedestrian friendly. Master students of landscape architecture elaborated four different design solutions with diverse ideas and proposals for enhancing this important open space and making it more sustainable, functioning, and attractive for residents and visitors.

Material and methods

The municipality of Veľký Kýr is situated in Nitra Region, in the Danube Lowland (SW Slovakia). The design assignment was to re-design the main square, which is an extended streetscape at the church, framed by important public amenities, in a direct spatial connection with the river. The main problems of the square include visual inconsistency, oversized impermeable hard surfaces, unorganised parking, unregulated transport and a lack of green spaces, pedestrian and cyclist corridors, and meeting places, see figure 1.

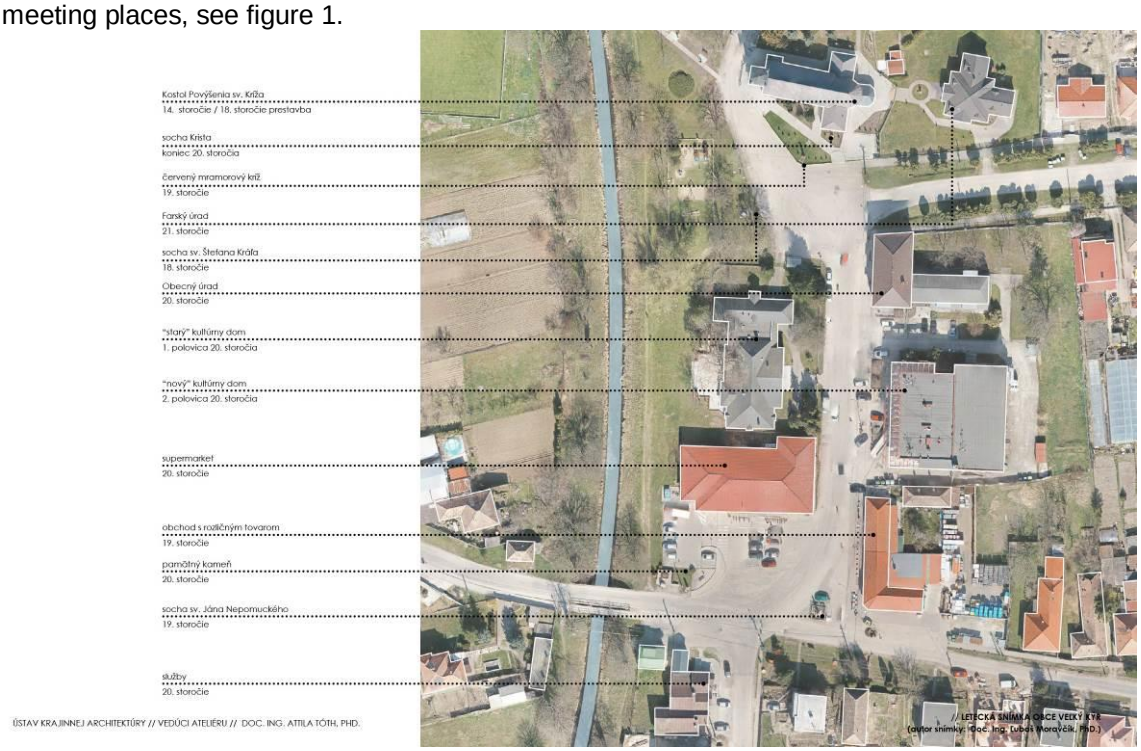

Fig. 1: Aerial view of the main square in Veľký Kýr (by Ľ. Moravčík, 2021).

Students worked individually in two main creative phases (analysis and design). They evaluated the historical development and current situation of the square, including its urban fabric, transport structure, architecture, functions and facilities, spatial composition, and visual features. The outcomes are four different design solutions for redesigning and improving the square, see figures 2, 3 and 4.

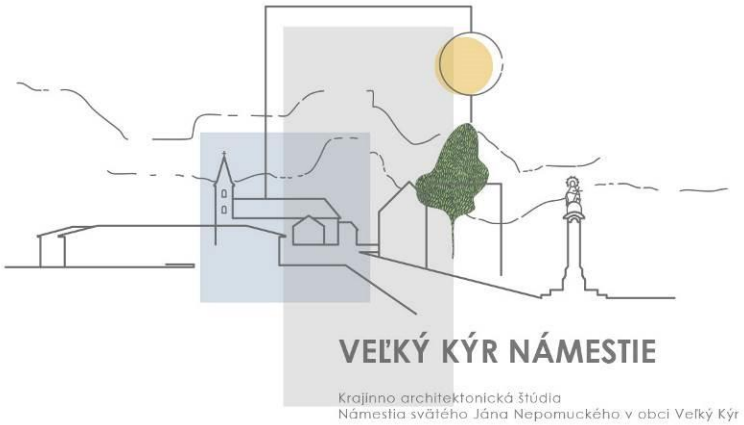

Fig. 2: The cover page of the design booklet designed by Anna Kulperová is an abstract stylisation of the main landmarks of the village centre.

Results

The four design solutions provided the municipality with a valuable input for starting the discussions on the revitalisation of the square at the local level. All design approaches addressed the main challenges and generated ideas on how to organise the transport and parking, how to bring more green spaces and permeable surfaces on the square and how to make the square generally more sustainable and attractive both for residents and visitors, see figures 3 and 4.

Fig. 3: Design No. 1 by Iveta Kojdová (left) and design No. 2 by Silvia Smoláriková (right).

Fig. 4: Design No. 3 by Anna Kulperová (left) and design No. 4 by Andrea Varga (right)

Discussion

All four authors integrated principles and elements of green infrastructure into their design solutions as suggested by Tóth (2022a) and Čibik and others (2020). Design studio as a method of project-based and research-led teaching has proved to be an effective way to address current challenges of open spaces through design and design teaching (Tóth, 2019; Čakovská et al., 2019), like a previous similar assignment in another rural municipality in the region (Tóth, 2022b).

Conclusion

Solutions generated within the design studio include a set of analyses and design ideas for the main central open space of the municipality Veľký Kýr. The outcomes of the design studio are currently being used as a basis and starting point for a long-term process of a comprehensive renewal and greening of the square by the municipal authority and local government.

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Souhrn
Článek prezentuje výstupy ateliérové výuky na Ústavu krajinné architektury FZKI SPU v Nitře, která dlouhodobě funguje jako efektivní nástroj pro iniciování a podporu udržitelného rozvoje venkovských sídel, jejich krajinných a sídelních prostor, včetně ploch veřejné a vyhrazené zeleně. Předmětem řešení byla obnova Náměstí svatého Jana Nepomuckého v obci Veľký Kýr na Slovensku. Výsledkem tvůrčího procesu jsou tematické analýzy a čtyři variantní ideová řešení obnovy náměstí. Výsledky jsou příkladem propojení vzdělávacího procesu s potřebami a požadavky venkovských sídel.

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WHICH INFLUENCE HAS DEFORESTATION ON TOURISTIC RECREATIONAL AREAS IN SUCEAVA COUNTY?

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Abstract
Deforestation is the problem that affects forest ecosystems and indirectly influences the other components of the geographical system. Degradation of forests is a continuous process that destroys more and more the biodiversity of the Carpathian environment in Romania, but also a series of recreational services. Overexploitation of wood resources, climate changes, and the construction of new roads are important causes of deforestation. In this article, I wanted to analyse the connection between deforested areas and tourist recreational areas in Suceava county. The results of the research reveal the fact that with the increase of deforested areas in the Carpathian Mountains, there is also instability in the touristic recreational areas.

Key words: environment, sustainability, recreational activities

Introduction

Our planet is going through a period of multiple changes, some of them major, so that the properties of the environment are affected by each disruption of ecosystem normality (Sîrbu and Benedek, 2012). Deforestation is an increasingly common problem internationally.
Degradation of the forest ecosystem is found from the equatorial forests to the temperate forests of Europe or Siberia (Allan et al. 2017; Bradshaw et al. 2007). The mission of international bodies is to encourage efforts to protect the environment (Bothe et al., 2010), how to improve the quality of life through recreational activities (Khalid et al., 2018).
The international legislative framework provides urgent measures for the development of non-polluting mechanisms, reforestation projects or the large-scale use of renewable resources. (Wang et al., 2021)
Forests constitute a significant resource for the inhabitants of areas with rich forest resources because they offer the existence of some possibilities of capitalization through a series of economic activities of exploitation or processing of wood mass.
In this article, we would like to highlight the influence of deforestation on certain tourist areas in Suceava County during the period 2001-2016.

Material and methods

The analysis of deforested areas in Suceava County was realised based on the Landsat-7 Enhanced Thematic Mapper Plus (Landsat-7 ETM+) images from Global Forest Change (GFC) from the University of Maryland (Hansen et al. 2013). Also, based on the literature review, we could make the link with the significance of deforestation on recreational activities, especially for the mountain areas.

Results

At the level of Suceava County, a very high degree of forest coverage can be noted in the western part of the county and small and very small areas are found in the eastern part of the county, in the latter the areas occupied by agricultural land are generally predominant (figure 1).
The situation of deforestation for the period 2001-2016 (figure 2) highlights the presence of five distinct intervals, noting very high rates of deforestation in the communes in the western part (Carpathian area) and lower rates in the eastern part of the county. The communes with very large deforested areas (>1,500 ha) are the ones that have such resources and are located in the mountainous area, characterized by a variety of forests, from deciduous forests to conifers and mixed forests.
The evolution of deforested areas for the period 2001-2016 (figure 3) can be noted three distinctive years, with high values of deforested areas: 2002 (4,837 ha), 2007 (9,616 ha) and 2012 (5,484 ha), an aspect also noted by the presence a significant number of extreme values, for the same years. This shows the fact that, within the years marked by the presence of several extreme values, there are as many localities as possible, which face significant deforestation. The total area of forest cut at county level, for the entire period, is 46,733 ha, with significant fluctuations from one year to the next. In general, the deforested areas showed significant annual fluctuations, the years with values below 1,500 ha are 2003 (765.8 ha) and 2004 (1,032.5 ha).

The stability of the tourist areas is affected by the changes brought to the environment and in particular, the forest environment. The Carpathian environment in Suceava county offers multiple recreational services: winter sports tourism, hiking, mountain trails, outdoor activities.

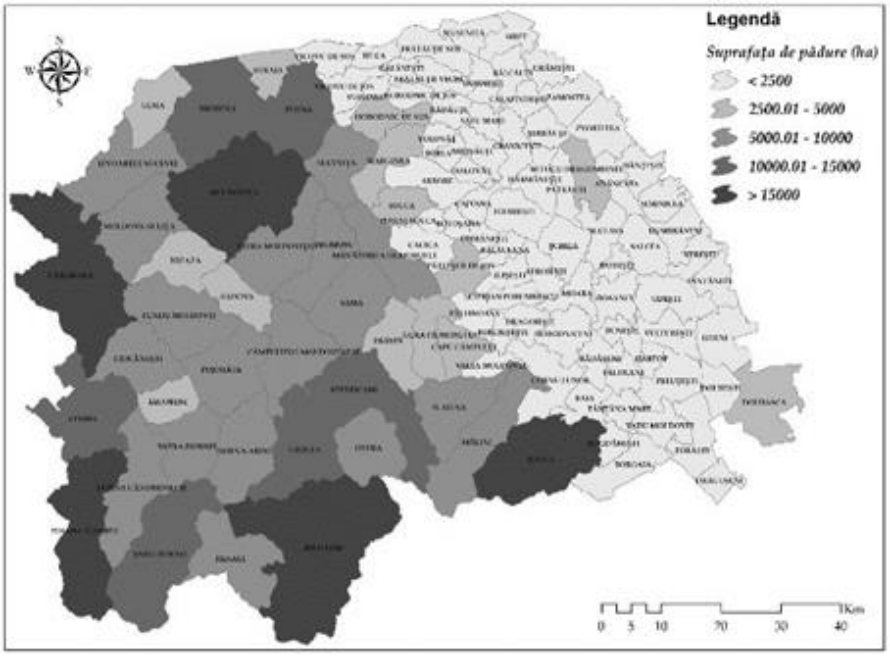

Fig. 1: The area occupied by forest in the period 2001-2016 in Suceava county, marked by shades from dark gray, mainly in a few communes in the western part of the county to light gray, in the eastern part of the county
Data source: Adapted from Hansen et al., 2013

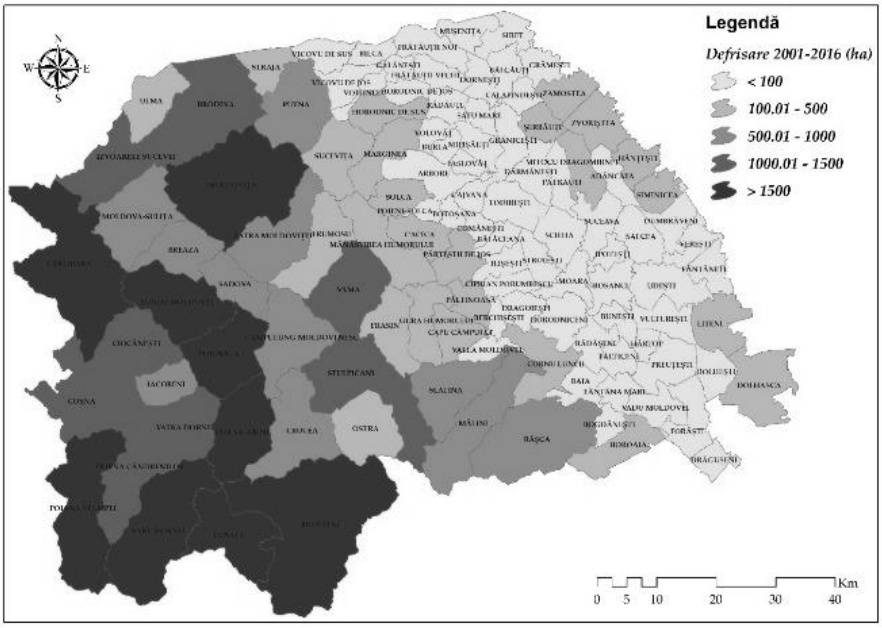

Fig. 2: The situation of deforestation in the period 2001-2016 in Suceava county
Data source: Adapted from Hansen et al., 2013

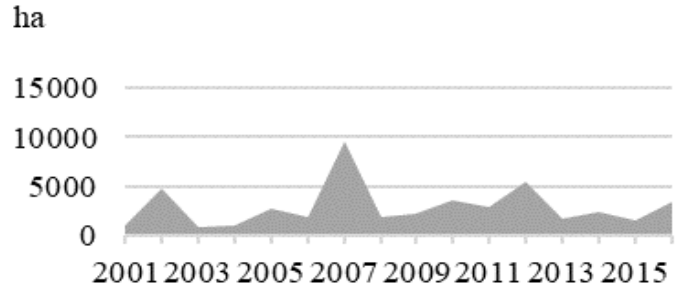

Fig. 3: The evolution of deforested areas in the period 2001-2016
Data source: Adapted from Hansen et al., 2013

Discussion

The increase in deforested areas implies changes in the structure of the geographical environment through changes in the landscape and the transformation into heavily anthropized natural environments. Keeping the mountain environment safe, good environmental education clearly demonstrates the importance of forests in the existence of quality tourist services. At the level of Suceava county, the high rates of deforestation in the Carpathian communes determine the degradation of access to quality tourist services: the destruction of the transport infrastructure because of the transport of wood, the impact of landslides and floods, the intense processes of soil erosion, the acceleration of processes of surface erosion.

Conclusion

Forest exploitation determines the instability of the geographical environment, and its influence is felt at the socio-economic level. Recreational services are dependent on a geographic environment and deforestation is an important natural element of stability. The reduction of forest areas will in the long run lead to deep structural changes and affect their sustainable development.

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Souhrn

Lesy představují významný zdroj pro obyvatele oblastí s bohatými lesními zdroji, protože nabízejí určité možnosti kapitalizace prostřednictvím řady ekonomických aktivit těžby nebo zpracování dřevní hmoty. Důležitými příčinami odlesňování jsou nadměrné využívání zdrojů dřeva, klimatické změny a výstavba nových silnic. Na úrovni okresu Suceava podmiňuje vysoká míra odlesnění v karpatských obcích zhoršení dostupnosti kvalitních služeb cestovního ruchu: zničení dopravní infrastruktury z

důvodu přepravy dřeva, dopady sesuvů půdy a povodní, intenzivní procesy eroze půdy, zrychlení procesů povrchové eroze.

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WILL THE REMOVAL OF THE RECREATIONAL SYMBOL OF JESENIKY MOUNTAIN SUMMIT PARTS, THE DWARF PINE FORESTS, AFFECT THE ECOSYSTEM FUNCTIONS OF THE HILLS?

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Abstract
The study evaluates how the removal of the dwarf pine from the forest stands of the summit parts of the Jeseníky Mountains will affect the performance of their ecosystem functions. The primary interest of the study is the assessment of the effect of the removal of the dwarf pine on the runoff conditions of the investigated locations, however, their recreational function is also considered. It is obvious that the dwarf pine has historically become one of the symbols of the local landscape in the summit parts of the Jeseníky Mountains. The results achieved by the author's team indicate that the removal of the dwarf pine will not significantly affect the functions of the forests in the monitored area compared to their current functionality. However, the social perception of this intervention will probably be very significant, both in the professional sphere (foresters) and in the sphere of the public (recreationists). It turns out that currently, the social significance of interventions implemented in socially exposed localities is as serious as its ecological and technical significance.

Key words: Dwarf pine reduction, surface runoff, Jeseníky Mountains

Introduction

The influence of tree vegetation on runoff from forested catchments has been confirmed by the results of many studies (Bosch and Hewlett 1982; Hrachowitz et al. 2013, Eisenbies et al. 2007, Bíba et al. 2010, Deutscher et al. 2016; Švihla et al. 2016, Černohous et al. 2017, Kupec et al. 2018, Kupec et al. 2019). Generally, reducing the forest cover causes an increment in the runoff, and oppositely causes the runoff reduction whereas the runoff quantity response to changes in forest cover is difficult to be predicted (Ganatsios et al. 2010).
The main objectives of the study, the results of which are presented in this article, were as follows:

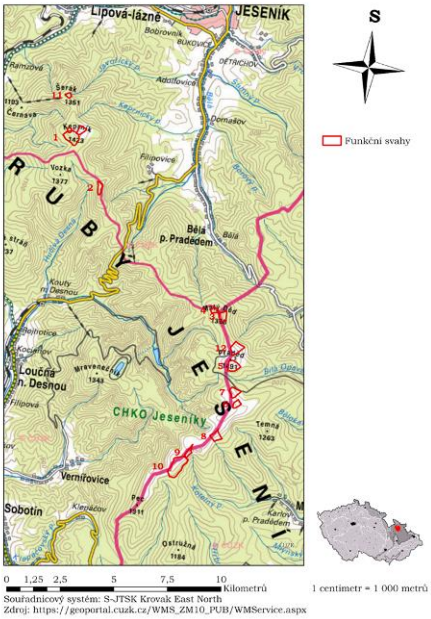
- Whether there will be changes in the parameters of the runoff process, or surface runoff from part of the top parts of the Jeseníky Mountains after mining in dwarf pine stands under normal hydrological (climatic) conditions?
- If there are any changes, what their extent will be?

Material and methods

The locality of the study has been the summit parts of the Jeseníky in general, or specific top hills identified by the study contractor (Jeseníky Protected Landscape Area Authority) respectively (see figure 1). These “Intervention localities” (24 localities) were reworked to “Functional slopes” (13 FS) in accordance with the used method of the study conducting (figure 1).
Methodologically, the method of runoff coefficients (rational method) has been used to determine potential changes in the runoff conditions of localities after the implementation of the intervention. Specific coefficients were taken from the Czech Standard ČSN 75 9010 and adjusted reflecting on the outputs of field verification and specific conditions of mountain slopes inclination (see tables 1 and 2).
For the final quantification of the influence of planned interventions (recalculations of the proportion of runoff from the annual precipitation values), the real precipitation data had to be used. Table 3 presents the annual precipitation data from the closest climatological stations (Dlouhé stráně and Šerák).

Results

Table 4 shows the overall results of the runoff changes on specific functional slopes. The results interpretation is given in next chapter.



Šerák	FS 11	IL 0
Keprník	FS 0,1	IL 1, 2,19
Červená hora	FS 2	IL 20, 21
Malý děd	FS 3, 4	IL 3, 4
Praděd	FS 5, 12	IL 5, 6, 7, 8, 9
Petrovy kameny	FS 7	IL 10, 11, 12
pod Vysokou holí	FS 6	IL 13, 14, 15
Kamzičník	FS 8	IL 22, 23
Velký máj	FS 9	IL 16
Jelení hřbet	FS 10	IL 16, 17, 18

Fig. 1: Location of the study sites

Tab. 1: Transfer of the categories of ČSN 75 9010 to the real vegetation types in the locality

Vegetation types in the locality	**Categories of ČSN 75 9010**
Trees – full canopy	Forests
Trees canopy > 60 %	Forests
Trees canopy 40-60 %	*Forests with canopy 40-60*
Trees canopy <40 %	*Forests with a canopy of less than 40*
Dwarf pine – full canopy	Forests
Dwarf pine > 60 %	Forests
Norway spruce – full canopy	Forests
Norway spruce 40-60 %	*Forests with canopy 40-60*
Norway spruce <40 %	*Forests with a canopy of less than 40*
Meadows	Green belts, fields, meadows
Rocks/Roads/Roofs	Built-up areas

Tab. 2: Adjusted runoff coefficients

Category of slope inclination (%)	**Built-up areas**	**Green belts, fields, meadows**	**Forests with a canopy of less than 40**	**Forests with canopy 40-60**	**Forests**
1	0.9	0.05	0.04	0.03	0
5	0.9	0.1	0.09	0.08	0.05
10	0.9	0.15	0.14	0.13	0.1
15	0.9	0.2	0.19	0.18	0.15
20	0.9	0.25	0.24	0.23	0.2
25	0.9	0.3	0.29	0.28	0.25
30	0.9	0.35	0.34	0.33	0.3
35	0.9	0.4	0.39	0.38	0.35
40	0.9	0.45	0.44	0.43	0.4

Tab. 3: Annual precipitation data from the closest climatological stations (Dlouhé stráně and Šerák) 2004 - 2021

Year	Dlouhé stráně (mm)	Šerák (mm)	Year	Dlouhé Stráně (mm)	Šerák (mm)
2004	1178.6	1018.2	2014	1025.6	1114.3
2005	1189.5	1120.9	2015	937.2	842.8
2006	1296.0	1139.9	2016	1070.6	1222.3
2007	1327.2	1270.3	2017	1140.3	1302.1
2008	1179.6	1148.8	2018	889.7	1145.8
2009	1299.3	1235.7	2019	1140.8	1230.8
2010	1600.1	1563.2	2020	1497.8	1449.8
2011	1041.7	954.7	2021	1165.0	1138.4
2012	1108.9	975.4	**Average**	**1178.9**	**1168.1**
2013	1132.8	1151.9	**Average last 10 years**	**1110.9**	**1157.4**

Tab. 4: Overall results of the runoff changes on specific functional slopes

Functional slope	Locality		Rational method						
	Area (ha)	Ø Inclin. (%)	Ø Runoff coef. before interv.	ø Runoff coef. after interv.	Runoff coef. increment øΨ (%)	Average runoff 18 years (mm)	Average runoff 10 years (mm)	Runoff increment 18 years (mm)	Runoff increment 10 years (mm)
0 – Keprník sever	10.02	13	0.2217	0.2346	5.5	259	272	15.05	14.91
1 – Keprník jih	32.15	14	0.2110	0.2161	2.4	246	250	6.01	5.95
2 – Panna Maria	9.77	16	0.3654	0.3834	4.7	427	444	20.96	20.76
3 – Malý děd	13.87	6	0.2127	0.2276	6.6	251	253	17.62	16.60
4 – Švýcárna	7.05	3	0.1792	0.1981	9.5	211	220	22.23	20.95
5 – Praděd	21.08	21	0.2786	0.2803	0.6	328	311	1.97	1.86
6 – Vysoká hole	8.86	4	0.2412	0.2500	3.5	284	278	10.38	9.78
7 – Petrovy kameny	15.34	49	0.3958	0.4008	1.2	467	445	5.90	5.56
8 – Kamzičník	15.03	23	0.3332	0.3381	1.4	393	376	5.73	5.40
9 – Velký máj	7,51	7	0.1874	0.1996	6.1	221	222	14.37	13.54
10 – Jelení hřbet	51,36	7	0.2744	0.2797	1.9	323	311	6.28	5.91
11 – Šerák	4,32	12	0.3516	0.3549	0.9	411	411	3.94	3.90
12 – Tabulové skály	22,68	13	0.3088	0.3195	3.3	364	355	12.57	11.84

Discussion and conclusion

The interpretation of the results given above could be as follows:

The average runoff coefficient before the intervention reaches a value of 0.274 (27.4%).

- Significantly lower value - Švýcárna and Velký Máj,

- Higher runoff coefficient (exceeding 30%) Tabulové skály, Kamzičník, Šerák, Panna Maria, and Petrovy kameny (almost 40%)

The average runoff coefficient after the intervention reaches 0.283 (28%), the increase in the value of the runoff coefficient occurs on all investigated functional slopes.

- Below average - Švýcárna and Velký Máj,
- Above average - Tabulové skály, Kamzičník, Šerák, Panna Maria and Petrovy kameny

The average potential increase in the values of the runoff coefficient at all investigated sites after the interventions was 3.67%.

- The smallest potential change - Praděd, Šerák, Petrova kameny, and Kamzičník (below 2%)
- The highest change (above 5%) - Keprník sever, Velký máj, Malý děd, and Švýcárna (9.9%)

Average runoffs for all functional slopes:

- approx. 322 mm per year from an average annual rainfall of approx. 1176 mm (for the period 2004-2021)
- approx. 319 mm per year from an average rainfall of approx. 1125 mm (for the period 2012-2021)

At these values, there will be an average increase in annual runoff from the sites:

- approx. 11.0 mm (in the case of the period 2004–2021)
- approx. 10.5 in (for the period 2012-2021)
- the lowest increase values - Praděd, Šerák, Petrovy kameny, and Kamzičník (below 6 mm)
- the highest increase values - Keprník sever, Malý děd and Švýcárna (over 15 mm)

The results of the study have shown that the changes in runoff conditions that will potentially occur on the examined functional slopes after the removal of the dwarf pine in the defined range will be very low to negligible in the context of normal hydrological conditions, considering the specifics of individual functional slopes. It can be indirectly stated that not only the hydric but also the soil protection efficiency of the functional slopes will be affected by the mentioned interventions, in the context of normal hydrological conditions, negligibly or very little.

However, the opposite situation is likely to occur in the social-recreational function of localities, where stands of dwarf pine form a long-term perceived image of the landscape character of the top parts of the Jeseníky Mountains. In this case, the main tool for education is an extensive positive campaign, with the help of which it is necessary to explain to tourists not only the fact that the dwarf pine is not native to the Jeseníky Mountains, but especially that it is harmful as competition for the native mountain meadows. In this campaign, the results of the presented study give an argument to both experts and the lay public that after the removal of the dwarf pine there will be no significant reduction in the functional efficiency of the hydric function in the top parts of the Jeseníky Mountains.

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Souhrn
Článek se zabývá hodnocením změny plnění ekosystémových funkcí lesních porostů vrcholových partií Jeseníků po potenciálním odstranění borovice kleče. Primárním zájmem studie je posouzení vlivu odstranění borovice kleče na odtokové poměry zkoumaných lokalit, uvažována je však i její implicitní rekreační funkce.
Změny v odtokových poměrech, které potenciálně nastanou na šetřených funkčních svazích po odstranění kleče v rozsahu, který definoval zadavatel studie budou v kontextu normálních hydrologických podmínek velmi nízké až zanedbatelné, s přihlédnutím ke specifikům jednotlivých funkčních svahů. Lze zprostředkovaně konstatovat, že nejen hydrická, ale i půdoochranná účinnost funkčních svahů bude zmiňovanými zásahy ovlivněna v kontextu normálních hydrologických podmínek zanedbatelně či velmi málo.
Opačná situace však pravděpodobně nastane v sociálně-rekreační funkci lokalit, kde klečové porosty tvoří turisty dlouhodobě vnímaný obraz krajinného rázu vrcholových partií Jeseníků. V tomto případě je hlavním nástrojem osvěty rozsáhlá pozitivní kampaň, pomocí které je nutné turistům vysvětlit nejen fakt, že borovice kleč není v Jeseníkách původní, ale zejména to, že je škodlivá jako konkurence původních horských luk. Výsledky prezentované studie pak dávají v této kampani argument jak odborné, tak laické veřejnosti, že po odstranění trpasličí borovice nedojde ve vrcholových partiích Jeseníků k významnému snížení funkční účinnosti hydrické funkce.

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WINDBREAKS AS AN IMPORTANT ECO-STABILISING AND SOIL-PROTECTIVE ELEMENTS IN THE LANDSCAPE OF SOUTH MORAVIA

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Abstract
South Moravia is one of the most popular and frequently visited areas for tourism and recreation. Cyclists can take advantage of the dense network of cycling paths of local, regional as well as European importance, which connect interesting localities in the area. Various landscape elements also contribute to the attractiveness of the landscape, among which vegetation linear elements have an irreplaceable function. Historically, windbreaks have been planted in the landscape of southern Moravia as protection against the adverse effects of wind. Their importance is growing, especially in view of the adverse effects of climate change. However, the health of many of the elements is often no longer satisfactory, which can cause serious problems. This is illustrated by the extreme weather event of 24 June 2021, when the area between Breclav and Hodonín was hit by a tornado, which caused enormous damage to the property and health of the inhabitants of the municipalities but also had significant destructive effects on the countryside. At the same time, a number of hiking and cycling routes pass through the area affected by the tornado.
The present paper deals with the assessment of the condition of linear vegetation elements in the affected area. A total of 10 cadastral areas that were directly affected by the tornado were analysed. The analysis of the area will be useful for further proposals for the restoration or implementation of new windbreaks to mitigate the risk of wind erosion and other climatic extremes in this area, to increase the permeability and attractiveness of the landscape, and to support the construction of a new network of field roads, bicycle paths, and walk trails.

Key words: climatic change; erosion; cycling; tourism; linear vegetation

Introduction

The impacts of climate change are not only manifested in extremes of temperature and annual precipitation, but also trigger extreme weather events, often associated with severe wind erosion, soil erosion, air pollution and property damage (Fallon and Betts 2010, (Střeštík et al. 2014).
The occurrence of wind erosion is mostly observed in dry and warm areas, intensively farmed and predominantly flat (Fryrear, D.W. et al. 2000, Doležal et al. 2017, Borrelli et al. 2014., Podhrázská et al. Such an area is also the region of southeastern Moravia, which was hit by a strong tornado in 2021. This event caused enormous damage to property, health and lives of the inhabitants of the communities in the tornado belt. The impact of this extreme event can still be seen today, not only on buildings but also in the open countryside, where permanent vegetation, especially linear vegetation, has been damaged. These features perform an irreplaceable function in the landscape, counteracting wind erosion and other weathering, improving the microclimate (Cleugh 1998) and helping to increase the recreational and tourist appeal of the area. They are landmarks along which link and access paths, used in many places as cycle routes, are routed. This is also the case in the study area, which is criss-crossed with cycle routes of local and international importance. This area has suffered greatly from the devastation caused by the tornado and it is necessary to work with experts to restore greenery not only to the intramural areas of the damaged villages but also to the open countryside. A study is currently being carried out to analyse the linear elements in the tornado belt with a view to proposing appropriate methods for their reconstruction and recommending the planting of new elements so as to gradually create an optimal network of windbreaks, which historically belong to this landscape.

Materials and methods

The area of interest is located in the districts of Breclav and Hodonín and includes 19 cadastral areas (c.a.) viz Fig. 1. The overview map of the area of interest also shows the categories of potential vulnerability of the area to wind erosion.

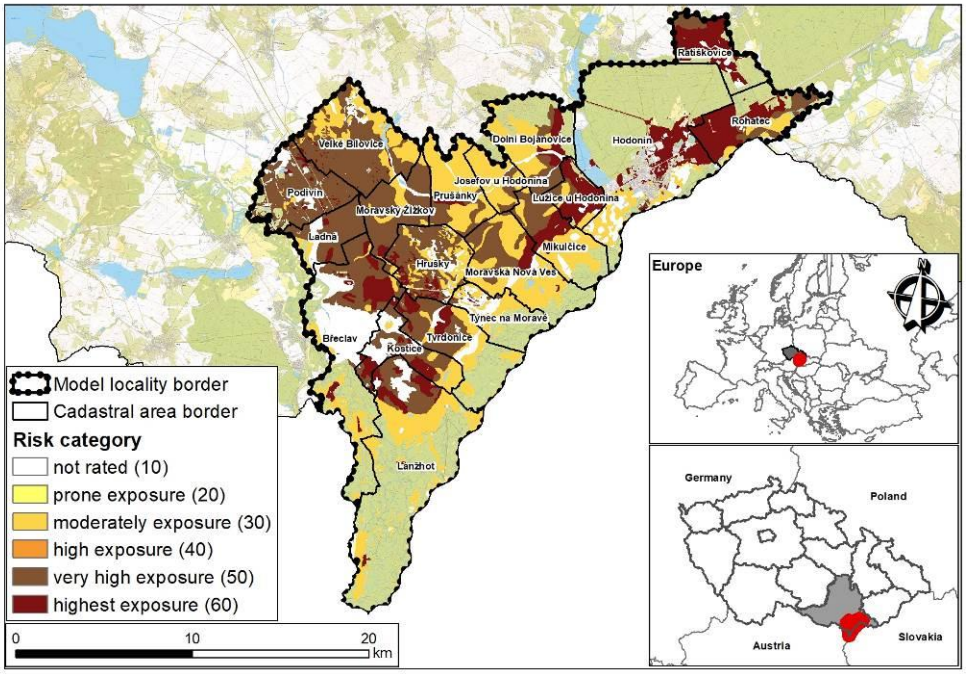

Fig. 1: Overview map of the area of interest, including categories of potential wind erosion risk

For the assessment of the risk of wind erosion in the area of interest, the valid methodological guidelines Doležal et al., 2017, Podhrázská et. al. 2021). According to the valid methodological procedures, a map of Potential Vulnerability of Agricultural Land to Wind Erosion was created, taking into account the effectiveness of protective vegetation barriers (Podhrázská et. al. 2021). The map expresses the potential vulnerability of agricultural land to wind erosion according to soil and climatic characteristics. Among soil characteristics, it takes into account the vulnerability of both light and heavy soils. In terms of climatic characteristics, the map takes into account the influence of the soil surface (subsidence), wind conditions (frequency of winds above 10 m.s-1) and unfavourable winter conditions affecting the vulnerability of heavy soils (alternating temperatures above and below freezing). The map also includes an assessment of the permissible lengths of the assessed plots (Tab. 1), in the direction of the prevailing erosive winds. Data from the Czech Hydrometeorological Institute on the prevailing wind directions were used to determine the tolerable plot length.

Tab. 1: Tolerated land lengths (threat to land by wind erosion due to existence of wind barrier)

Risk category	Tolerated length of land
1 – 4	< 850
5	< 600
6	< 350

The map also takes into account the effectiveness of permanent vegetation barriers (Tab. 2). To take into account the effectiveness of these barriers, the methodology of Podhrázská et al. (2008) defining a buffer zone for windbreaks with a fixed value of 300 m for the buffer zone on the leeward side and 100 m on the windward side was used. The buffer zone for other vegetation barriers has a value of 150 m for the buffer zone on the leeward side and 50 m on the windward side.
The assessment was carried out on the detail of agricultural land blocks (PB) from the LPIS database. The PBs are clearly separated from the surrounding terrain features. This means that between adjacent PBs there is, for example, a landscape feature, a forest, a built-up area, a road (with a tree line), a watercourse or a water body (with riparian vegetation). These are features that can have a significant effect on the occurrence and progression of wind erosion. For all PBs, a maximum length in the direction of the prevailing erosion hazard winds was determined. According to the prevailing potential hazard and Table 1, the maximum tolerated length is determined. By comparing the maximum length of a parcel to the maximum tolerated length, parcels are identified where the length limit has been exceeded and are therefore more susceptible to wind erosion. For plots with an

exceeded tolerated length, a value of 1 was added to the rating at the last position of the code (Tab. 2). Thus, in the resulting layer of overall farmland vulnerability to wind erosion, the code designation of the vulnerability category is used to identify which factors are causing the parcel to be vulnerable. For clarity, the results of the analysis have been detailed to the cadastral areas of interest.

Tab. 2: Vulnerability categories of the resulting map of the overall vulnerability of agricultural land to wind erosion

Threat category without consideration of tolerated length	Threat category with consideration of tolerated length - Not exceeded	Threat category with consideration of tolerated length - Exceeded
1	10	11
2	20	21
3	30	31
4	40	41
5	50	51
6	60	61

Results and Discussion

The wind erosion risk assessment included 19 c.a. with an area of 40 thousand ha. The assessment was carried out on 19 thousand ha of agricultural land. Over 2 thousand PB were assessed in this area. The tolerated length was exceeded in 237 PB. These are the blocks with code designation 11, 31, 51 and 61 see Table 3. The assessed PBs with exceeded tolerated plot length cover 55.4% of the assessed area. This represents a majority of the total area assessed. The most represented category with exceeded tolerable length was the threat category - soils at high risk (28.2%). This rating indicates the need for implementation of additional stable vegetation features (e.g., windbreaks) in the area of interest.

Tab. 3 Percentage representation of the vulnerability category code in the area of interest

Hazard category code	Description of the code designation of the categories of vulnerability	Percentage of vulnerability category codes [%]
10	Unthreatened or protected by a wind barrier	12,8
11	Unthreatened, unprotected and too long	7,0
30	Land block slightly threatened, unprotected but within limit	19,6
31	Land block slightly threatened, unprotected and too long	10,1
50	Land block severely threatened, unprotected but within limit	10,0
51	Land block severely threatened, unprotected and too long	28,2
60	Land block most at risk, unprotected but within limit	2,0
61	Land block most at risk, unprotected and too long	10,1

The following assessment focused on the detail of the assessed k..u. in the area of interest. The following Table 4 shows the percentage of the hazard category code (exceeded/not exceeded tolerance length) per k.u. The highest representation of PB with exceeded tolerated length was in c.a. Hrušky (4.8%), the next most significant were Moravská Nová Ves (4.8%) and Lanžhot (4.7%).

Tab. 4: Percentage representation of the hazard category code (exceeded/not exceeded tolerable length) for the c.a. in the area of interest

Evaluated c.a.	Percentage of vulnerability category codes – not exceeded [%]	Percentage of vulnerability category codes – exceeded [%]	Total sum [%]
Hrušky	2,3	4,9	7,2
Moravská Nová Ves	3,1	4,8	7,9

Lanžhot	1,9	4,7	6,6
Břeclav	3,0	4,5	7,5
Moravský Žižkov	1,6	4,5	6,1
Velké Bílovice	6,0	3,7	9,7
Hodonín	1,9	3,2	5,1
Dolní Bojanovice	2,2	3,0	5,2
Podivín	3,0	2,8	5,9
Tvrdonice	2,5	2,8	5,3
Mikulčice	2,4	2,6	5,0
Kostice	2,3	2,6	4,9
Ladná	1,3	2,5	3,8
Rohatec	1,9	1,8	3,7
Ratíškovice	0,7	1,8	2,5
Týnec na Moravě	0,6	1,7	2,3
Lužice u Hodonína	0,5	1,5	2,0
Prušánky	4,8	1,3	6,0
Josefov u Hodonína	2,7	0,6	3,3
Total sum	44,6	55,4	100,0

Conclusion

The paper shows an assessment of the wind erosion problem on the example of a recreationally and touristic important area in the Czech Republic. At the same time, it is the area affected by the tornado of 24.6.2021, which caused significant damage to the property of persons, municipalities, and current vegetation barriers, including windbreaks, in the area of interest. An assessment of the potential vulnerability of the area to wind erosion, considering an assessment of the tolerated length of the land (soil blocks), confirmed the high potential susceptibility of the area to wind erosion. The assessment was prepared for 19 land areas. The results of the assessment indicate the need for further implementation of vegetation barriers (especially windbreaks). The proposed elements should appropriately divide soil blocks with high potential vulnerability to wind erosion. The reduction of extended soil blocks will also have additional ecological significance. Extensive hiking and biking trails in the area can be used for design and further implementation of vegetative barriers. The analysis of the area will be useful for further proposals for the restoration or implementation of new vegetation features to mitigate the risk of wind erosion and other climatic extremes in this area, to increase the permeability and attractiveness of the landscape, and to enable the construction of new networks of dirt roads, cycle paths and walking routes. The newly proposed measures will help to increase the recreational and tourist potential of the area.

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Souhrn
Příspěvek ukazuje hodnocení problematiky větrné eroze na příkladu rekreačně a turisticky významného území v ČR. Současně se jedná o území zasažení tornádem 24.6.2021, které v zájmovém území způsobilo výrazné škody na majetku osob, obcí a současných vegetačních bariér, včetně větrolamů. Hodnocení potenciální ohroženosti území větrnou erozí s přihlédnutím na hodnocení tolerované délky pozemků (půdní bloků) potvrdilo vysoký potenciál náchylnost území k větrné erozi. Hodnocení bylo zpracováno pro 19 k.ú.. Z výstupů hodnocení vyplívá potřeba další realizace vegetačních bariér (zejména větrolamů). Navrhované prvky by měli vhodně rozdělit půdní bloky s vysokou potenciální ohrožeností větrnou erozí. Zmenšení půdních bloků budu mít i další ekologický význam. Pro návrhy a další realizace vegetačních bariér je v tomto území možné využít rozsáhlé turistické trasy a cykloturistických tras. Analýza území bude přínosná pro další návrhy na obnovu či realizaci nových vegetačních prvků pro zmírnění rizika vzniku větrné eroze a dalších klimatických extrémů na tomto území, zvýšení prostupnosti a atraktivity krajiny, umožní budovat nové sítě polních cest, cyklostezek a pěších tras.

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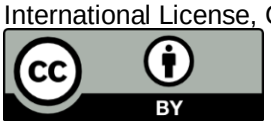

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