

**Mendel University in Brno
Czech Society of Landscape Engineers – ČSSI, z.s.**

**Public recreation and landscape protection
– with environment hand in hand!**



Proceedings of the 15th Conference

Editor: Jitka Fialová

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**2024
MENDEL UNIVERSITY IN BRNO**

Czech Society of Landscape Engineers – ČSSI, z. s.,



and

**Department of Landscape Management
Faculty of Forestry and Wood Technology
Mendel University in Brno**



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Editor: associate Professor Ing. Jitka Fialová, MSc., Ph.D.

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Under the auspices

of prof. Dr. Ing. Jan Mareš, the Rector of Mendel University in Brno,

of prof. Dr. Ing. Libor Jankovský, the Dean of the Faculty of Forestry and Wood Technology,
Mendel University in Brno,

of doc. Ing. Tomáš Vrška, Dr., the Director of Training Forest Enterprise Masaryk Forest
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of Ing. Dalibor Šafařík, Ph.D., the Chief Executive Office, Forests of the Czech Republic,



of Mgr. Jan Grolich, the Governor of South Moravia,

south moravian region

of PhDr. Ivan Bartoš, Ph.D., Minister of Regional Development of the Czech Republic,



and of Mgr. Marek Výborný, Minister of Agriculture of the Czech Republic,



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AGROECOLOGY IMPLEMENTED THROUGH BIOSYSTEMS ENGINEERING TECHNIQUES FOR RURAL LANDSCAPE PROTECTION

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Abstract

Agroecology is a scientific subject, an innovative practice and a social movement, which studies ecological processes in relation to agro-food systems, providing new concepts and tools for mainstreaming advanced management strategies of the agroecosystems. The implementation of Agroecology principles may strongly benefit from Biosystems Engineering techniques. Indeed, their synergical integration may contribute to the reduction of the environmental footprint of agriculture, while protecting biodiversity and ecosystems, so leading to better techniques, materials and tools for planning the rural landscape. Several techniques characterized by an eco-friendly impact are currently investigated by Biosystems Engineering, e.g.: building elements for bio-architecture, produced/integrated with natural materials (bricks insulated with straw/wool; concrete reinforced with natural fibers; “adobe” bricks; etc.); Nature-Based Solutions (NBS); fully biodegradable materials (e.g., for soil mulching); remote-sensed data (from drone/satellite) exploited for precision agriculture, to optimize the use of resources (water; soil; agrochemicals; etc.). These solutions may support the formulation of strategies for re-designing agroecosystems at the landscape level, focusing on ecosystem services, biodiversity, water conservation, crop/livestock production, agrochemicals limitation, pollution reduction, and climate change adaptation. This review paper presents the main technical solutions of Biosystems Engineering for Agroecology, able to integrate territorial planning, reducing pollution from agriculture and protecting the rural landscape.

Keywords: Sustainable Agriculture, Biodiversity & Ecosystems, Ecological Engineering, Bio-Architecture, Landscape Planning.

Introduction

Agroecology is an approach to agriculture that aims to the promotion of the health of the agricultural environment. Over the past two decades, agroecology has become increasingly popular, although being assigned various definitions and meanings. Among the many scientific research, Wezel et al. (2009), have defined agroecology as “*a science, a set of practices and a social movement*”. Other Authors (Wezel et al., 2020) stated that, within agroecology, there are the different agroecosystems that, in turn, create interactions and synergies among all factors that may ensure the balance of biodiversity. So, the primary objective of an agroecological system is its interaction and productivity as a whole, and not only that one of individual crops. Reducing the negative factors which affect the environment is closely connected to, and dependent on, the context of action, and it is necessary to take into account the biophysical, social, cultural and economic aspects of the system. Agroecology today is more relevant and important; in fact, the numerous scientific articles on the subject has peaked with nearly 800 scientific papers published only in 2022 (Fig. 1).

Biosystems Engineering techniques for implementing Agroecology

Biosystems Engineering has over the years developed significant contributions on new knowledge based on environmental principles, as well as the ability to apply those principles to agricultural practices. These competences include a wide range of expertise and skills, aimed to better understanding agricultural systems, natural resource management, land use planning, technological innovation, as well as the development of innovative technologies supporting the implementation of the concept of Agroecology. The scientific sector of Biosystems Engineering is rich of researches in the field of agroecology, which has increasingly evidenced its own multidisciplinary nature. The two macro areas of research - namely, Farm Buildings and Agro-forestry Land – most relevant to the implementation of the concept of Agroecology, are reported in Table 1, together with their specific application fields and most relevant recent scientific

publication. Farm buildings, have been investigated by scientific researches related to the valorisation of traditional material for architectural solutions (Picuno P., 2016), the development of new bio-materials (Castronuovo et al., 2015), etc. Several studies have discussed the materials and architectural solutions to use in green building, such as the research conducted by Manniello et al. (2022), that analyzed the structural performance of a plant - considered as a weed, for urban and rural areas, such as *Arundo donax* L. - when used to lighten concrete bricks, showing positive results in mechanical tests (Fig. 2). In addition to *Arundo donax*, some "new" plant-based materials used in green building, such as hemp and lime materials, have been more recently tested, in conjunction with conventional building materials, offering high energy savings, combined with the environmental sustainability of the components used to make it.

Highly innovative techniques are the applications of Nature-Based Solutions (NBS), as described by Convertino et al. (2023), that have examined green roof, walls, facades, covered and thermally insulated using crops, that allow urban environments to become greener and more sustainable, thanks to a significant reduction of energy consumption.

In agriculture, on the other hand, research on new bio-materials to limit environmental pollution has been extended, due to the need to reduce the plastic footprint of Mediterranean agriculture, where large amounts of waste caused by the extensive use of plastic material, may be avoided, by using fully biodegradable materials. In order to identify an alternative to replace plastic films for mulching, Martín-Closas et al., 2008 conducted a research to determine the potential of biodegradable plastics found in agriculture.

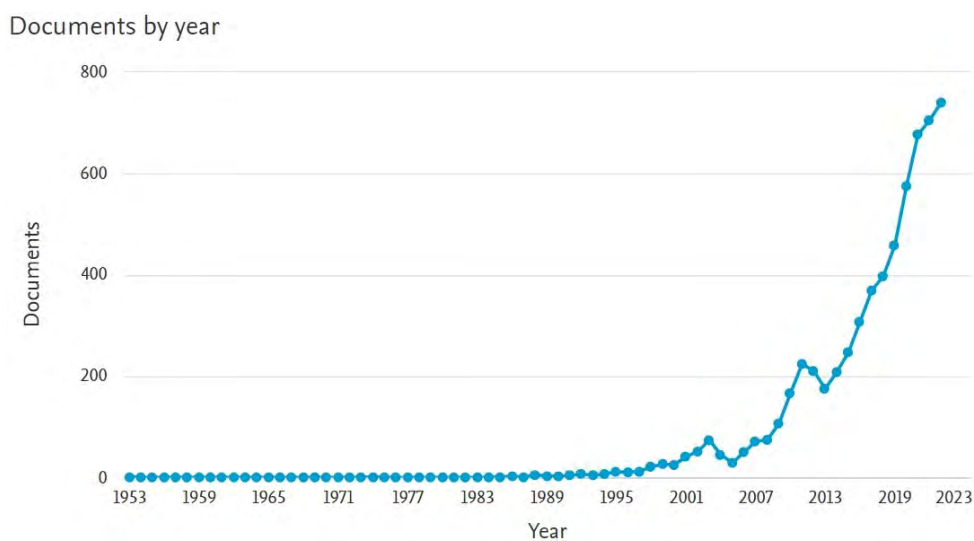


Fig. 1: Scientific papers on agroecology (Scopus database – last access: 28 February 2024)



Fig. 2: Culms of *Arundo donax* (L.) used to make cylindrical concrete blocks (Manniello et al., 2022).

Tab. 1: Synoptic overview of biosystems engineering

Sector	Application	Examples	References
Farm Buildings	Natural building materials	“Adobe bricks”; stone; wood; <i>etc.</i>	(Picuno, 2016)
	Conventional structural elements (<i>e.g.</i> , concrete) lightened with natural material	Concrete lightened with natural fibres having high tensile properties	(Manniello et al., 2022)
	Building insulating components with natural material	Building insulating elements made with straw, hemp, wool, <i>etc.</i>	(Castronuovo et al., 2015)
	Bio-degradable materials	Bio-based/biodegradable film for soil mulching	(Martín-Closas et al., 2008)
	Agricultural waste recycling	Biomass/agro-plastics recycling & valorization	(Castronuovo et al., 2019)
	Nature-Based Solutions (NBS)	Green roof/walls/facades, covered and thermally insulated using crops	(Convertino et al., 2023)
Agro-forestry Land	Remote Sensing & GIS	Satellite data & planning tools for landscape survey, analysis and management	(Cillis et al., 2021)
	AI, Drones & Robotics in Agriculture	Automatic implementation of remote-sensed data into landscape planning tools	(Cillis et al., 2020)
	Energy saving - Renewable energy sources in agriculture	Optimization of energy in greenhouse buildings	(Puglisi et al., 2023)
	Sustainable soil and water management	Reduction of pollution from agro-plastics	(Picuno, 2014)
	Landscape design and management	Landscape Information Modelling (LIM)	(Picuno C.A. et al., 2022)

Agro-forestry Land is linked to the use of new technologies such as GIS, Drones and Artificial Intelligence (AI). Several experimental researches have evaluated the implementation of monitoring strategies for the management, conservation, enhancement, and restoration of forest greenery. Among them, Cillis et al. (2021) collected historical cartographies that were implemented into a GIS, to assess spatial and statistical changes in the forest landscape. So, it was possible to assess how much, where and how the forest landscape has changed, in order to provide a methodology to support more detailed and sectoral studies.

Agro-forestry Land is also concerned with the development of more recent tools based on advanced technologies, like Landscape Information Modelling – LIM (Picuno C. A. et al., 2022)

Discussion

Due to several linkages between agricultural systems, their natural surroundings, and other activities that address biodiversity and ecosystems, rural landscapes are frequently the ideal level for facilitating an efficient transition to agroecology. In order to facilitate the implementation of agroecology at the landscape scale, biosystems engineering would perform a primary role, taking care of the essential stages of development, which enable an integrated system approach. To this aim, the following research activities would be further implemented by experts in Biosystems Engineering, to foster the implementation of the concept of Agroecology at landscape level and protecting the rural environment:

- provide methods for redesigning agroecosystems at the landscape level, taking into account the ecosystem services and additional advantages of agroecology at this geographic scale; improving and enriching biodiversity; creating ecological corridors; safeguarding water; combining crop and livestock production to close energy and nutrient cycles; cutting back on the use of agrochemicals; lowering pollution; and enhancing the contribution of farming practices to climate change adaptation and mitigation;
- create plans which integrate territorial planning, promote agroecology at the landscape level, improve the coherence of environmental and agricultural policies and regulations within a specific landscape or territory, and encourage the development of new governance structures;

- design strategies aimed at using locally available renewable resources, trying to keep the cycles of biomass and nutrients as near to home as possible, while enhancing recycling practices;
- valorizing natural solution for anthropic interventions (on buildings, etc.), so as to maximize the use of local traditional materials, technical solutions based on natural elements, fully biodegradable materials, etc.
- Improve landscape and natural resource governance, by suitably integrating remote-sensed data, GIS and LIM, to play a key role in supporting comprehensive assessments of agroecological systems, offering a valuable approach for sustainable agricultural resource management and rural landscape protection.

Conclusion

The interactions between agroecology and the rural landscape are fundamental to understanding and promoting sustainable agricultural practices and environmental conservation. The practice of agroecology tends to foster agricultural biodiversity by promoting the presence of natural habitats, ecological corridors, and wildlife refuge areas within the rural landscape. This might lead to greater resilience of agricultural ecosystems and benefits for agricultural productivity in the long term. An improved contribution by researches on Biosystems Engineering may enhance the co-creation and horizontal sharing of knowledge, to reduce pollution from agriculture and to protect the rural landscape.

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Souhrn

Význam agroekologie dokládá nárůst vědeckého výzkumu na toto téma v bibliografii. Vysoká multidisciplinarita inženýrských biosystémů umožňuje výzkumníkům v této oblasti zabývat se různými výzkumnými tématy. Kromě toho hrají inženýrské biosystémy v agroekologii zásadní roli, neboť přispívají k navrhování a zavádění udržitelných a ekologicky šetrných zemědělských postupů. Tento obor integruje inženýrské principy s ekologickými a agronomickými znalostmi s cílem vyvinout potravinové systémy, které snižují dopady na životní prostředí, podporují biologickou rozmanitost a zvyšují odolnost zemědělských ekosystémů. Biosystémoví inženýři uplatňují své odborné znalosti při navrhování a optimalizaci systémů chráněných plodin, které snižují plýtvání vodou a minimalizují znečištění. Biosystémové inženýrství hraje také klíčovou roli při vývoji a zavádění pokročilých zemědělských technologií, jako je přesné zemědělství a využívání dronů a senzorů k účinnému a udržitelnému monitorování plodin. Souhrnně řečeno, zemědělské inženýrství poskytuje nástroje a řešení nezbytná k převedení zásad agroekologie do praktických činností, čímž podporuje udržitelnější a odolnější zemědělsko-potravinářskou produkci.

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ATTITUDE TOWARDS SUSTAINABLE TOURISM ACROSS GENERATIONS; A QUANTITATIVE APPLICATION ON X, Y, AND Z GENERATIONS

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Abstract

This study aims to identify the similarities and changes in attitudes towards sustainable tourism across generations and to detail the sources of sustainable tourism behaviors that generations possess. Another objective of this study is to determine the changes in attitudes towards sustainable tourism based on different demographic situations such as income, education, and gender. Material and Method: Based on these objectives, the study was conducted through an online survey application on individuals living in Turkey. According to the 445 surveys obtained from the research, a data set carrying strong reliability and validity elements has been formed. The obtained data were subjected to frequency analysis with the SPSS program to obtain descriptive outputs, and to T-test and ANOVA analyses to obtain relational outputs. Findings: Analysis of the obtained data reveals a positive perception of the sustainable tourism impact amongst consumers. Among Generation X, Y, and Z, Generation Y has the highest perception of sustainable tourism, followed by Generation Z and then Generation X. A significant difference was found between Generation Y and Generation Z after analysis, with Generation Y's view on sustainable tourism being higher than Generation Z's. On the other hand, no differences were found in sustainable tourism attitudes according to gender, education level, and income status. Results: The sustainable attitude between generations initially increased and then decreased over time, but the negative difference between Generation Y and Generation Z is more significant. Furthermore, it is shown that female individuals have a more positive and higher sustainable tourism attitude structure compared to males, the level of sustainable tourism attitude meaningfully increases positively as the level of education rises, and individuals with middle and upper-income levels are more positive compared to those with lower-middle income, as revealed after the analyses.

Keywords: Sustainability, Tourism, Generations X Y Z

Introduction

Sustainable tourism is based on the principle of preserving current resources for future generations. The local community, at the heart of tourism activities, is both affected by and affects these actions. In other words, the local community is directly exposed to the positive and negative outcomes of tourist activities. However, for tourism to be sustainable, the support of the community is necessary. The number of studies examining the attitudes of people towards tourism and its impacts has increased over the last 30 years. A review of the current literature reveals that the community is directly affected during the process of tourism development and thus plays a critical role in sustainable tourism (Ap, 1992). One of the most important factors supporting the touristic development of a destination is the support of the community. This is because the continuity and sustainability of tourism in destinations largely depends on the community's attitude towards tourism (Sümbül and Erdem, 2022). The community's positive approach to visitors and the development of tourism is considered a key element in attracting and satisfying visitors (Cooke, 1982). In this context, for sustainable tourism to be effectively implemented in a tourism destination, proper planning is of great importance. Active participation of the community in this planning process is a factor that increases visitor satisfaction (Koçoğlu et al., 2020). The support of the community is of critical importance for sustainable development of tourism (Ramcander, 2004). The support of the local community for tourism is necessary for the development, sustainability, and successful implementation of tourism (Jurowski et al., 1997). When the community of a region has a positive attitude towards tourism, it will be a significant factor promoting tourism (Yoon et al., 2000). For tourism to reach

a sustainable dimension, approval and support from the local community are required, in terms of short or long-term planning, and the form, scale, and location of its development (Avcıkurt, 2015).

Tourist destinations rely on stakeholder support and tourism awareness for survival and growth (Bekci, 2018). Public attitudes towards sustainable tourism are influenced by factors like socioeconomic status, age, and lifestyle. Therefore, different research methods are required for various demographics. Understanding these attitudes is crucial for effective social, environmental, and economic activities. This study examined how Istanbul public's support for tourism development influences their attitudes towards sustainable tourism, considering demographic variables and generational structure. The findings provide insights for tourism activities, and the study contributes to raising public awareness about these variables.

This study examines the link between sustainable tourism attitudes and the local population's generation structure in tourism destinations. It assesses demographic influences on these attitudes and determines general sustainable tourism attitude levels. This information is crucial for destination development and situation analyses. The research may benefit local governments and industry stakeholders. While many studies have explored tourism's impact on sustainability attitudes, none have evaluated this on an inter-generational scale. Thus, this study, focusing on X, Y, and Z generations in Istanbul, Turkey, is pioneering. Istanbul was chosen for its cultural, sociological, and economic structure. A convenience sample was formed via an online survey among Istanbul's X, Y, and Z generations, reaching 445 voluntary participants.

Conceptual Framework

Concept of Sustainability and Attitude Towards Sustainability in Tourism

Sustainability is an expanding and prevalent concept, with over 500 definitions identified within particular disciplines and fields (Young and Dhanda, 2013). In general, sustainability expresses the ability to maintain a situation or process for an indefinite period (WordNet, 2024) and therefore can be understood in various ways. Primarily, sustainability is seen as the capacity to continue the functions, processes, and efficiency of ecological systems into the future (Chapin, Torn, and Tateno, 1996). Sustainability has often been discussed alongside economic concepts, thus sustainability and sustainable development are frequently used synonymously. According to the definition made by the World Commission on Environment and Development, sustainable development means "meeting current human needs without jeopardizing the ability of future generations to meet their own needs" (UN, 1987). Upon reviewing different definitions, it is observed that the terms "sustainability" and "sustainable development" are interchangeably used in the literature. However, while sustainability signifies the ultimate goal or desired outcomes, sustainable development describes the process of reaching these goals (Akpulat, 2019). According to the 1987 World Commission on Environment and Development definition, sustainable development means "meeting our present needs without compromising the ability of future generations to meet their own needs". Examining the historical development of the concepts of sustainability and sustainable development, it initially appears that the concept of sustainability took the forefront. Initially, environmental sustainability was the priority; however, over time, it has been understood that environmental sustainability alone is not sufficient, and the necessary benefit can be achieved when it is considered together with economic and social sustainability. Sustainable development theory integrates the concept of sustainability with the theory of development (Sharpley, 2000:3).

The irregular growth of tourism carries the potential to threaten human structure and the ecosystem. This growth process might deviate from sustainability in case factors that could negatively impact tourism development (Sirakaya, Jamal, and Choi, 2001). In order to minimize the negative impacts of tourism, all stakeholders in the tourism sector need to make joint decisions and implement these decisions effectively. The development process of tourism can negatively affect many different sectors in a region. Among these sectors, the local community is the most affected group in terms of cultural and life interaction. Therefore, gaining the support of the local community is of critical importance for tourism to develop in a region (Güneş et al., 2020). Another significant mistake in tourism development plans is neglecting the sensitivities

and cooperation of the local community. Investments in infrastructure or new technologies can help eliminate certain deficiencies, but individuals are fragile entities that need to be handled carefully. In other words, it is quite challenging to eliminate the negative perceptions of local populations against tourism. Studies on the effects of tourism on the local community (Ko and Stewart, 2002; Lee et al., 2007; Chen, 2011; Andereck and Nyaupane, 2011; Biçici, 2013; Boğan and Sarıışık, 2016; Işık and Turan, 2018) indicate that including the local community in the planning process of sustainable tourism and the joint decisions taken in this process bring success for long-term tourism development (Bramwell and Sharman, 2002).

Concept of Generations

Generations signify groups that encompass a specific timeframe, uniting around similar experiences and traditional values, and generally exhibiting homogeneous attitudes (Howe and Strauss, 1991). The relationship and interaction between these groups differ depending on the dynamics of the period they lived in. Generations are analyzed within the framework of certain characteristics and behavior patterns, with these analyses usually based on a 30-year period. The classification of generations is grounded on the priorities, values, characteristic features, and general mindset of that period (Töröcsik Mária, 2014). Generations are usually categorized based on age, owing their sustainability to the transformation of age (Baysal, 2015).

Drawing clear lines of distinction between generations may not always be possible. However, noticeable differences can be seen between older groups such as the Silent and Baby Boomer generations and younger generations like X, Y, and Z, who are newly entering the workforce. In Turkey, generational classifications usually take significant political events as their basis (Aka, 2018). While there are different views regarding the years each generation encompasses, it has been observed that individuals born in the same time period do not exhibit the same characteristics in every country. Therefore, there may be discrepancies between international and Turkish data regarding the birth years and characteristics of generations (Öz, 2015). Generations can generally be explained as follows: the term **"Silent Generation"** is used to describe individuals born between 1925-1945. Individuals in this generation are described as disciplined and conservative (Patalano, 2008). They appreciate formality and show serious commitment to the hierarchical command chain. They usually utilize past experiences in decision-making processes. Additionally, these individuals prefer to save money and exhibit great dedication in the work environment, making them compatible with teamwork. Because of these characteristics, they are generally identified as a loyal workforce. When it comes to communication, they show great respect in the relationships they establish with each other (Tolbize, 2008); **the Baby Boomer Generation** consists of individuals born between 1946-1959. This generation, having witnessed harsh war conditions, has facilitated the transition to a democratic and peaceful way of life in society. Also, this generation, conscious of human rights and individual freedoms, emphasizes the importance of societal values. Individuals of this period have developed themselves in areas such as entertainment, sports, education, travel, and culture, and are known for their emotional structures (Şan, 2018; Şalap, 2016); **Generation X** refers to individuals born between 1960-1979. According to a study by Coupland (1989, p.83), Generation X individuals have generally positioned themselves outside society. This generation generally establishes corporate connections but attributes less value to hierarchy and status compared to earlier generations. They react positively to corporate policies. If they cannot find continuous learning and development opportunities in their work environments, this reduces their job satisfaction. The creation of opportunities and autonomy are the most important corporate rewards for Generation X. These are seen not only as rewards but also as factors that make this generation happy and productive in the workplace (Kyles, 2005); **Generation Y** encompasses individuals born between 1980-1999. The technological evolution and transformations experienced during the formative years of this generation have influenced their innovative and creative characteristics. Compared to Generation X, Generation Y tends to adapt more quickly to technology (Cran, 2010). Generation Y is known for its intense interest in knowledge and experience, and its fondness for traveling and entertainment. In other words, they have become a generation that knows when to work and when to have fun. In this context, they have widely benefited from the opportunities offered by technology (Pendergast, 2009); **Generation Z** defines individuals born after the year 2000. The characteristic feature of this generation is their mastery of technology. Generation Z closely follows technological

advancements and quickly adapts to innovations (Singh, 2014). Despite their strong connection with the virtual environment, this generation is also smart, flexible, and open to innovations. Generation Z, who grew up with technological norms, usually meets their social needs via internet technologies. They easily adapt to changes in their lives and quickly access the information they want with the help of technology (Andrea et al., 2016; Lachmann, 2018).

There are noticeable differences in lifestyle and approach to innovations among the demographic groups defined as Generation X, Y, and Z. Generation X generally leads a life deeply connected to traditions. Generation Y, while accepting traditions, also strives to adapt to innovations and changes. When it comes to Generation Z, this group continues their lives by adopting innovations and making them a part of their lives. The approaches of each generation to innovations, habits, and traditions determine the unique characteristic features of the generation (Gürocak, 2013).

Material and methods

Based on the literature review conducted to identify scales for use in the research, it was decided to conduct the study with pre-designed and tested scales. The scale developed by Choi and Sirakaya (2005) was used to test the attitudes towards the impact of tourism on sustainability. Exploratory testing showed the sustainable tourism attitude scale to be normally distributed, with close mean (3.7096) and median (3.7500) values, and skewness (-0.490) and kurtosis (0.663) within acceptable range (+1 / - 1). These results fit the criteria for parametric tests. Table 1 reveals Cronbach's Alpha values above 0.70, indicating internal consistency. Factor analysis using the Varimax method clarified data and caused some item distribution changes.

Tab. 1: Reliability Analysis of Sustainable Tourism Attitude Scale

Cronbach's Alpha	N. Scale Items
,935	44

In order to make the data more explicable and meaningful, factor analysis was conducted using the Varimax method. Consequently, the distribution of items across the dimensions in the ethical and work value scales differed from their original states. Upon examining the variance and eigenvalue coefficients of the scales, it was found that their factorial explicabilities were at a very good level. In the Kaiser-Meyer-Olkin and Bartlett's Test of Sphericity, coefficients of 0.943 for the scale. The significant value of the scales (0.000) indicates the appropriateness of the data set distribution for the research.

The results of the relational and descriptive analysis are presented in the following section. Variables were also examined according to demographic expressions. The research hypotheses formed accordingly are as follows:

- H1: The attitude towards sustainable tourism differs according to the generation groups of the participants.
- H2: The attitude towards sustainable tourism varies according to the demographic characteristics of the participants.
- Sub-hypotheses H2 a,b,c: The attitude towards sustainable tourism varies among the participants' a) gender b) education c) income groups.

The testing of the hypotheses and the interpretation of the analyses are provided below;

- In the analysis conducted based on the generation groups of the participants, the obtained homogeneity coefficient (0.005) was not within the required range ($P > 0.05$) to ensure homogeneity. In the analysis conducted to detect the significance difference, the Sig ($P = 0.034$) value met the required value ($P < 0.05$). Therefore, the H1 hypothesis was accepted. Dunnett's C Post Hoc analysis, which is used in non-homogeneous data to determine which variables have differences, was applied. The analysis found a high

difference and significant disparity between individuals in the Generation Z group and those in the Generation Y group.

- Upon examining the T-test analysis, it was observed that the Levene value (0,881) is at the expected value for homogeneity ($P > 0.05$). In the significance analysis, the Sig ($P = 0.009$) value met the necessary coefficient ($P < 0.05$). Accordingly, the H2a hypothesis was accepted. In light of this situation, considering the mean differences formed in the analyzed tables, it is observed that female individuals have a significantly higher positive attitude towards sustainable tourism compared to male individuals.
- In the analysis conducted on the education of the participants, the homogeneity coefficient obtained (0.324) is within the required range ($P > 0.05$) to ensure homogeneity. In the analysis conducted to detect significance difference, the Sig ($P = 0.000$) value met the required value ($P < 0.05$). Accordingly, hypothesis H2b was accepted. To determine in which variables there are differences, TUKEY HSD and Scheffe Post Hoc analysis, which is used in homogenous data, was applied. In the analysis, it was determined that there is a significant difference between individuals belonging to the group with high school or lower education level and individuals with Associate and Bachelor's education level. This significant difference shows us a differentiation that is positive as the education level increases.
- In the analysis conducted on the income groups of the participants, the homogeneity coefficient obtained (0.000) did not fall within the required range ($P > 0.05$) to ensure homogeneity. In the significance difference detection analysis, the Sig ($P = 0.027$) value met the required value ($P < 0.05$). Accordingly, the H2c hypothesis was accepted. Dunnett's C Post Hoc analysis, used on non-homogeneous data to determine which variables had differences, was applied. The significant difference obtained after the analysis shows us a difference that is increasing and positive as income level increases. However, there seems to be no difference in the attitudes of individuals with medium, good, and very good income levels after the medium income level.

Results, Discussion and Conclusion

The sustainable tourism approach aims to minimize the negative impacts arising from multidimensional and reciprocal interactions between local populations, visitors, the tourism industry, and the environment. This approach encompasses efforts for the quality and continuity of natural and human-made resources (Paskaleva-Shapira, 2001). On the other hand, while aiming to reduce environmental and social impacts from tourism, sustainable tourism attitudes are important in increasing interactions between local people and tourists, ensuring local people benefit economically from tourism, and involving local people in tourism planning (Patterson, 2016). Many studies have been conducted demonstrating the importance of local attitudes for sustainable tourism development (Choi & Murray, 2010; Dağlı, 2018; Duran, 2013; Huayhuaca et al., 2010; Lee, 2013). This study presents important and original results in terms of comparing the sustainable tourism attitudes of people representing different generations. As a result of descriptive and relational analyses, it was seen that the group with the highest perception of sustainable tourism was the Y generation, followed by the Z generation, and lastly, the X generation. It was found that there was a significant difference between people in the Y generation and the Z generation, with the Y generation's perspective on sustainable tourism being higher than the Z generation. It was detected that the sustainable attitude between generations initially increased and then began to decrease; however, the negative difference was more pronounced between people in the Y generation and the Z generation. In this case, ensuring communication between generations, where losses are as minimal and transitions are as smooth as possible, carries significant importance for sustainability in terms of preserving and transmitting tangible and intangible heritage. Sarıbaş et al. (2016) in a similar study, examined the perceptions of young people in the Z generation about the environment and sustainable development, and found that this young generation was distant to many sustainability concepts included in the study questions. However, a positive approach to sustainable development and sustainable tourism can settle with societal awareness. This awareness can be provided with education given at young ages. Investment in and transfer to the Z generation will take them away from life where consumption occurs without production, and it will create a value with awareness. The study analyzed whether there were differences in the sustainable tourism attitudes of the participants according to gender, income level, and

education level. In variability by gender, it was seen that women have a higher sustainable tourism attitude than men. When data were analyzed according to the education level, it was observed that as the education level of people increased, the sustainable tourism attitude increased positively. Finally, the relationship between the participants' sustainable tourism attitudes according to their income level was analyzed. As a result of the analysis, it was found that the sustainable tourism attitude of those with high income level increases significantly and positively compared to low-income individuals. It was found that there was no difference in sustainable tourism attitudes of people with medium, good, and very good income levels after the middle-income level. In similar studies, Dağlı (2018) examined the sustainable tourism attitudes of the local population according to their ages and found that the Y generation had positive and high-level views in all dimensions of sustainable tourism compared to others. Güneş et al. (2020) in their study in which they researched the attitudes of the local population living in Fethiye towards sustainable tourism, found that there was no significant difference between sustainable tourism attitudes according to gender and education levels of the participants, but there was a difference according to income level. The sustainability of natural and cultural resources and their transmission to future generations is of vital importance for the tourism industry. Therefore, examining the attitudes of the local population in tourism destinations towards sustainable tourism and researching their knowledge and interest levels are recommended for future studies. The views of the local population should be considered when forming tourism policies and planning sustainable development. In future studies, attitudes of tourists visiting the destination towards sustainable tourism can be examined. In addition, projects on the theme of "sustainability" can be proposed with the participation of educators and local administration. Studies comparing the sustainable tourism attitudes of the local population between different destinations can be planned.

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Souhrn

Cílem této studie je zjistit podobnosti a změny v postojích k udržitelnému cestovnímu ruchu napříč generacemi a podrobně popsat zdroje chování v oblasti udržitelného cestovního ruchu u jednotlivých generací. Dalším cílem této studie je zjistit změny v postojích k udržitelnému cestovnímu ruchu na základě různých demografických situací, jako je příjem, vzdělání a pohlaví. Materiál a metoda: Na základě těchto cílů byla studie provedena prostřednictvím online dotazníkové aplikace na jednotlivcích žijících v Turecku. Podle 445 dotazníků získaných z výzkumu byl vytvořen soubor dat nesoucí silné prvky reliability a validity. Získaná data byla podrobena frekvenční analýze pomocí programu SPSS pro získání popisných výstupů a T-testu a analýze ANOVA pro získání relačních výstupů. Zjištění: Z analýzy získaných dat vyplývá, že spotřebitelé pozitivně vnímají dopady udržitelného cestovního ruchu. Mezi generacemi X, Y a Z vnímá udržitelný cestovní ruch nejlépe generace Y, následuje generace Z a poté generace X. Po analýze byl zjištěn významný rozdíl mezi generací Y a generací Z, přičemž názor generace Y na udržitelný cestovní ruch je vyšší než názor generace Z. V případě generace Z byl zjištěn významný rozdíl mezi generací Y a generací Z, kdy generace Y vnímá udržitelný cestovní ruch lépe než generace Z. Na druhou stranu nebyly zjištěny žádné rozdíly v postojích k udržitelnému cestovnímu ruchu podle pohlaví, úrovně vzdělání a příjmové situace. Výsledky: Postoje k udržitelnému cestovnímu ruchu mezi generacemi se zpočátku zvyšovaly a poté se v průběhu času snižovaly, ale negativní rozdíl mezi generací Y a generací Z je výraznější. Dále se ukázalo, že jedinci ženského pohlaví mají pozitivnější a vyšší strukturu postojů k udržitelnému cestovnímu ruchu ve srovnání s muži, úroveň postojů k udržitelnému cestovnímu ruchu se významně pozitivně zvyšuje s rostoucí úrovní vzdělání a jedinci se střední a vyšší příjmovou

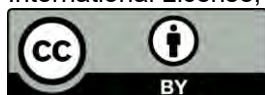
úrovní jsou pozitivnější ve srovnání s jedinci s nižšími středními příjmy, jak se ukázalo po analýzách.

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CONTRIBUTION OF AN NGO TO ENVIRONMENTAL EDUCATION AT A PRIMARY SCHOOL THROUGH THE 'PROJECT GARDEN LABORATORY'

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<https://doi.org/10.11118/978-80-7509-963-1-0023>

Abstract

In Slovakia, there is a slight increase in public knowledge on the topic of sustainable living, development, and collective responsibility for the quality of environment. The rapidly worsened state of the climate is alarming and a proactive approach for changes in society's lifestyle is essential. The non-profit sector of civil society has an important role to play in this regard, often engaging in projects that promote environmental education for children, their parents and educators in schools. This article presents methods for engaging school communities in transforming the school grounds towards sustainable education. Schools often have a generous ground area, yet in Slovakia there is a low quality of green spaces and equipment that could provide stimuli for children and educators in learning and leisure activities. The paper presents an example of good practice at the Mostná Primary School in Nové Zámky (southwestern Slovakia), where a good collaboration has generated a community and created facilities for the development of environmental education in the form of a 'garden laboratory' with composters, raised beds for growing vegetable, fruit, and herbs. The low-biodiverse lawn has been replaced by a perennial bed, which is now attracting pollinators. The redesigned open space with new site furniture serves as an outdoor dining room and classroom for experiential pedagogy.

Keywords: experiential pedagogy, green infrastructure, landscape architecture, participation, school garden

Introduction

In the former Czechoslovakia, institutional gardens with environmental education and "eco" pedagogy that dates to early 1900s, persisted under the communist era. Specious school grounds were offering even the "gardening" as a mandatory part of the school's curriculum and has recently received backing from the Ministry of the Environment and the Ministry of Education, Youth, and Sport since the 1990s (Duží et al., 2014).

In the last decade, more and more civic initiatives have been devoted to the protection, improvement of green spaces and transformation of public spaces in cities (Slobodníková, Tóth, 2022). One of the well-known civic associations is the Živica organisation, which has been actively involved in environmental education since 2000. Among their important projects related to eco-education are Global Education, Green School, The Garden that Teaches, Hurrah Outside. The organization offers teachers methodologies, training, as well as material support in the implementation and realization of innovative principles in the teaching of environmental topics at schools.

The non-profit sector contributes significantly to nature and landscape conservation in many regions of Slovakia. In some places it complements activities in cooperation with local authorities, in others it replaces their work entirely. At the same time, there is also an increase of public interest in environmental protection, which is facilitated by well-known grant opportunities from several Foundations (Slovenská sporiteľňa, Ekopolis, ZSE, SPP, Pontis, VÚB, Milan Dubec, Slovnaft, Raiffeisen), that support "green" projects. However, the subsidies of these schemes are not set to raise a lot of money, so they are often used by schools and NGOs for small interventions, such as the implementation of tree planting, flower beds, or the workshops, which greatly limits the possibility of overall revitalization of the school grounds. These would often require a complex solution of new hard surfacing, design of sports infrastructure, interactive playgrounds, furniture, which are the most expensive items of revitalisation.

An essential component of the entire educational system is environmental education, and educational gardens have seen rapid growth in the last several years (Duží et al., 2014), currently often supported by the work of NGOs.

In the ever-worsening urban conditions due to construction activity, dedicated areas (hospitals, school grounds) with extensive green spaces are becoming one of the most important urban green structures that have recreational potential to serve the benefit of public and in the development of the green infrastructure concept (Tóth, A.2022).

Material and methods

There is an obvious increase in promoting educational gardens in Slovakia. We can find 32 primary schools (out of 46 together with high schools) enrolled in education programme: A Garden that teaches organised by Živica NGO (www.zahradaktorauci.sk).

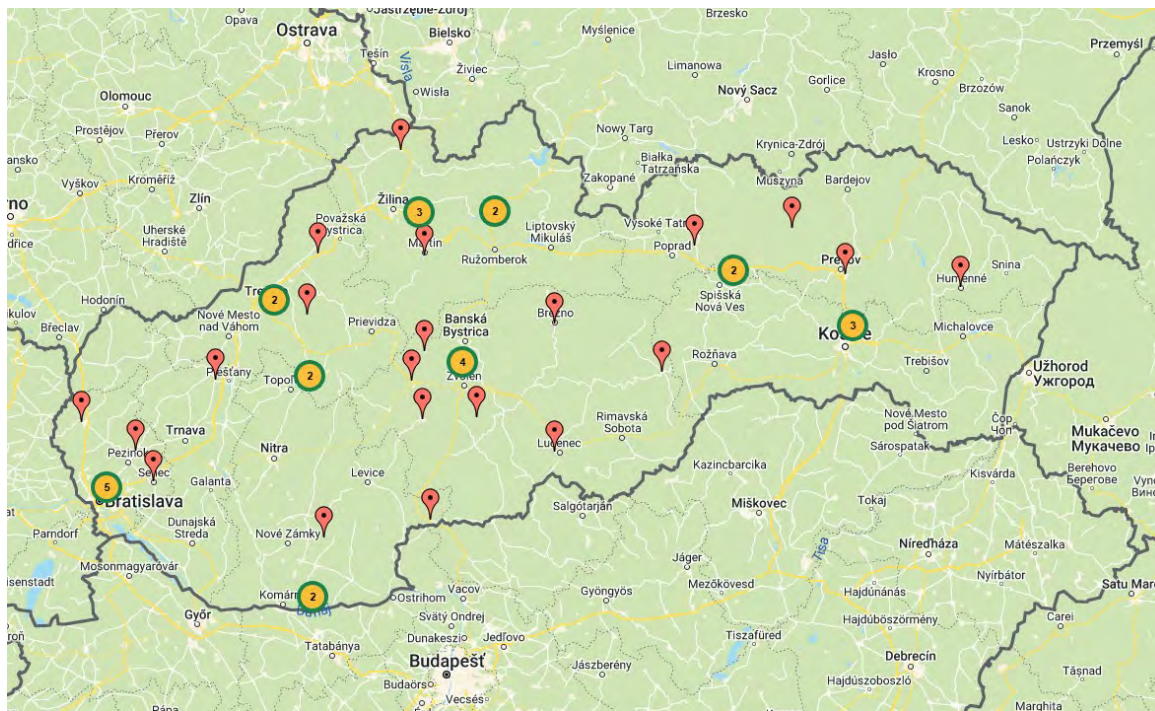


Fig. 1: Map of gardens (primary and secondary schools) that teaches in Slovakia.

Zdroj: www.zahradaktorauci.sk/mapa/

In the town of Nové Zámky (with 37 000 inhabitants), the civic initiative (CI) Tree as a gift (Strom darom) is involved in protection and improvement of greenery as well as the transformation of public spaces. Some of their members were also involved in the founding of the Berek Forest Kindergarten project (www.berek.sk) in 2016. It is dedicated to preschool education in the form of Waldorf and forest pedagogy, which naturally led to the need to continue this type of education for children in primary school after that. This is how the project Živá škola (www.zivaskolanz.sk), which is part of the Mostná state school in Nové Zámky, came into existence. The municipality has 10 primary schools in its administration. The neglected, unused area (0,5 ha greenery of total 2ha plot) of the school ground Mostná has been the subject of the (CI) Tree as a gift, that helps to transform the exterior of the school into a place that will offer possibilities for children to actively spend time outdoors and expand their skills and knowledge in an experiential way.

Activities kicked off in 2019 by a participatory process with the children and teachers at the school in creating “feeling maps”. These were used as a form of data collection, before developing the overall masterplan of the ground. From the evaluation of the “feeling maps”, we identified the places that influenced the participants positively or negatively when being outdoors, as well as a set of elements that were missing for the actors in the school grounds. We have abandoned the conventional process of creating landscape architecture documentation for the moment due to the greater financial requirements for project documentation that would be needed for such a complex re-development. Schools often do not have that extra funding for procurement of this.

Therefore, we went down the path of gradual co-work with stakeholders to form the design in phases. In 2022, an opportunity arose to receive funding for environmental education activities from the state grant scheme ENVIROFOND. (CI – Strom darom) Tree as a gift prepared a proposal according to the wording of the request for proposals, which was intended for the following activities: building new, completing and renovating existing indoor and outdoor spaces used for the purpose of environmental education, training and awareness-raising activities. Landscape architect a member of (CI) Strom darom prepared a masterplan proposal and budget description for the project of "Garden Laboratory". A professionally developed proposal based on a participatory process helped in obtaining funding for the implementation of the project.

Results

The aim of the revitalization was to build a "Garden Laboratory" on an area of 700m², out of which 300 m² was a paved surface in bad condition, that was replaced with a new permeable material made of stone rubble. The garden laboratory consists of 9 raised beds built of DURISOL components (a durable ecological material) that creates an area of 35m² for growing vegetables, edible fruit and herbs. The formerly 230m² lawn has been replaced by an extensive perennial bed with bulbs that significantly enhances the biodiversity of the plot. At the same time 4 trees were planted (Tilia and Prunus sp.), 3 composters, 2 picnic sets and 5 oak seats were installed. The budget of the project was 49 726,03 EUR. The construction works were carried out by the company, the rest was part of the co-work with teachers, children and parents under the leadership of the initiative, which provided the necessary expertise for the establishment of the vegetation types.

By revitalizing the plot, we were able to build grounds for the students' gardening work and at the same time it can be used as an outdoor classroom for teaching multiple subjects as well as giving children a space to spend a meaningful time in the after-school club.

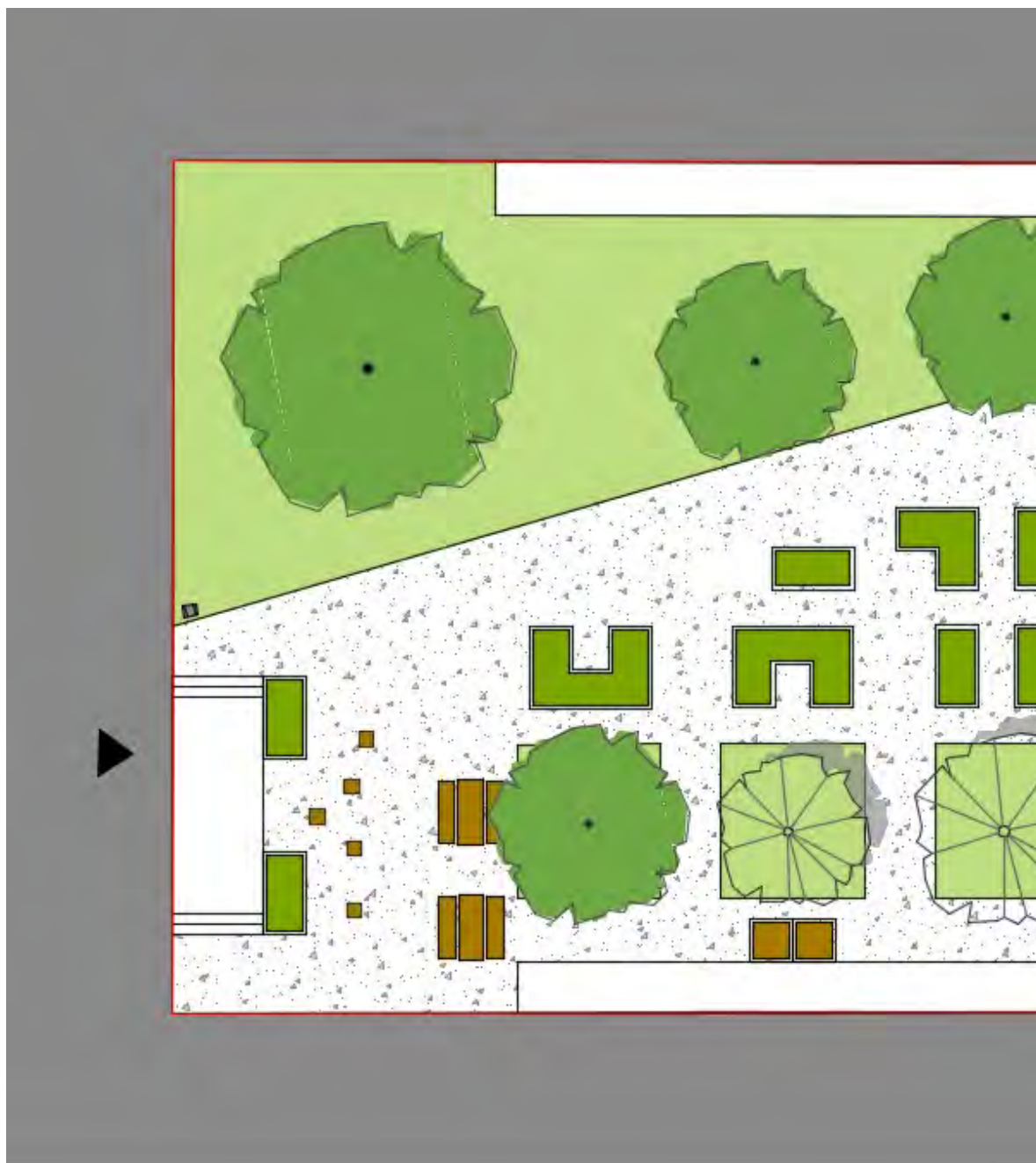
By transforming unused paved surfaces into functional areas that bring benefits are a positive added value to educate stakeholders about such possibilities in built environment.

Discussion

Slovakia is currently experiencing one of needed transformations and that is in children's education, where the so-called curriculum reform is intended to lead to a better overall readiness of children for life in the 21st century.

One of the fields of new curriculum reform is the field - People and Nature, where the main objective is that students are involved in identifying and solving environmental problems and protecting nature. They identify regional and global problems and issues of different kinds and can reflect on them and express themselves appropriately. They are aware that through their actions they can influence individual parts of the environment and themselves (Pupala, Fridrichová, 2022). The fundamental change in children's learning under the curriculum reform will be in engaging them in activities that provide their own experiences and create concepts that they understand and use in meaningful way. Such learning will ensure the development of appropriate attitudes towards nature and its knowledge. Students become convinced of their own competence to explore the world around them and to contribute to its positive change by proposing and implementing solutions in different areas of life (Pupala, Fridrichová, 2022). Here we see an opportunity where "GARDEN LABORATORY" can serve to explore the real experience of growing your own vegetables, converting bio-waste into compost, which is a source of nutrition for growing crops, and thus explore the cycle of living processes.

Design and implementation of the "GARDEN LABORATORY" idea was a targeted strategy rather than a design principle of the project to transform part of an unused area of the school garden into educational environment that promotes human-environment relationships in the context of cultural ecology (Lapka et al., 2012, Tóth et al., 2018). We agree with the authors' statement that educational gardens are extraordinary objects, and environmental education should be the primary design strategy for them.



Legenda
SÚČASNÝ STAV

Legenda
NÁVRH

Fig. 2: Design proposal of "Garden Laboratory" for Envirofond Funding. Zdoj: Ing. Katarína Slobodníková



Fig. 3: Co-planting by kids, teachers and parents of extensive perennial flower bed to enhance biodiversity of the school ground under supervision of landscape architects Slobodníková, Balogová from (CI) Tree as a gift. Source: Lucia Balogová



Fig. 4: Raised vegetable beds ready for planting in "Garden Laboratory". Source: Katarína Slobodníková

Conclusion

At the local level, active civic initiative or NGO play an important role in building communities and green infrastructure of settlements. By engaging different stakeholders on projects led by professionals from civic initiatives, it brings benefits to the development of the area, while also succeeding in educating different communities on sustainable urban development issues in an experiential way.

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Souhrn

Případová studie projektu "Zahradní laboratoř" popisuje proces přetváření školní zahrady (700 m²), který iniciovala občanská iniciativa (CI) "Strom jako dar" ve městě Nové Zámky. "Zahradní laboratoř" má být zahradou, která učí a je využívána v rámci tematických hodin nebo v mimoškolním kroužku. Na jejím plánování, tvorbě a údržbě se od počátku podílejí žáci, učitelé a rodiče dětí. (CI) vede komunitu k budování vztahu k přírodním živlům nebo udržitelnosti prostřednictvím péče o zelené zeleninové a trvalkové záhony, kompostování a biodiverzity. Dobrých výsledků je dosahováno díky aktivnímu přístupu (CI), který koordinuje proces realizace projektu od nápadu až po jeho údržbu a zajišťuje tak udržitelnost projektu. To znamená, že i malé lokální zásahy s profesionálním přístupem mohou mít významný dopad v širším slova smyslu.

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CROSS-BORDER DIMENSION OF (UN)SUSTAINABLE TOURISM IN BORDER REGIONS

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Abstract

Several attractive tourist regions in the Czech Republic are located in border areas, making them accessible to visitors from the other side. Although the Czech Republic has been a member of the Schengen area since 2007 and border controls have since been abolished, the border is still present, for example, in non-connected public transport, insufficient cross-border infrastructure, or in tourists' preferences for accommodation. These factors contribute to unsustainable forms of tourism in border areas, manifested by large numbers of day visitors arriving by private cars.

The paper analyzes the topic of the Czech-Polish border, using semi-structured interviews with tourism actors (cities and municipalities, entrepreneurs, and NGOs). The results show that after 1945, the Czech-Polish border was re-bordered for political reasons, and cross-border contacts also suffered due to population exchanges on both sides. A strong border effect is still present, which may lead to overtourism in some famous places without adequate financial benefits for the affected destinations. The paper concludes by presenting recommendations on how to mitigate the border effect in tourism and thus contribute to the sustainability of tourism in the region.

Keywords: Destination management, nature protection, cross-border tourism, border effect, Czech-Polish border.

Introduction

The presence of efficient cross-border public transport is crucial for the sustainability of tourism in border areas. Cross-border transport infrastructure facilitates the movement of tourists between neighboring regions, enhances territorial integration, and promotes tourism development (Medeiros, 2019). A lack of cross-border transport can limit spatial interaction, hinder the growth of border regions, and create barrier effects that restrict tourism flows and infrastructure development (Jacobs-Crisioni & Koomen, 2017; Ramadani et al., 2020). Political instability in neighboring countries can further impede tourism entrepreneurship and activities reliant on border access (Anisiewicz, 2021).

The absence of efficient cross-border public transport poses challenges for establishing sustainable tourism development. It can hinder cross-border cooperation, stakeholder engagement, and the implementation of sustainable tourism practices (Paunović & Jovanović, 2017; Jelinčić et al., 2019). Additionally, the lack of cross-border transport can create obstacles inhibiting tourism development, especially when national interests conflict with the mutual benefits of cross-border cooperation at the regional level (Ioannides et al., 2006). This lack of cooperation can impede the successful development of tourism products, economic activities, and governance structures in cross-border destinations (Stoffelen, 2018). Addressing the inadequacy of cross-border public transport is essential for fostering tourism development, economic growth, and regional integration in border regions by improving transport infrastructure, enhancing cross-border cooperation, and promoting sustainable tourism practices.

An exemplar of a border delineating the conspicuous impact of insufficient cross-border public transportation on the sustainability of tourism within border regions is the boundary separating the Czech Republic and Poland. Historically, the majority of this border, save for Těšín/Cieszyn Silesia, demarcated the frontier between the Czechoslovak state and Germany, fostering robust cross-border interactions amidst a predominantly German-speaking populace on both sides. However, following the upheavals of the Second World War, ethnic Germans were displaced, and the borderlands were resettled by inhabitants from Czechoslovakia and Poland, hailing from disparate regions and lacking local affiliations. Consequently, a phenomenon known as re-

bordering unfolded in the Czech-Polish border vicinity, artificially intensifying the border's impact and disrupting the flow of cross-border activities.

Re-bordering is the process of redefining and reinforcing boundaries and borders between regions or countries, often in response to changing geopolitical situations, economic conditions, or social factors. This phenomenon can be observed in the restructuring of cross-border relations, the establishment of new regulations or policies governing border areas, and the reinforcement of border controls or restrictions (Jańczak, 2019). Re-bordering can impact cross-border cooperation initiatives by influencing the dynamics of collaboration, altering the perception of borders as barriers or facilitators, and shaping the development of shared resources and infrastructure along borders (Kurowska-Pysz et al., 2022). The concept of re-bordering highlights the fluid and evolving nature of borders and the significance of understanding how these changes affect cross-border interactions, cooperation, and regional development. It underscores the need to adapt cross-border cooperation strategies to address emerging challenges and opportunities arising from redefined borders and shifting geopolitical landscapes (Jańczak, 2019).

Materials and methods

The article draws upon two primary data sources for its analysis. Firstly, it relies on semi-structured interviews conducted with a diverse array of stakeholders involved in regional development within the Praděd/Pradziad, Nisa/Neisse/Nysa, and Glacensis Euroregion. A total of 24 interviews were conducted, some of which were recorded while others were not. These interviews explored various aspects of cross-border cooperation and related issues, with specific focus on segments pertinent to tourism.

Secondly, the analysis incorporates an examination of cross-border public transport networks, utilizing historical maps of the region alongside archived and contemporary timetables. This analysis tracks shifts in public transport infrastructure, the frequency of connections, and the availability of transport routes viable for tourism purposes in the present context.

Results

During the initial phase, the content of the interviews underwent analysis. Findings revealed that despite the presence of several highly alluring tourist destinations along the border—such as the Jizerské Mountains, Krkonoše National Park, the rock towns of Broumovsko, Orlické Mountains, and Jeseníky Mountains – visitors from neighboring regions typically engage in day trips and opt for accommodation on their respective side of the border. Consequently, this pattern results in substantial traffic congestion, parking challenges, and related issues in certain areas. In Poland, this challenge was further compounded by a populist campaign preceding parliamentary elections, wherein accommodations in Poland were subsidized. As a consequence, in the preceding year of 2023, notably fewer Polish tourists ventured into the Czech Republic compared to previous years.

Tab. 1: Overview of railway lines that exist, or existed in the past, across today's Czech-Polish border

Railway	Operation status
Frýdlant – Heřmanice – Bogatynia – Zittau	Dismantled
Frýdlant - Zgorzelec	Personal traffic cancelled
Jindřichovice pod Smrkem – Gryfów Śląski	Dismantled
Tanvald - Jelenia Góra	Functional
Královec - Kamienna Góra	Functional
Meziměstí - Mieroszków	Personal traffic cancelled
Otovice zastávka – Ścinawka Średnia	Dismantled
Náchod – Kudowa Zdrój	Dismantled
Lichkov - Kłodzko	Functional
Bernartice u Javorníka – Otmuchów	Dismantled
Vidnava – Nysa	Dismantled

Jeseník - Głucholazy - Krnov	Travel possible only from Czechia to Czechia
Krnov – Głubczyce	Dismantled
Opava-západ – Pilszcz	Dismantled
Chuchelná – Racibórz	Dismantled
Bohumín – Racibórz	Functional
Bohumín - Zebrzydowice	Functional
Český Těšín - Cieszyn	Functional

The interviews yielded various intriguing insights, with some respondents noting that tourists tend to mentally confine themselves to one side of the border, preferring to stay and dine within their own territory while venturing out for excursions on the opposite side. The dearth of cross-border public transportation, which is only sporadically available on select major routes, emerged as a significant concern, leading to several adverse effects and rendering public transport links impractical for border tourism. Criticism was also directed towards the limitation of tourist information materials, which typically cease at the border of the tourist region, leaving visitors uninformed about attractions across the border even at tourist information centers. Consequently, tourists lack the motivation to explore regions beyond the border for extended periods, thereby gravitating towards familiar highlights and exacerbating the strain on the sustainability of tourism in these destinations.

During the second phase of the research, an examination of historical and contemporary cross-border public transport connections was conducted. A notable disparity was observed post-1945, following the aftermath of the Second World War, during which both Czechoslovakia and Poland sought to delineate the border between the two states as distinctly as possible. Consequently, measures were implemented to reinforce the border psychologically, including the disruption of railways and public transport networks in general (refer to Table 1).

The findings reveal that out of the original 15 cross-border railways, only 3 remain operational today in areas affected by population exchanges after 1945, while no railways were disrupted in regions unaffected by such exchanges. This underscores the phenomenon of re-bordering, which continues to impede border traffic to this day. A similar analysis was conducted for bus transport, yielding comparable results, albeit space constraints prevent their detailed presentation within this article.

Discussion and Conclusion

The findings of the research underscore the significant psychological barrier that the border imposes on visitors. Despite the Czech-Polish border being largely open and accessible without significant hindrance since 2007, aside from a brief interlude during the Covid-19 pandemic in 2020-2021, both nations predominantly utilize their respective border regions for leisure activities. This phenomenon presents a paradox, considering the minimal language barrier between Czechs and Poles, and the fact that many Czechs engage in shopping excursions in Poland. Yet, when it comes to vacations in border areas, they tend to favor their own side of the border, even though this choice often entails financial disadvantages. This inclination persists despite the regularity with which citizens from both nations visit historical cities (like Praha or Kraków) or, in the case of Poland, the Baltic Sea.

The repercussion of this tourism landscape is a heavy reliance on car travel, which, alongside air transport, stands as one of the least environmentally friendly modes of transportation. Passenger vehicles exert significant capacity and spatial pressure on tourist destinations, particularly detrimental in nature reserves, national parks, and other ecologically sensitive areas. This concerning scenario necessitates intervention, requiring concerted efforts from tourism institutions at various levels—national entities such as CzechTourism and the Polish Tourism Organization, as well as regional bodies including regions, voivodeships, and tourist regions—alongside cross-border collaboration facilitated by euroregions. Presently, such collaboration predominantly occurs within euroregions, albeit with comparatively limited financial resources compared to the aforementioned organizations. Consequently, areas beyond the border often remain relatively unfamiliar to visitors.

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Souhrn

Řada turisticky atraktivních regionů v Česku se nachází v příhraničních oblastech, díky čemuž jsou dostupné i návštěvníkům z druhé strany hranice. Ačkoli je Česko od roku 2007 členem Schengenského prostoru a na jeho hranicích jsou od té doby zrušeny hraniční kontroly, hranice však je doposud přítomna např. v podobě nenavazující veřejné dopravy, nedostatečné přeshraniční infrastruktury, či v preferencích turistů ohledně ubytování. Tyto faktory pak přispívají k neudržitelným formám cestovního ruchu v příhraničních oblastech, projevující se velkým množstvím jednodenních návštěvníků přijíždějících osobními automobily.

Článek analyzuje dané téma na příkladu česko-polské hranice, přičemž využívá metody polostrukturovaných rozhovorů s aktéry v cestovním ruchu (města a obce, podnikatelé, neziskové organizace). Z výsledků plyne, že po roce 1945 došlo na česko-polské hranici k re-borderingu z politických důvodů, přeshraniční kontakty také utrpěly z důvodu výměny obyvatelstva na obou stranách hranice. Silný border efekt se zde projevuje doposud, kvůli čemuž v některých populárních destinacích může vznikat overturismus, a to bez adekvátního finančního přínosu pro postižené destinace. V závěru článku jsou prezentována doporučení, jak border efekt v oblasti cestovního ruchu zmírnit a tím přispět k udržitelnosti cestovního ruchu v regionu.

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CULTURAL ECOSYSTEM SERVICES OF THE TRADITIONAL SOUTH BOHEMIAN LANDSCAPE ON THE EXAMPLE OF LAG TŘEBOŇSKO

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Abstract

The article focuses on the identification and evaluation of cultural ecosystem services within the territory of the Local Action Group (LAG) Třeboňsko. The practical implementation of ecosystem services into decision-making processes, planning, monitoring, or economic mechanisms in the Czech Republic is still low. Besides the need for its dissemination in public administration, it is desirable to raise awareness within the organization of local action groups as a tool for local and rural development. Methodically, the article works with an expert estimation of the significance of cultural ecosystem services in terms of targeted management on a scale of 4 to 0 points. For the actual identification of cultural ecosystem services, the CICES system was used. Its ecosystem service classes were grouped into four groups - 9.1.1.1 Characteristics of ecosystems that enable activities supporting health, recovery, or pleasure through active physical or impressive interactions; 9.1.1.2 Characteristics of ecosystems that enable activities supporting health, recovery, or pleasure through passive or observational interactions; 9.1.1.3 Characteristics of ecosystems that enable intellectual interactions, research activities, or education; 9.1.1.4 Characteristics of ecosystems with heritage value - cultural, historical, traditional, regional heritage (biodiversity conservation also belongs to this group). To map the sources of cultural ecosystem services, the Consolidated Ecosystem Layer (KVES) was used. The model area of LAG Třeboňsko is unique with its pond landscape, where valuable natural ecosystems intersect with a historical pond management system. This is reflected in the widespread representation of cultural ecosystem service sources belonging to group 9.1.1.4 with the highest priority in terms of management.

Keywords: Regional development, Local Action Group, Ecosystem services, Cultural landscape

Introduction

Cultural Ecosystem Services and Their Significance for Society

Cultural Ecosystem Services (CES) represent intangible benefits that humanity derives from ecosystems. These benefits include aesthetic contributions that can serve as inspiration, reinforcement of cultural identity, a sense of belonging to the place where people live, spiritual experiences, or recreational activities. These services are crucial for improving the quality of life for individuals and communities as they foster the relationship between humans and nature, culture, thus contributing to overall human well-being. Cultural ecosystem services arise from the interaction between humans and the environment. They are non-material benefits that aid in assessing ecosystem services by revealing significant social aspects in the management of natural resources (Pascua et al., 2017).

The aesthetic and recreational values of ecosystems can directly contribute to the development of tourism, which is a crucial component of the economy in many regions. Recreational and aesthetic values of nature and landscape can attract visitors, generating income and job opportunities (TEEB, 2010).

Spiritual and cultural values of nature can strengthen regional identity and contribute to social cohesion through shared values and experiences. These values can also be utilized for educational and interpretive purposes, creating added value for visitors and local residents (Daniel et al., 2012).

These benefits of CES are fundamental aspects in regional development because they can act as a source for the development of local economies, strengthen social cohesion, support regional identity, and improve the quality of life for residents in the region.

Local Action Groups

Local Action Groups (LAGs) act as independent networks of citizens, non-profit organizations, entrepreneurs, and public institutions dedicated to the development of rural regions, supporting the agricultural sector in accessing financial support from national and European Union funds through the LEADER method (French: Liaison Entrée Actions de Développement de Économie Rurale), which translates to "Linking activities for rural development." The main mission of LAGs is to support the quality of life and protection of the environment in rural areas, which includes effective management of grant funds.

The article focuses on the identification and evaluation of cultural ecosystem services within the territory of the Local Action Group (LAG) Třeboňsko. The practical implementation of ecosystem services into decision-making processes, planning, monitoring, or economic mechanisms in the Czech Republic is still low. Besides the need for its dissemination in public administration, it is desirable to raise awareness within the organization of local action groups as a tool for local development and rural development.

Materials and methods

Mapping was performed using the Consolidated Ecosystem Layer (KVES developed by CzechGlobe) and publicly available orthophoto maps. Since both sources may not be current, the ongoing result was consulted with LAG managers and updated as necessary. Ecosystem service resources were described at the level of Land Use/Land Cover types - e.g., arable land, natural/artificial water bodies, meadows, and pastures, etc. Each ecosystem service resource was described in terms of cultural ecosystem services - its potential for provision and possible ways of utilization and management by stakeholders.

For the assessment of cultural ecosystem services in the territory of LAG Třeboňsko, we have chosen an expert estimation of the significance of ecosystem services based on their management (i.e., whether the ecosystem service is the main or secondary goal of management with the given ES resource - ecosystem type) or utilization. This is our own original approach. The proposed scoring for the importance of individual types of ecosystems in providing, utilizing, and managing ES under current conditions in the Czech Republic is as follows:

H – Main ecosystem service - almost always managed (usually the main goal of management), utilized (protected by law, subject to trade, intensity of visitation) – value **4**

V – Secondary ecosystem service - almost always utilized (consumed, used), but not always the goal of management - value **3**

O – Occasional - the ecosystem has the potential for its utilization (produces function), but it is deliberately utilized rather rarely or, if frequently, in negligible scale - value **2**

T – Theoretical - The ecosystem has the potential for ES utilization but is not utilized as much (or was utilized in the past) - value **1**

Unused or unmanaged ecosystem services - value **0**, without designation.

When processing ecosystem service classes, we found the possibility to unify and merge cultural ecosystem services into four own categories based on the similarity and overlaps of the original CICES ecosystem service classes:

9.1.1.1 Characteristics of ecosystems that enable activities supporting health, recovery, or pleasure through active physical or impressive interactions

9.1.1.2 Characteristics of ecosystems that enable activities supporting health, recovery, or pleasure through passive or observational interactions

9.1.1.3 Characteristics of ecosystems that enable intellectual interactions, research activities, or education

9.1.1.4 Characteristics of ecosystems with heritage value - cultural, historical, traditional, regional heritage The overall value of significance for cultural ecosystem services is calculated according to the formula:

Cultural Ecosystem Services (CES)

$$CES = 9.1.1.1 + 9.1.1.2 + 9.1.1.3 + 9.1.1.4$$

Results

The scoring values of the significance of cultural ecosystem services in terms of management are presented for ecosystem categories represented in the territory of LAG Třeboňsko in Table 1. Forest ecosystems, including intensively managed forests, generally have high significance.

Similarly, natural ecosystems in general. For water bodies and ecosystems, the impossibility of active water recreation often reduces their value, while conversely, the value of historical and cultural heritage, as well as the intrinsic value of nature, increases.

Tab. 1: Scoring values of the significance of cultural ecosystem services according to the significance in terms of and the goal of managing ecosystem service resources

KVES Categories	9.1.1.1	9.1.1.2	9.1.1.3	9.1.1.4	Sum of CES
Alluvial meadows	3	3	2	4	12
Swamps	1	2	2	4	9
Beech forests	3	3	2	4	12
Transport units	0	0	1	0	1
Oak and oakhornbeam forests	3	3	2	4	12
Intensive coniferous forests	3	3	2	3	11
Intensive broad-leaved forests	3	3	2	3	11
Intensive mixed forests	3	3	2	3	11
Degradated grasslands	1	3	2	2	8
Alluvial forests	3	3	2	4	12
Macrophyte vegetation of water bodies	0	1	2	4	7
Artificial urban green areas – parks, gardens, cemeteries	4	4	3	2	13
Mesic meadows	3	3	2	4	12
Wetlands and littoral vegetation	0	2	2	4	8
Introduced shrub vegetation	1	2	2	3	8
Discontinuous urban fabric	2	2	3	1	8
Arable land	1	0	2	4	7
Orchards and gardens	1	4	2	3	10
Industrial and commercial units	0	0	2	0	2
Natural shrub vegetation	2	3	2	4	11
Peatbogs and springs	1	2	2	4	9
Bog forests	3	3	2	4	12
Scattered greenery	3	3	2	4	12
Human influenced water bodies	2	3	2	3	10
Artificial rocks	0	0	1	2	3
Natural rocks	2	0	2	2	6
Dump and construction units	0	0	1	0	1
Spruce forests	3	3	2	4	12
Continuous urban fabric	1	1	1	0	3
Artificial urban green areas – recreation and sport areas	4	3	1	0	8
Dry pine forests	3	3	2	4	12
Dry grasslands	3	3	2	4	12
Ravine forests	3	3	2	4	12
Water courses	2	2	3	4	11
Heaths	3	3	2	4	12

The following figures present the spatial representation of cultural ecosystem services in the territory of LAG Třeboňsko within individual groups (figures 2 – 5) and their overall sum (figure 6). Figure 1 presents the diversity of ecosystems in the Consolidated Ecosystem Layer (KVES) as sources of cultural ecosystem services.

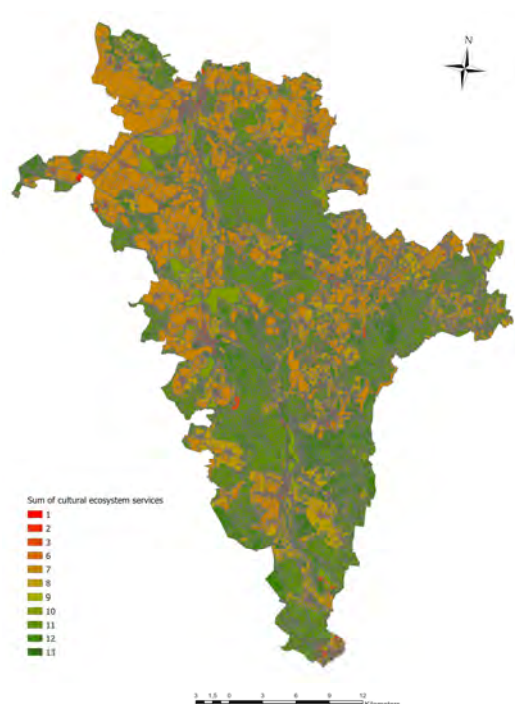


Fig. 1: Consolidated ecosystem layer in the territory of LAG Třeboňsko

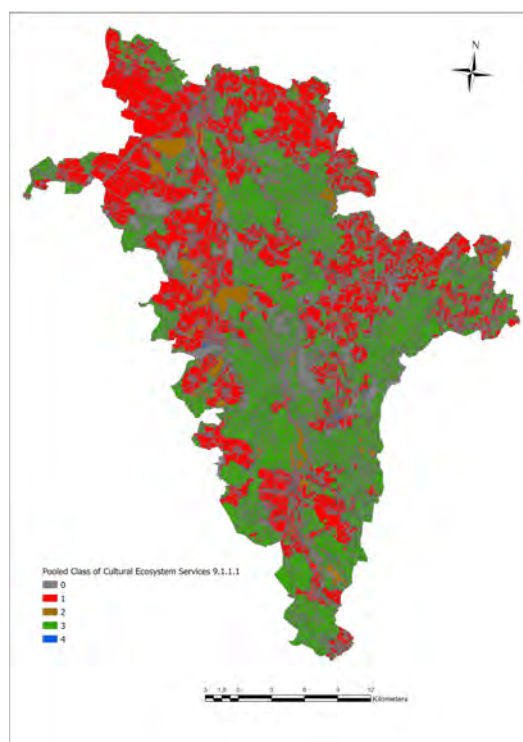


Fig. 2: Assessment of the potential management and utilization of cultural ecosystem services in LAG Třeboňsko - Characteristics of ecosystems that enable activities supporting health, recovery, or pleasure through active physical or impressive interactions 9.1.1.1

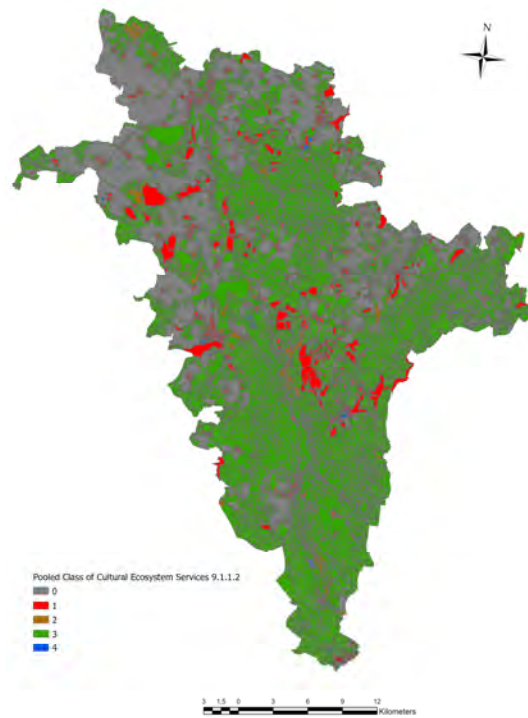


Fig. 3: Assessment of the potential management and utilization of cultural ecosystem services in LAG Třeboňsko - Characteristics of ecosystems that enable activities supporting health, recovery, or pleasure through passive or observational interactions 9.1.1.2

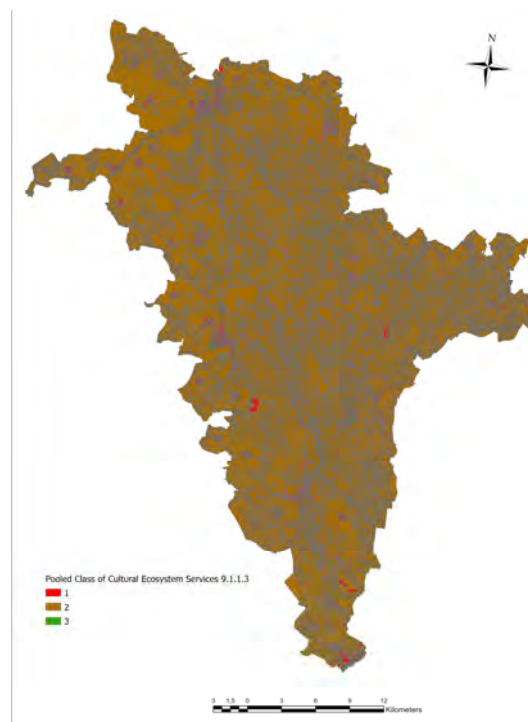


Fig. 4: Assessment of the potential management and utilization of cultural ecosystem services in LAG Třeboňsko - Characteristics of ecosystems that enable intellectual interactions, research activities, or education 9.1.1.3

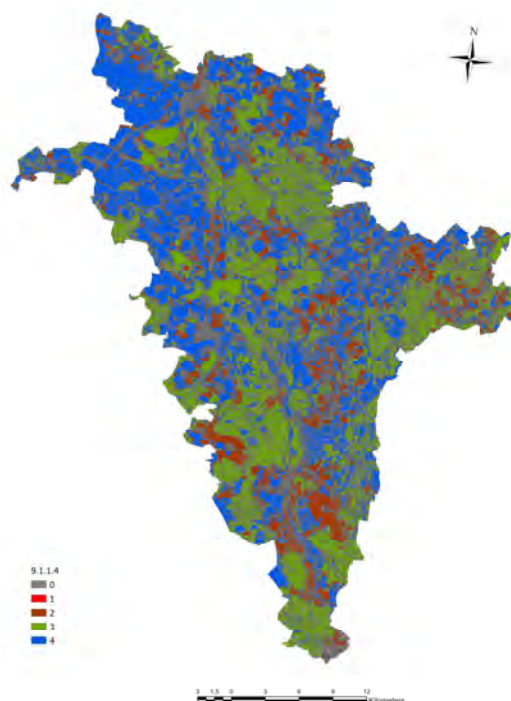


Fig. 5: Assessment of the potential management and utilization of cultural ecosystem services in LAG Třeboňsko - Characteristics of ecosystems that have heritage value - cultural, historical, traditional, regional heritage 9.1.1.4

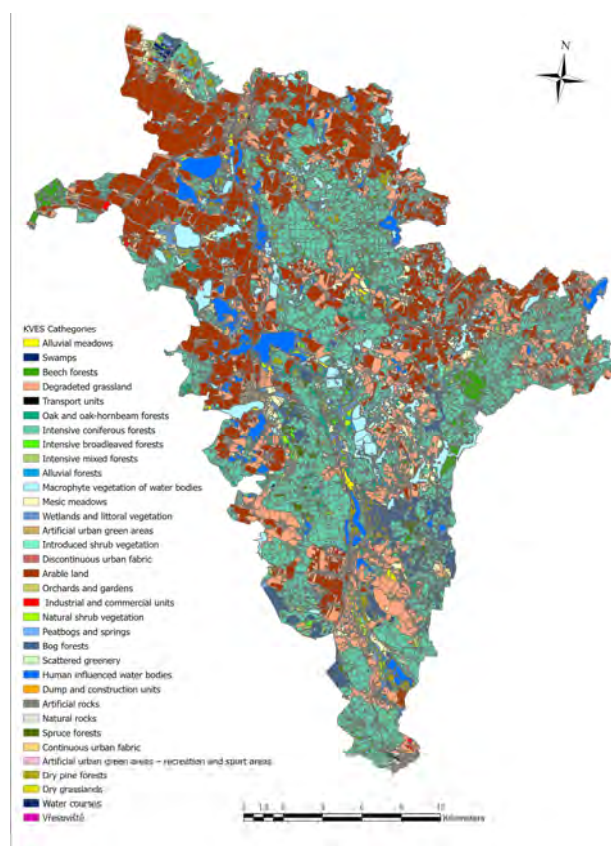


Fig. 6: Total value of cumulative classes of cultural ecosystem services in LAG Třeboňsko

Conclusion

For the evaluation of cultural ecosystem services, expert estimation was used in terms of significance as a management goal. Although this method is subject to subjective interpretation, mapping of cultural ecosystem services in the territory of the Local Action Group Třeboňsko has shown to be a relevant methodological approach. From the results, it is evident that the traditional, well-preserved, harmonious cultural landscape of Třeboňsko, with a mosaic of natural and extensively managed agricultural ecosystems, represents a significant source of cultural ecosystem services.

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Souhrn

Článek je zaměřen na identifikaci a vyhodnocení kulturních ekosystémových služeb v rámci území místní akční skupiny (LAG) Třeboňsko. Praktická implementace ekosystémových služeb do rozhodovacího procesu, plánovacích, kontrolních či ekonomických mechanismů je v České republice stále nízká. Kromě potřeby jejího šíření ve veřejné správě je žádoucí zvyšovat povědomí i v rámci organizace místních akčních skupin jako nástroje pro místní rozvoj a rozvoj venkova. Metodicky článek pracuje s expertním odhadem významnosti kulturních ekosystémových služeb z hlediska cílového obhospodařování na škále 4 – 0 bodů. Pro vlastní identifikaci kulturních ekosystémových služeb byl využit systém CICES. Jeho třídy ekosystémových služeb byly sdruženy do čtyř skupin - **9.1.1.1** Charakteristiky ekosystémů, které umožňují činnosti podporující zdraví, zotavení nebo potěšení prostřednictvím aktivních fyzických nebo působivých interakcí; **9.1.1.2** Charakteristiky ekosystémů, které umožňují činnosti podporující zdraví, zotavení nebo potěšení prostřednictvím pasivních nebo pozorovacích interakcí; **9.1.1.3** Charakteristiky ekosystémů, které umožňují intelektuální interakce, výzkumné aktivity nebo vzdělávání; **9.1.1.4** Charakteristiky ekosystémů, které mají hodnotu odkazu - kulturního, historického, tradičního, regionálního dědictví (do této skupiny patří i ochrana biodiverzity). Pro zmapování zdrojů kulturních ekosystémových služeb byla použita Konsolidovaná vrstva ekosystémů (KVES). Modelové území LAG Třeboňsko je unikátní svojí rybníční krajinou, v níž se setkávají cenné přírodní ekosystémy s historickým systémem rybníkaření. To se odráží v plošně rozsáhlém zastoupení zdrojů kulturních ekosystémových služeb, patřících do skupiny 9.1.1.4 s nejvyšší prioritou z hlediska obhospodařování.

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DEFINING A STRATEGY FOR MONITORING MARINE LITTER IN THE PROTECTED AREA OF ASINARA ISLAND, BY INVOLVING THE LOCAL COMMUNITY

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Abstract

Environmental pollution, especial of water bodies is the main problem of the local authorities. The main objective of the present study is to develop some actions to raise awareness among the fishermen and all actors involved, identifying the most vulnerable areas from the point of view of marine pollution. The study area is the Asinara Island (Sardinia Island, Italy), one of the most vulnerable protected area face to marine litter pollution whose argument is fishing activities by "Fishing for Litter". The methodology consists of field investigations, questionnaires, cartography, and data collection regarding the typology of marine litter. The analyses also include interpolations, correlations, GIS, cartographic and statistic models. The main results is the network of fishermen ("The Guardians of the Sea") for the efficiency of the fishing activities as an useful tool for the main actors involved keeping a clean environment.

Keywords: Marine pollution, fishermen community, tourism activities, marine waste, vulnerable areas

Introduction

Marine pollution became an important environmental issue in the last decades, and a lot of actors became interested in being involved to solving it. The main objective of this study is to identify the vulnerable areas from the marine litter pollution point of view and to develop some actions of sensibilizing the local communities and all the actors involved. The main purpose is to define some strategic actions for maintaining a clean environment.

Marine Protected Areas (MPAs) are a widely used protection strategy, but there are questions about their impact on the economy of the communities in their vicinity. The scientific literature assessing the impact of MPAs has identified five indicators of community well-being: food security, right to resources, employment, community organization and income. Food security generally remained stable after the establishment of MPAs, or even increased in older and smaller MPAs. Access to resources was positively correlated with MPA zoning and compliance with the regulations governing these protected areas. The results of the analyzes demonstrate that MPAs influence the standard of living and the political and administrative involvement of fishing communities; the impacts they have, both positive and negative, differ within and between social groups; at the same time social impacts are correlated with some – but not all – explanatory factors used in the working hypotheses. MPAs may thus represent a viable strategy for increasing food security and engaging local communities, but current practices negatively affect at least a minority of fishers. For policymaking, further research needs to better argue and explain the differentiations of positive and negative social impacts of MPAs (Mascia *et al.*, 2010).

In terms of management, various approaches have been proposed to analyze the alarming depletion of marine resources in coastal areas. One of these would be community management and the establishment of marine protected areas (MPAs). The failure to effectively include local communities in the design and implementation of relevant protection measures is reflected in the poor performance of MPAs. Community management, in fact a hybrid form of management, which ideally builds on existing local management practices. The main challenge of this process is the development of adequate frameworks to support successful participation in the management process of local communities. Review of studies on MPA design and community-based marine resource management, as well as field observations, provide clues on how to address current socio-economic disparities in MPA design and implementation, while

successfully involving local communities to provide a better basis for the creation of larger and more effective MPA networks. For conservation approaches to be successful, a combination of tools is needed as a formal framework and community-based natural resource management, as an adaptive core that recognizes the relevance of local communities as partners, not competitors (Ferse *et al.*, 2010).

Community priorities can be identified through individual and group interviews with users who are knowledgeable about the resources. A decision support tool is the maps that were made and capture the priorities of communities on the one hand and those of scientists on the other and were very similar for coastal areas, which gives credibility to both approaches. Resource users consider maps based on scientific analysis necessary in highlighting areas important from the point of view of the conservation process, but rather prefer an integration of the two approaches. Spatial variation in human impact on marine areas, as well as variation in commercial fishing, both represent protection costs. The results highlight the value of integrating approaches based on community and scientist priorities in conservation planning to achieve community buy-in and, of course, conservation utility. Also, community assessments based on their traditional ecological knowledge can be used as a reasonable proxy for scientific approaches in selecting areas of ecological value (Ban *et al.*, 2009).

The acceleration of ecosystem degradation has influenced the increase in the number of proposals to expand protected areas (PA), potentially affecting the means and livelihoods of local communities (IPLC). The benefits of multifunctional PAs emphasizing the management role of IPLCs have long been recognized. Quantitative analyzes of how resource governance and the distribution of management rights affect conservation outcomes are, however, critical to the long-term sustainability of the protected area. Study results suggest that well-governed, multifunctional PAs can achieve conservation goals without undermining IPLC rights (Fidler *et al.*, 2022).

Globally, the objectives of marine protected areas (MPAs) have changed, from a focus mainly on maintaining ecosystems by prohibiting extractive activities, to more equitable approaches that address both the needs of people and the needs of nature. This has resulted in MPAs with a diverse range of fishing restrictions as well as debates about the type of restrictions that will contribute to the achievement of biodiversity objectives. For example globally, 172 MPAs (representing 31 nations) alongside nine detailed case study MPAs (Australia, Belize, Cambodia, Federated States of Micronesia, Fiji, Indonesia, Madagascar, Solomon Islands and the United States of the Americas), plus partially protected areas that allow regulated fishing, have been used to illustrate the many measures that some MPAs have adopted to protect biodiversity and protect the rights and livelihoods of dependent coastal communities of these resources. MPAs are grouped based on their restrictions and analyzed from four key perspectives that emerge from these groupings: (i) for fisheries regulation, MPAs use very diverse approaches; (ii) gaps in regional fisheries management in the case of partially protected areas can be addressed; (iii) chosen fishing restrictions are influenced by the transfer of resource management rights to communities; (iv) highly tailored fishing restrictions can be used to increase equity in access to resources, in the case of state-governed MPAs. It is noted that in the case of partially protected MPAs, biodiversity conservation, effective and equitable solutions can be identified if they are adapted to the local context. It is thus recommended that a combination of locally appropriate levels of protection – from fully protected areas to partially protected MPAs – be used to achieve the new global MPA targets to achieve positive biodiversity conservation outcomes (Andradi-Brown *et al.*, 2023).

Overfishing has reduced fish biomass and resulted in fragmentation of food webs, weakening the resilience of ecosystems. Carbon emissions led to ocean warming and acidification, with negative impacts on marine biodiversity, and sea level rise threatens communities in coastal regions. Plastic waste breaks down into microplastics that significantly affect marine life (Entwistle *et al.*). The unprecedented threats facing the oceans and seas require urgent and coordinated global action. Reference to other effective area-based conservation measures and recognition of traditional territories has laid the foundations for successful action to halt biodiversity loss, but progress needs to be monitored to ensure that the livelihoods and property rights of local communities are not compromised. However, we need to ensure that area-based marine conservation networks are designed and managed with the agreement, participation, and leadership of local stakeholders. By initially adopting a small-scale, community-based approach, we ensure that existing and newly designated sites achieve objectives, benefit

marine ecosystems and the communities that rely on them and provide a solid foundation for scaling up effective marine conservation and. fair. Ongoing support has strengthened the traditional fisheries management system and created partnerships between fishermen and local authorities (Church *et al.*, 2023).

Material and Methods

a. The Study area

The study area is the European Marine Protected Area of Asinara, located in Sardinia Island (Italy). The protected area represents a small territory, about 50 km² (51,9 km²) with a length of 17.4 km, with a range of 290 m, a hilly territory, situated in the north-western part of the Island. The highest point is 408 m in Punta della Scomunica. The area is an inhabited territory, one of the important parts of the National Parks system of Italy, a state property. (Figure 1).

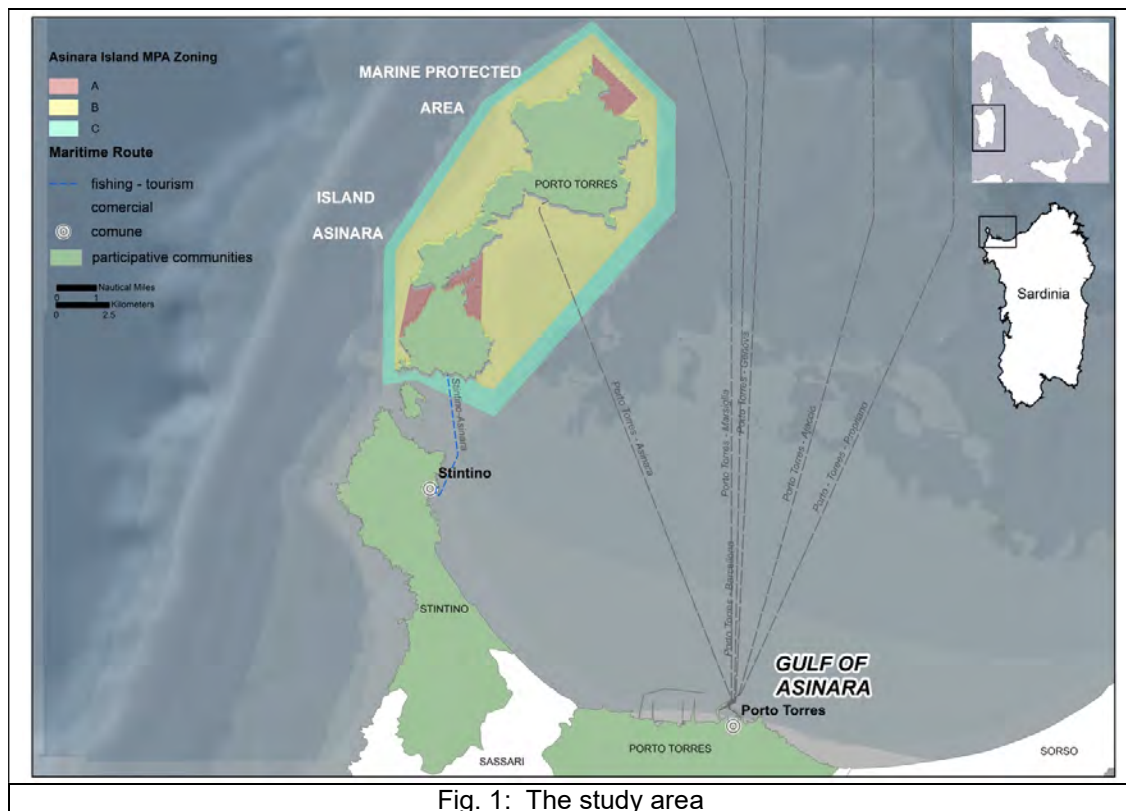


Fig. 1: The study area

b. Data collection

The study is part on a specific project based on the cartographical documents, open-source data, and some field investigations. The participants were the community of fishermen (about 50 participants) involved, in their daily activities, in focus groups, answering questionnaires, participative cartography, data collection regarding the typology of the marine litter (Figure 2). They were trained how to identify marine litter, how to take their GPS coordinates, to take photos and trying to collect them (if possible). The analyses consisted of interpolations, data correlations and GIS methods.

Results

The main results of the study were obtained by involving the fishermen community. Their participation was a great contribution to the study. Their main activity for the study was to identify the marine litter on and in the water, to take its GPS coordinates, to photo them and trying to collect it, if possible.

Their multiple preferences for the fishing areas (Figure 2) identified the areas where the marine litter is present, also. Most of them (35 fishermen) prefer the 4th area (23%), a coastal area between the two ports Stintino and Porto Torres, then the 3rd area (21%), that partially belongs to the Marine Protected Area of Asinara. Some minor preferences were for the 1st (11%), 2nd

(15%) and the 6th area (14%), the latter ones located in the western and north-eastern part of the area.

Regarding the typology of the marine litter identified in the fishing areas on their routes (Figure 3) could be classified into five major types: most of them are plastic (in red – 20.5%), multi-material (in yellow – 12%) wood (in green – 4%), misc (in purple – 2.5%) and glass (in turquoise – 1%).

The distribution of the marine litter overlays both on commercial and touristic routes (40% along the waterways, until 1000 m buffer area), 17.5% between waterways and other in the coastal area. The sources of the marine litter are also diverse; 45% from them (especially plastic and misc.) could have as possible determinant the sea transport and tourism activities. The state of the marine litter identified was 47.8% already collected and taken onboard, 37.7% adrift, 4.5 failed onshore.

The marine litter that was floating were identified along the eastern and western shores of Asinara Island and off the Bay.

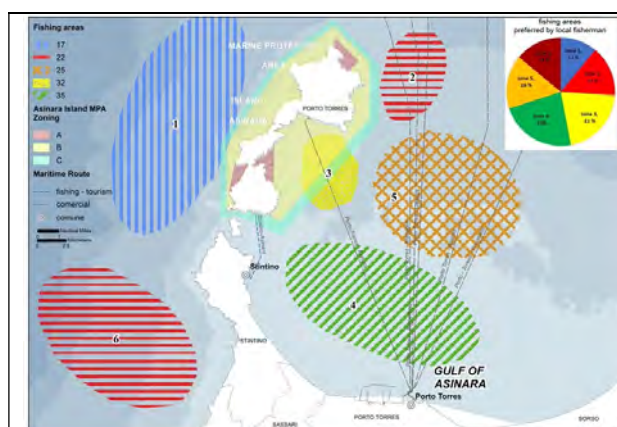


Fig. 2: Main routes preferred by fishermen for fishing

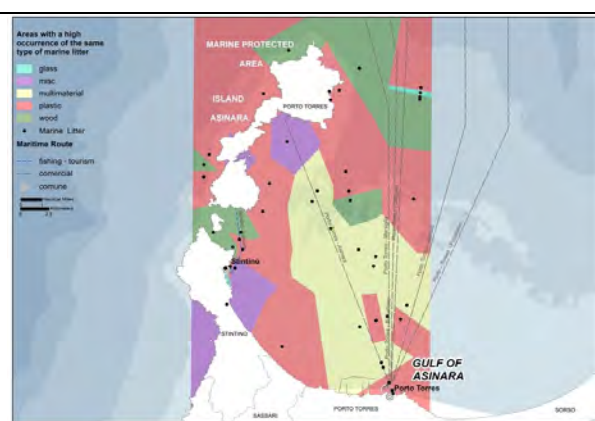


Fig. 3: Typology of the marine litter

Discussions

During our study, some aspects were identified and demonstrated:

- the main area of concentration for the marine litter. Their GPS position illustrates the main distribution along the transportation corridors, but in very small distances between them (sometimes, even tens meters).
- the distribution of the marine litter depends on the natural factors (wind, local sea streams, seasons, etc) and socio-economic ones. Marine litter is predominant in the meridional part in the springtime and septentrional in the summertime. As main possible causes: tourism and wind direction. There is a seasonal difference between the spatial distribution of the marine litter between April to June and between July and August.
- only a permanent monitoring of the main transportation corridors allows the identification of the main sources and types for the marine litter;
- the efficiency of data collection, by the fishermen, they should be financially stimulated or receiving some royalties (kilos of fish/kilos of marine litter);
- the data collection and GPS data demonstrate the necessity of involving the fishermen in these activities, because only they are able to cross and to navigate along the water corridors (routes);
- the density and the frequency of the marine litter could be diminished through the contribution (involvement) of the fishermen, in their quality as "Guardians of the Sea", because they could prevent the spreading of the marine litter.

Conclusions

The study demonstrated the need for a real involvement of the local community in the awareness and the preservation of the natural resources they have. The involvement of the local communities in preserving their environment represents a win-win relation between all the

actors. By receiving any royalties, they could get even more involved in these volunteer actions, to be more efficient and intensive.

An increasingly accelerated growth of the tourism phenomenon in the last period, especially after the pandemic crisis of 2019, when this phenomenon must recover from the accumulated losses. The role of local communities, in general, but of fishermen, in this case, of the Guardians of the Sea is becoming increasingly important and contributes to shaping a new form of tourism: civic tourism. This new form of tourism is based on the exploitation of natural and socio-economic tourism resources, through the involvement of local communities.

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Souhrn

Znečištění životního prostředí, zejména vodních ploch, je hlavním problémem místních orgánů. Hlavním cílem této studie je vypracovat některá opatření ke zvýšení informovanosti rybářů a všech zúčastněných subjektů a určit nejzranitelnější oblasti z hlediska znečištění moří. Studovanou oblastí je ostrov Asinara (ostrov Sardinie, Itálie), jedna z nejzranitelnějších chráněných oblastí, která čelí znečištění moří odpady a jejímž argumentem je rybolovná činnost "Fishing for Litter". Metodika se skládá z terénního šetření, dotazníků, kartografie a sběru dat týkajících se typologie mořského odpadu. Analýzy zahrnují také interpolace, korelace, GIS, kartografické a statistické modely. Hlavním výsledkem je síť rybářů ("Strážci moře") pro zefektivnění rybářských činností jako užitečný nástroj pro hlavní aktéry podílející se na udržování čistého životního prostředí.

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DEFORESTATION IN GABON: DETERMINANTS OF FOREST ACTIVITIES AND ECONOMIC GROWTH AMIDST LANDSCAPE PROTECTION AND CLIMATE CHANGE CRISIS

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Abstract

Forestry is vital in the socio-progress of numerous societies and nations, especially those with abundant forest reserves, like Gabon. However, managing forests sustainably faces challenges due to factors such as population growth, expansion of agriculture, wood fuel, and round wood production at the expense of nature, habitats and tourism activities. Understanding the drivers of forest-related actions is crucial for developing policies supporting forest preservation and economic progress. This research explores the factors influencing forest-related actions and their implications for growth in Gabon, including population size, wood fuel production, round wood production, energy emissions, agriculture, and gross domestic product (GDP). Using time series methods, we analysed data from the United Nations Forest and Agriculture Organization covering the period from 1980 to 2019. We uncover significant connections through tests like Augmented Dickey Fuller (ADF) and Engle Granger cointegration test for assessing stationarity and long-term relationships among these variables as ordinary least squares (OLS) multiple regression analysis to understand their impact on economic growth. Our results highlight that population and wood fuel production affect growth while round wood production has a negative impact. Moreover, we find that wood fuel production and agriculture contribute to expanding wood production, while energy emissions also influence the economy, and yet are considered critical factors of deforestation. These insights could guide policymakers in Gabon aiming to craft strategies for forest management and economic advancement while foresting landscape protection, biodiversity and ecosystems services.

Keywords : Agriculture, Eco-tourism, deforestation and forest degradation, firewood and charcoal, landscape conservation, roundwood, Tourism activities

Introduction

Forests play a role in ecosystems by offering a range of benefits globally such habitats, soil regulation, recreation services, air regulation, climate mitigation among others. Moreover, forest ecosystem services are vital in eco-tourism given the biodiversity role they play. In nations like Gabon, where forests are abundant, they serve as a driver of economic progress and societal development (Asamoah et al., 2020, FAO, 2020, Bamwesigye et al., 2020a, Bamwesigye et al., 2020b, Bamwesigye et al., 2020c). However, managing forests sustainably faces obstacles due to social, economic, and environmental factors (Bamwesigye and Hlavackova, 2018, Bamwesigye et al., 2020a, Bamwesigye et al., 2020c). Understanding the factors influencing forest activities and their impact on growth is essential for creating policies that balance conservation with development goals (Bamwesigye et al., 2020a, Bamwesigye et al., 2020b, Bamwesigye et al., 2020c, Bamwesigye, 2023).

Gabon, situated in Central Africa, is renowned for its forest resources that cover around 88% of its land area, according to the World Bank (2019).

The country's forests protect biodiversity, support the livelihoods of many people, and contribute significantly to the national economy through activities like timber exports. However, challenges such as population growth, expanding agriculture, and rising energy emissions are hindering forest management and economic progress in Gabon (Niang et al., 2017; Nkoumou et al., 2018, Asamoah et al., 2020).

To tackle these issues effectively, Gabon's policymakers need evidence on what drives forest activities and how they impact growth. By understanding the factors influencing forest activities and their connection to indicators, policymakers can implement targeted measures to support

sustainable forest management and inclusive economic development (World Bank, 2020, Bamwesigye, 2023).

This study explores the factors influencing forest activities and their effects on growth in Gabon. Specifically, it examines the correlation between population size, wood fuel production, Roundwood production, energy emissions, agriculture, and Gross Domestic Product (GDP). Through the use of time series analysis methods and econometric models, the study aims to shed light on the relationships between these variables and how they influence economic growth as well as the impact on landscape conservation and protection which could save endangered biodiversity and forest ecosystems services. This study aims to enhance our knowledge of forest economics and sustainable development by focusing on Gabon.

Material and methods

Data collection

The study used a secondary data source from the Forest and Agriculture Organization of the United Nations (FAO) from 1980 to 2019. Although the sample size includes limited observations, there is a lack of data on the 1970 or earlier. Using FAO data is much more appropriate because it is a recognized organization under the United Nations and provides a credible report for public usage. A theoretical framework for a general model is if it takes interdependence among variables into account: GDP, energy emission, agriculture, population, Roundwood production, and wood fuel production. Research by (Hobbs, Dimitrios, & Mostafa, 2021, AboElsoud, 2018) transformed their time series into natural logarithm. However, the selected variables for the analysis of this paper were also transformed into their natural logs. Emissions are often measured in carbon dioxide (CO₂) equivalent, the population in millions, gross domestic product in billions of US\$, Roundwood production, and wood fuel in meters cube.

This study investigates some of the determinants of forest activities in Gabon. In achieving this objective, we consider some factors(variables) significant to the paper. It is well-known that time series analysts have a different approach to analyzing economic data (Granger, 1981). It encompasses an empirical assessment of total energy emission linkage with agriculture, population, wood fuel, and Roundwood production towards economic growth. We are observing the dynamics associated with different assessment levels and gaining much insight into the movement of torrents associated with these selected variables in Gabon. The study on the impact of GDP was conducted using quantitative analysis. The quantitative approach is analyzed to give empirical results to verify the hypothesis. The empirical outcome is utilized to make some important recommendations to policymakers in the country of study, allowing them to determine the relationship between the variables. The study used multiple regression through the ordinary least squares, the Augmented Dickey-Fuller test(ADF), and the Engle-Granger cointegration test.

Model specification

The study targeted model specification focusing on economic indicators such as (GDP and population), forest indicators (Round wood and wood fuel productions), and environmental pollution activity such as (energy emission and wood fuel usage). Round wood production can be considered part of GDP, but these activities directly affect the forest; hence it is essential to examine them individually. Investigating whether population, Round wood, and wood fuel production contribute to economic growth, an econometric model was designed to achieve the set goal as indicated in equation one (1) to answer whether these variables affect growth in Gabon since the country is endowed with large forestland.

$$\ln GDP_t = \alpha + \beta_1 \ln WFP_t + \beta_2 \ln Pop_t + \beta_3 \ln RDW_t + \mu_t \quad (1)$$

$\ln GDP_t$ represents the log of gross domestic product, $\ln WFP_t$ indicates the log of wood fuel production, $\ln Pop_t$ and $\ln RDW_t$ stand for the log of population and a log of Round wood production, respectively. GDP is used as the explained variable because it is often considered the most significant in assessing a country's economic growth and indicating the market size. To further expand the scope of this study, Round wood production was used as the dependent variable, as shown in model equation two (2), to investigate its relationship with population, wood fuel production, energy emission, and agriculture.

$$\ln RDW_t = \alpha + \beta_1 WFP_t + \beta_2 Pop_t + \beta_3 Agric_t + \beta_4 EM_t + \mu_t \quad (2)$$

$\ln RDW_t$ Indicates the log of round wood production Pop_t represents the population $Agric_t$ and EM_t stands for agriculture and energy emission, respectively. The expected sign of the selected coefficients is that wood fuel production is positive, the population is positive, agriculture is negative, and energy emission is negative. An anticipated negative sign for agriculture is that activities such as farming lead to deforestation. Energy emission reduces Round wood production because of the countermeasures to stop deforestation; hence there is an expectation of a negative coefficient. Also $\beta_1, \beta_2, \beta_3$, and β_4 are the regression coefficients μ_t represents the error term α and represent the constant term of the obtained models.

Results

Augmented Dickey-Fuller test

The study used the Augmented and Dickey-Fuller to test for the assumption of the unit-root presence in the time series variables and verify the stationarity property of the time series (Dickey & Fuller, 1979). The method of testing whether a time series has a unit root or equal in value is that the variable follows a random walk (Dickey & Fuller, 1979). Under the ADF unit root test, we exploit all three variants, including without constant, with constant, and with constant and time. Table 1 shows that the variables are non-stationary at levels.

Tab. 1: ADF Unit root test at levels and first difference

Variables	Sample period	ADF T-Stat	p-value	Critical Value (5%)	ADF T-Stat	p-value	Critical Value (5%)
Log of GDP	1981-2019	-2.412	0.372	-0.209	-5.443	8.39e-08	-0.881
Log of Wood Fuel Production	1981-2019	-2.074	0.559	-0.217	-6.005	4.502e-09	-0.987
Log of Population	1982-2019	-1.573	0.496	-0.001	-7.325	2.69e-10	-0.116
Log of Roundwoodm3	1981-2019	-1.368	0.599	-0.070	-5.470	7.326e-08	-0.877
Log of Agriculture	1981-2019	-3.017	0.127	-0.413	-8.592	1.261e-15	-1.332
Log of Energy Emission	1982-2019	-1.610	0.789	-0.162	-9.574	4.098e-18	-1.373

The null hypothesis of the ADF test states no unit root existence, and the alternative hypothesis of unit root presence. Table 1 above indicates a unit root presence in the time series based on the significance level of 5%. However, the first difference of variables displayed stationarity. Therefore, the series were integrated in the first order I (1). Consequently, Table 2 shows the cointegration test relationship of the residuals using the Engle-Granger test.

Tab. 2: Engle-Granger cointegration test

Unit-root $H_0: \alpha = 1$ model: $(1-L)y = (\alpha-1) * y(-1) + e$	estimated Value of $(\alpha - 1)$: -0.508 test statistic: $\tau_{ct}(4) = -3.835$ P-value= 0.036
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The cointegration investigates the long-run relationship between the variables. It assesses the movement from each relative to a shock or any deviation. However, the rule of cointegration states that variables must have a unit root and no unit root in the error term. Table 2 shows that the variables meet the cointegration since the p-value of the error term is less than the 5%

significance level. Conversely, Tables 3 and 4 show the collinearity test using the variance inflation factor under the Belsley-Kuh-Welsch collinearity diagnostics.

Tab. 3: Collinearity test of model 1

Variables	Variance Inflation Factor
Log of Wood Fuel Production	6.271
Log of Population	5.821
Log of Roundwood	2.629

According to the Belsley-Kuh-Welsch collinearity diagnostics, Cond greater or equal to 30 represents strong near-linear dependence between the variables, and Cond between 10 and 30 is moderately strong. The outcomes from Tables 3 show no excessive collinearity in both models estimated using the variance inflation factor. The significance of the multicollinearity test is that its existence in a model violates the classical assumption, which states that the variables should not be a combination (none of the variables should be a perfect explanation of the other).

Regression results

Table 4 indicates the regression coefficients of the model with a log of GDP as the dependent variable. The constant of the model is not statistically significant. All variables of interest were significant for interpretation. The variable's coefficient indicates that Round wood production negatively impacts economic growth in Gabon, whereas population and wood fuel production affect growth positively.

Tab. 4: Model 1 estimation

Indicators	Coefficient	Std. Error	t-ratio	p-value
Constant	-0.406	1.357	-0.299	0.7663
Log of Wood fuel	0.841	0.153	5.494	3.30e-06***
Log of Population	0.874	0.194	4.505	6.75e-05***
Log of Round wood	-0.550	0.132	-4.166	0.0002***

Note: significance code: *** 1%

The log wood fuel production coefficient means an increase of 0.84% will lead to a percentage change in GDP. However, if the population changes by 0.87%, the GDP of Gabon is increased by a percentage difference, whereas a change in the log of Round wood production by 0.55% decreases growth. The evidence that population increases GDP is because as the number of people expands, it leads to a large labour force, which expands the country's output. On the contrary, wood fuel production increases the GDP since most of the population depends on it as a source of energy for cooking and other housing activities. The implication is that as the production of wood fuel increases, demand will expand, which leads to an expansion of the country's aggregate production. However, the model variant shows that the regressors explain 91% of the variation in GDP.

The coefficients of the variables wood fuel production, agriculture, and energy emission are statistically significant. However, the coefficient sign of energy emission shows that an increase will reduce Round wood production. On the other hand, agriculture and wood fuel production positively impact Round wood production. It means that an increase in agriculture and wood fuel expands production. Agriculture and wood fuel production directly affect round wood because agricultural activities such as clearing land for farming lead to an expansion in the dependent variable. Wood fuel production positively affects Round wood production because of their direct linkage. It is because of people's demand for wood fuel for household activities like cooking.

Discussion and Conclusion

The results of this study are in line with research that has identified population growth, wood fuel production and Roundwood production as factors influencing development in countries rich in forests. Forests ecosystems offer a range of benefits globally such habitats, soil regulation, recreation services, air regulation, climate mitigation, recreation services (tourism and eco-tourism services) among others. Moreover, forest ecosystem services are vital in eco-tourism given the biodiversity role they play. However, this study brings perspectives by examining how

energy emissions, agriculture and their consequences impact forest operations and economic progress in Gabon. The positive relationship between population growth and economic advancement underscores the importance of implementing policies to manage population growth for long-term stability. Similarly, the findings on wood fuel production and Roundwood production underscore the need for forest management strategies that balance expansion with environmental conservation objectives (Niang et al., 2017; Nkoumou et al., 2018, Asamoah et al., 2020, World Bank, 2020, Bamwesigye, 2023).

This study provides insights into the factors affecting forest-related activities and their effects on growth in Gabon. The results highlight the significance of adopting approaches to forest management that consider not only factors but also social, environmental, and cultural aspects related to forest resources. By integrating forest management practices with strategies, decision makers can promote both forest preservation and economic development in Gabon, ensuring prosperity for future generations in modern forest services such as biodiversity conservation and eco-tourism services.

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Souhrn

Lesní ekosystémy nabízejí v celosvětovém měřítku řadu přínosů, jako jsou mimo jiné stanoviště, regulace půdy, rekreační služby, regulace ovzduší, zmírňování klimatických změn, rekreační služby (turistika a ekoturistika). Pochopení hnacích sil činností souvisejících s lesy má zásadní význam pro rozvoj politik podporujících zachování lesů a hospodářský pokrok. Tento výzkum zkoumá faktory ovlivňující činnosti související s lesy a jejich důsledky pro růst v Gabonu; velikost populace, produkci dřevních paliv, produkci kulatiny, emise energie, zemědělství a hrubý domácí produkt (HDP). Odhalujeme významné souvislosti pomocí testů, jako je rozšířený Dickey Fullerův (ADF) a Engleho Grangerův kointegrační test pro posouzení stacionarity a dlouhodobých vztahů mezi těmito proměnnými, jakož i vícenásobné regresní analýzy metodou obyčejných nejmenších čtverců (OLS), abychom pochopili jejich dopad na hospodářský růst. Naše výsledky zdůrazňují, že počet obyvatel a produkce dřevních paliv ovlivňují růst, zatímco produkce kulatiny má negativní dopad. Navíc zjišťujeme, že výroba dřevních paliv a zemědělství přispívají k rozšiřování produkce kulatiny, zatímco emise energie rovněž ovlivňují ekonomiku, a přesto jsou považovány za rozhodující faktory odlesňování. Tyto poznatky by mohly být vodítkem pro tvůrce politik v Gabonu, jejichž cílem je vypracovat strategie pro hospodaření v lesích a ochranu krajiny mezi ekonomickými ambicemi a zároveň zajistit moderní lesnické služby, jako je ochrana biologické rozmanitosti a ekoturistické služby.

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DESIGNING HEALTHSCAPES FOR THE DUDINCE SPA RESORT IN SLOVAKIA

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Abstract

The Dudince Spa Resort is situated in southern Slovakia, close to the Hungarian border. It is famous for its Roman Spa, which consists of natural travertine formations set in a hilly terrain. An important recreational asset of the resort is the forest park Búroš and various site furniture for outdoor recreation, leisure, sport, and recovery. The first written report on the healing mineral water dates to 1777. The Czechoslovak State Spa Resort was founded in 1953 and Dudince was declared a spa town in 1983. In 2003, the Dudince Spa Resort was established, and it has been continuously investing in developing the overall area of the spa park, its visual and functional quality. In 2023, the Institute of Landscape Architecture was commissioned to develop a landscape architectural study of the 'Area of Health' located at the southern periphery of the resort. Through research by design, we have developed two possible scenarios. One works with the vision of a 'Garden of Emotions' and the other one develops the idea of a 'Garden of Senses' for spa clients, visitors, and inhabitants of Dudince. The paper presents the outcomes of the study and evaluates both scenarios with different design approaches, while discussing further steps and visions for the 'Area of Health'.

Keywords: design teaching, green infrastructure, landscape architecture, research by design, research-led teaching

Introduction

Spa resorts, like hospital areas, provide important open spaces for recreation and recovery (Halajová et al., 2019) and are specific components of green infrastructure systems (Tóth, 2022a), both in urban (Fornal-Pienak and Bihuňová, 2016; Bihuňová et al., 2021) and rural landscape settings (Čibík et al., 2020; Tóth, 2022b). These areas usually have a high species diversity, and the woody vegetation composition includes a wide range of non-traditional tree species (Bakay, 2015; Hus et al., 2021; Bechera et al., 2022). The Spa Resort Dudince has commissioned the Institute of Landscape Architecture at the Slovak University of Agriculture to develop design ideas for the so-called Area of Health, which is part of the spa resort, located at its southern periphery. The assignment was elaborated in 2023 within the Special Green Space Design Studio.

Material and methods

The Dudince Spa Resort is situated in southern Slovakia, close to the Hungarian border. It is famous for its Roman Spa, which consists of natural travertine formations set in a hilly terrain. An important recreational asset of the resort is the forest park Búroš and variable site furniture for outdoor recreation, leisure, sport, and recovery. The first written report on the healing mineral water dates to 1777. The Czechoslovak State Spa Resort was founded in 1953 and Dudince was declared a spa town in 1983. In 2003, the Dudince Spa Resort was established, and it has been continuously investing in developing the overall area of the spa park, its visual and functional quality. In 2023, the Institute of Landscape Architecture was commissioned to develop a landscape architectural study of the 'Area of Health' located at the southern periphery of the resort. Students worked in two main creative phases (analysis and design). The first design phase started with field works and mapping and continued with the analysis of wider spatial relations, historical development, landscape context, functional and spatial characteristics, built structures and technical infrastructure. The design process was conducted by two student groups, each of three persons, supervised by two teachers. The main methodological approach applied was research by design, while developing two possible scenarios. The process was communicated with representatives of the spa resorts and final outcomes were presented at a meeting.

Results

The design studio has generated two possible scenarios for the Area of Health of the Dudince Spa Resort. One works with the vision of a 'Garden of Emotions', see figures 1-3, and the other one develops the idea of a 'Garden of Senses' for spa clients, visitors, and inhabitants of Dudince, see figures 4-5.



Fig. 1: The Garden of Emotions (authors: N.Bábiková, D.Keller, and S.Rozkoš, supervisors: A.Tóth and M.Bihuňová, 2023).

The Garden of Emotions design concept dedicates the Area of Health to physical, mental, and social health. The design includes a comprehensive path system. The grasslands are designed to be selectively managed as intensive lawns and extensive flower meadows. The project incorporates existing trees and shrubs and green spaces are enhanced by lavender fields, a community garden, a public orchard, a pollinator meadow with apitherapy and many new opportunities for sports and recreation, see figures 2 and 3.



Fig. 2: A flower meadow with small structures for apitherapy and equipment for bees and pollinators (authors: N.Bábiková, D.Keller, and S.Rozkoš, supervisors: A.Tóth and M.Bihuňová, 2023)



Fig. 3: Geometric lavender fields and a community garden (left) and equipment for sports and games (right) enhance the cultural ecosystem provision by the Area of Health (authors: N.Bábiková, D.Keller, and S.Rozkoš, supervisors: A.Tóth and M.Bihuňová, 2023).

The Garden of Senses has a path system consisting of a geometric shaped concrete walkway in combination with an organically shaped pathway for enjoying the garden. Along the main geometric shaped pathway, there are different attractions catching the attention of visitors and users and addressing their five senses through a diverse vegetation and artistic elements that are focussed in several thematic zones throughout the garden, see figures 4-5.



Fig. 4: The Garden of Senses (authors: P.Halová, K.Remenárová, and K.Žuffová, supervisors: A.Tóth and M.Bihuňová, 2023).



Fig. 5: Different impressions of the thematic zones dedicated to senses (authors: P.Halová, K.Remenárová, and K.Žuffová, supervisors: A.Tóth and M.Bihuňová, 2023).

Discussion

All authors integrated principles and elements of green infrastructure as suggested by Tóth (2022a). The implemented design solutions can also raise awareness of the visitors on the environment and nature-based solutions (Tóth et al., 2018) and provide spaces for improving physical and mental health (Halajová et al., 2019). 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 teaching and learning (Čakovská et al., 2019).

Conclusion

Solutions generated within the design studio include a set of analyses and design ideas for the Area of Health in the Dudince Spa Resort. The outcomes of the design studio are currently being used as a basis and starting point for a long-term process of a comprehensive redesign, that has already started through an intensive exchange between the municipality and the management of the spa resort.

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Souhrn

Lázeňský resort Dudince se nachází na jižním Slovensku, nedaleko maďarských hranic. Je známé svými římskými lázněmi, které tvoří přírodní travertinové útvary zasazené do kopcovitého terénu. Významným rekreačním přínosem lázní je lesopark Búroš a různý mobiliář pro venkovní rekreaci, odpočinek, sport a zotavení. První písemná zpráva o léčivé minerální vodě pochází z roku 1777. Československé státní lázně byly založeny v roce 1953 a v roce 1983 byly Dudince vyhlášeny lázeňským městem. V roce 2003 vznikl Lázeňský resort Dudince, který průběžně investuje do rozvoje celkové rozlohy lázeňského parku, jeho vizuální a funkční kvality. V roce 2023 bylo Ústavu krajinářské architektury zadáno vypracování krajinářsko-architektonické studie "Areálu zdraví", který se nachází na jižním okraji lázní. Prostřednictvím

průzkumu podle návrhu jsme vypracovali dva možné scénáře. Jeden pracuje s vizí "Zahrady emocí" a druhý rozvíjí myšlenku "Zahrady smyslů" pro klienty lázní, návštěvníky a obyvatele Dudinců. Článek představuje výsledky studie a hodnotí oba scénáře s různými přístupy k návrhu a zároveň diskutuje další kroky a vize pro "Oblast zdraví".

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DETERMINATION OF THE HISTORICAL CULTURAL LANDSCAPES AND ITS APPLICATION IN LANDSCAPE PROTECTION AND PLANNING

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Abstract

The historic cultural landscape represents a significant natural and cultural heritage. Thanks to its specific features (landmarks), cultural and historical values and attractiveness, the cultural landscapes have a high potential for the development of recreation and tourism. The Czech Republic is an area with a high concentration of preserved fragments of historic cultural landscapes. However, some of them have not yet been sufficiently explored and identified, as a result of that the protection of landscape values and character, as well as its use for education and recreation are not adequately addressed. In order to identify and subsequently protect them, we developed in cooperation with partners methodologies for identification, interpretation, typology, and presentation of historic cultural landscapes of the Czech Republic. These are currently being tested on the example of the South Moravian Region. The obtained results are usable not only for heritage management and ensuring general landscape protection, but also as a tool of identification of tourist attractors. The paper presents the mentioned above methodologies and points out the possibilities of their application in landscape protection and development of recreation.

Keywords: landscape heritage, historic landscape typology, tourism, landscape planning, Czech Republic

Introduction

The historic cultural landscape represents a significant natural and cultural heritage and co-creates the cultural identity of the site and inhabitants. Cultural landscapes are primarily based on the combination of natural and human activities that occur in the area of interest (Taylor, Lennon, 2011). Landscapes can be considered as a kind of historical document, a palimpsest, in which the historical land use pattern is partly recorded. Landscapes began to be understood as an object of heritage protection in the Czech Republic as early as 1956. The general protection of the historic landscape characteristics shaping the character of the landscape and its identity was also supported by the European Landscape Convention in 2000.

The Czech Republic is a territory with a high concentration of preserved fragments and elements of historic cultural landscapes despite the fact that area was significantly changed and unified during the period of Communism. The remnants of historic elements and structures of common landscapes have long been neglected values of the landscape and have only sporadically been the subject of interest for conservation. As a result of the lack of systematic research on the territory of the Czech Republic, the protection of the heritage values of the common landscape and its use for education and recreation has not been systematically used.

Research in the field of identification and interpretation of historic cultural landscapes has been carried out at the Department of Landscape Planning of the Faculty of Horticulture, Mendel University in Brno for a long time, mainly thanks to the support of the projects of the Ministry of Culture of the Czech Republic for National and Cultural Identity (NAKI). Thanks to the support of a number of research projects, a typology of historic cultural landscapes of the Czech Republic has been created, key elements and landmarks of individual landscape types have been defined and a number of methodologies have been developed to specify the correct way of interpretation and presentation of historic cultural landscape types. The developed methodologies were subsequently verified on a number of case areas, processed at various scales of details so that the results obtained are usable in the field of spatial planning, general landscape protection and heritage management.

Materials and methods

The identification of valuable types of historic cultural landscape is based on the correct identification of historical landscape elements and structures – features/landmarks of the historic cultural landscape. The method of identifying features varies depending on the category of historic cultural landscape. The basic categories were defined in 1992 at a special meeting of the ICOMOS/IFLA Bureau. They are designed landscapes, organically evolved landscapes, and associative landscapes.

The prerequisite for the identification of a designed landscape is the definition of the spatial design of landscape composition (compositional elements, units, axes and lines) and the correct interpretation of the compositional purpose (more in Kulišťáková et al., 2014). Organically evolved landscapes can be identified mainly by comparing historical and contemporary forms of land use (e.g. Jelen, Šantrůčková, Komárek, 2021; Ehrlich et al., 2020). Associative landscape types are the most difficult to identify, where the key is to evaluate the relevant association (story) and its relations to specific sites or elements of the cultural landscape (e.g. Šantrůčková et al., 2020).

Depending on these categories, the catalogues of landscape features have been drawn up individually for each category and type of the historic cultural landscapes. The landscape features have been identified on the basis of the study of archival documents, old maps, vedutas, historical photography, cadastral data or by methods of non-destructive archaeology (Kuna et al., 2004). The basic inventory and description of features of historic cultural landscapes has been elaborated in the methodology for a standardised landscape record for the needs of the management of landscape conservation zones (Kučová et al., 2014). The method of defining the features has subsequently been refined by other methodologies, in particular the Typology of Historical Cultural Landscapes (Ehrlich et al., 2020) and the Identification and Classification of Areas of Landscape Value (Kuča et al., 2022). The methodological approaches were subsequently validated on case areas of different landscape types. The research results were compiled into special analytical maps, which are available for study on the project websites: Protection and Management of Historic Cultural Landscape through Landscape Conservation Areas (www.kpz-naki.cz), Identification and Presentation Heritage Potential of Historic Cultural Landscapes in the Czech Republic (www.hikk-naki.cz) or Practical Approaches to Territorial Conservation of Historical Cultural Landscape (www.krapr-naki.cz).

The mentioned above methodologies were used to define units of historic cultural landscape across the territory of the Czech Republic. The identification of historic cultural landscape units in the South Moravian Region is currently underway in order to assess their potential threat from climate change. The research procedure consists of the three basic steps: 1. step is based on the study of historical maps and other pictorial sources, literature, available database systems and the study of current maps and aerial photographs of the South Moravian Region, areas with potential for determination of the historic cultural landscape units were first identified for each type of historic cultural landscape (according to Ehrlich et al., 2020); 2. step: these territories were subsequently subjected to deeper analysis based on comparison of historical data with the current state of area according to historical maps, orthophotos, supplemented by field and archival research in order to verify the preservation and significance of historical landscape elements and features in the case areas so that they meet the requirements of the methodology of Kuča et al. (2022); 3. step: a shortlist of historic cultural landscapes in the South Moravian Region was completed. At present, the definition of historic cultural landscape units at the scale of 1 : 10000 is being specified.

Results

The determination of the types of historic cultural landscape in the territory of the South Moravian Region is currently being completed in the form of an interactive map so that it can be accessible in the form of open access to all potential users. The map will be available after its approval by the Ministry of Culture by the end of this year. Individual areas of the historic cultural landscapes are simultaneously being processed in greater spatial detail, in which all key elements of the historic landscape structure can be recorded. An example of the graphical layout of the map is shown in Figure 1. A general overview of the types of historic cultural landscape that have been determined in the territory of the South Moravian Region is given in Table 1.

Tab. 1: The list of historical cultural landscape types and their presence in the territory of the South Moravian Region.

Historic Landscape category	Type No.	Historic landscape type	Identified (X = present)
I. Designed landscapes	1	Geometrically designed landscape	X
	2	Idealised „Natural“ Picturesque landscape	X
	3	Combined (designed) landscape	X
	4	Spa landscape	-
	5	Landscape of Pilgrimage Sites	X
II. Organically evolved landscapes	6	General organically evolved landscape	X
	7	Landscape with a Specific Settlement Structure	X
	8	Landscape of Structurally Distinct Ploughed Field	X
	9	Landscape of Landlords Manorial Farms	X
	10	Landscape of Vineyards	X
	11	Hop Field Landscape	-
	12	Orchard Landscape	X
	13	Fishpond Landscape	X
	14	Pasture and Meadow Landscape	X
	15	Game Preserve and Forest Landscape	X
	16	Landscape of Ancient Fortified Settlements	X
	17	Urban Landscape	X
	18	Landscape of Water Reservoirs	X
	19	Hiking Landscape	-
	20	Landscape of Backcountry Camping Settlement	-
	21	Landscape of Deep Mining	-
	22	Landscape of Opencast Mining	-
	23	Stone Quarry Landscape	X
	24	Industrial Landscape (without direct ties to extraction)	-
	25	Linear Industrial Landscape	X
	26	Landscape of Border Fortifications	X
	27	Landscape of Military District	-
III. Associative landscapes	28	Landscape of Myths and Legends	-
	29	Battlefield Landscape	X
	30	Landscape of Depopulated Territories	-
	31	Landscape of Exterminated Settlements	-
	32	Landscape of Prison Camps of Suffering and Death	X
	33	Landscape of a Significant Historic Events	-
	34	Landscape Related to an Important Personality	X

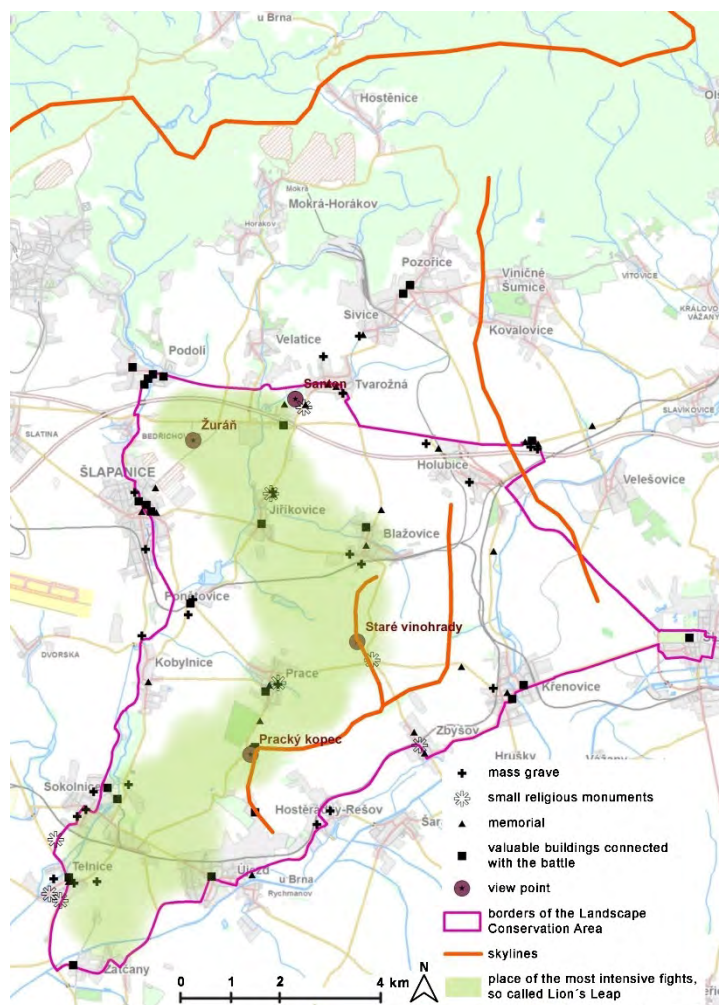


Fig. 1: Example of the determined elements and the border of unit of the historic cultural landscape of the Battlefield Austerlitz (Salašová, Matějková, Sedláček, Šesták, Matějka, Flekalová, 2019)

Discussion

Map records identifying historic cultural landscape types and their features can be used in several ways. First of all, it is an important basis for the preparation of the register and evidence of heritage conservation object. It can be used as a basis for defining and implementing appropriate conservation management. If the analysis reveals significant overlaps between different types of historic cultural landscape or their large territorial extent, the possibility of declaring such a landscape conservation zone can also be considered. Another possibility of using the results is to incorporate them into the drawing of values within the spatial planning analysis documents. In this way, the recorded phenomena receive a higher level of protection in the context of general landscape conservation (e.g. landscape character protection according to §12 of Act No. 114/1992 Coll., on Nature and Landscape Conservation). At present, mapping of significant units of the historic cultural landscape of the South Moravian Region is underway in order to identify their possible threat from the consequences of climate change. This will form the basis for refining the regional adaptation plans to climate change. Last but not least, maps containing the identification of types of historic cultural landscape and their key historical features are a useful basis for assessing the landscape potential for the development of tourism and recreation (e.g. see Vítovská, 2023).

Conclusion

The identification of the features and units of historic cultural landscapes is an important part and prerequisite of landscape protection, planning and management in the context of the

Council of Europe Landscape Convention. It is a professionally demanding process requiring a multidisciplinary approach and detailed study of historical maps and archival documents, as well as thoroughgoing field research. The processing of the results of identification and interpretation of the historic cultural landscape in the form of maps will find wide application in the field of monument protection, general landscape protection and landscape character, as well as in recreation and tourism development plans. The article provided information on the methodologies used for identification of historic cultural landscape types and the results of their verification in the form of maps with professional content.

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Souhrn

Historická kulturní krajina představuje významné přírodní a kulturní dědictví a spoluutváří kulturní identitu obyvatel. Díky své kulturně historické hodnotě a atraktivitě má vysoký potenciál pro rozvoj rekreace a cestovního ruchu. Česká republika je územím s vysokou koncentrací dochovaných fragmentů historické kulturní krajiny. Část z nich ale není dosud dostatečně prozkoumaná a identifikována v důsledku čeho není adekvátně řešena ochrana památkových hodnot a krajinného rázu území, ani využití pro vzdělávání a rekreaci obyvatel. Pro identifikaci a následnou ochranu byly na našem pracovišti ve spolupráci s partnery vyvinuty metodiky na identifikaci, interpretaci, typologii a prezentaci historických kulturních krajín ČR. Ty jsou aktuálně

ověřovány na příkladu území Jihomoravského kraje. Získané výsledky jsou využitelné nejenom pro památkovou péči a zajištění obecné ochrany krajiny v územním plánování, ale i pro identifikaci významných turistických atraktorů území. Jsou základním podkladem pro následnou prezentaci tohoto specifického přírodního a kulturního dědictví širší veřejnosti. V příspěvku jsou představeny výše uvedené metodiky a objasněné možnosti jejich aplikace pro potřeby ochrany krajiny a rozvoje rekreace a cestovního ruchu.

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EFFECTIVENESS OF ECODUCTS AND HUMAN ACTIVITY

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Abstract

Ecoducts address the threat of biodiversity decline due to anthropogenic activities by preserving landscape connectivity. In this study, human and wildlife interactions on ecoducts in the Czech Republic are evaluated. Results from Rozkoš and Václavice ecoducts in the Liberec region monitored by camera trapping as part of a wider project involving a total of 23 migration sites across the country were analysed. Wildlife activity peaks at night, contrasting with daytime human usage. Proximity to settlements influences human activity, with Rozkoš attracting more cyclists due to its location. Discussion emphasizes ecoducts' dual role in facilitating wildlife migration and enhancing landscape recreation. Despite human presence, wildlife migration remains resilient, especially at night. Understanding usage patterns informs future ecoduct design and management for biodiversity conservation and human recreation.

Keywords: green bridge; anthropogenic disturbance; wildlife monitoring; camera trap

Introduction

Transport infrastructure and other anthropogenic activities are one of the main drivers of the global decline in biodiversity (IPBES, 2019). Increasing traffic volumes and further construction of highway infrastructure have been a serious threat to landscape connectivity for wildlife in recent decades (Papp et al., 2022). One way to preserve the connectivity of the landscape is to build special migratory passages across infrastructure (Soanes et al. 2024). These were first built in America and Europe but gradually began to appear in all countries with heavy traffic (Brennan, Chow, Lamb, 2022). The ecoducts can occur both in forest environments (connecting forest complexes) and in intensively used cultural landscapes (connecting mainly agricultural landscapes with fields, meadows or orchards). Migratory objects are often operated as multi-purpose structures, i.e. they are not only a solution for wildlife but also provide local accessibility such as field and forest routes, cycleways or walking paths (Warnock-Juteau et al., 2022). The first ecoduct in the Czech Republic was put into operation 25 years ago, in 1999, near the village of Dolní Újezd on the D35 motorway. By the end of 2023, a total of 34 objects that can be considered as an ecoduct or similar construction (type design N1 to N4 according to Hlaváč et al., 2020) have been built in the whole country, of which one object is located on the railway, all others on motorways or national roads.

The paper aims to evaluate two ecoducts in the Czech Republic concerning their use by humans including local recreation and leisure activities and the possible negative impact on their effectiveness in terms of wildlife migration.

Material and methods

The camera-trapping method was the main approach for recording activity on migratory objects as it is an effective non-invasive method for collecting data on wildlife species (Delisle et al., 2021; Oliver et al., 2023). Oxe Spider traps were used, which allow sending photos by email over the GSM network. To receive, process, and evaluate the images from the camera traps, a common database was set up, which automatically stores the photos from incoming emails as individual records, which are subsequently manually analyzed and cleaned of blank and repeated shots. Multiple traps were installed at larger ecoducts to cover the entire area adequately.

Of the 34 sites, 23 ecoducts were monitored for at least part of 2023, of which 11 sites were monitored year-round. At least one trap per ecoduct was in operation for 4,997 days. For some highly exposed ecoducts, monitoring was only started later in the growing season so that the

traps could be hidden to prevent theft. Despite this, monitoring had to be stopped at 7 sites due to traps being robbed. In total, about 150,000 photos were received by the database, from which about 65,000 records relevant to monitoring were processed.

Results

In the following section, the movement of people and their activities at two selected ecoducts in the Liberec region were evaluated to reveal their regular daily and weekly patterns.

The first selected ecoduct is Václavice (10 km north of Liberec) on the national road I/35. It is located in an agricultural landscape with plenty of landscape greenery in the close vicinity of the migration object. Two camera traps were in operation for 299 days (43 weeks) during the period March to December 2023 covering the entire area of the ecoduct. During this time there were 2,954 records (see Fig. 1) of which 2,388 (80.8%) belong to wildlife. Of the rest, 440 records involved a person alone or with a dog, 20 cases involved a horse rider and 16 times a cyclist occurred. There were also 35 motor vehicles recorded and 55 records were classified as unrecognized.

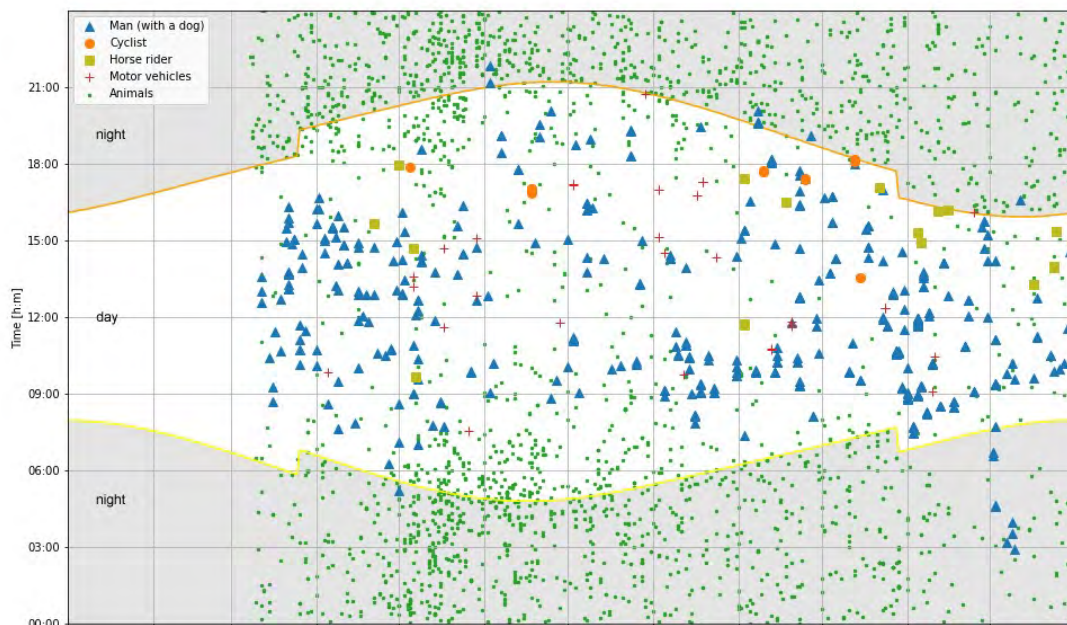


Fig. 1: All-year records of the movement at Václavice ecoduct

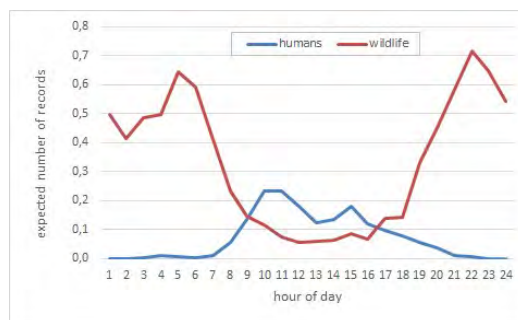


Fig. 2: Daily pattern - Václavice

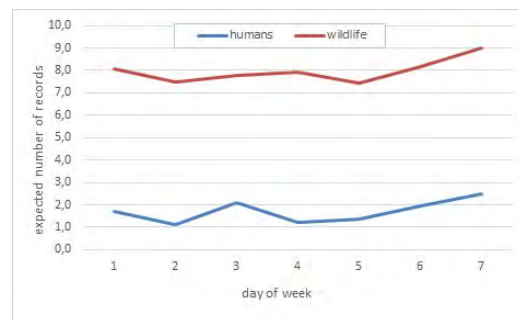


Fig. 3: Weekly pattern - Václavice

Fig. 2 shows a clear difference between human and wildlife activity within each day. For animals, activity is predominantly nocturnal with a peak in the early evening and early morning hours (0.72 and 0.65 expected records per hour, respectively), dropping to 0.05 expected records per hour during the day. In contrast, people use the ecoduct predominantly during the day with a peak of 0.23 expected records per hour in the morning. The weekly pattern in Fig. 3 revealed that the ecoduct is fairly evenly used on all days of the week by both wildlife and

people. Both series of values indicate slightly increased activity around weekend days, especially Sundays (2.47 and 9.00 expected records, respectively). For humans, there is then a secondary peak on Wednesday (2.12 expected record), while Tuesday, Thursday and Friday values are significantly lower (1.19 to 1.39 expected record). For wildlife, there is a non-significant peak on Thursday with a 7.93 expected record compared to a minimum of 7.42 on Friday.

The second selected ecoduct is Rozkoš on the I/13 road, which was completed in May 2023 and is thus the newest ecoduct in the Czech Republic. It is located on the border of a forest complex and pastures. Its construction was complemented by the fencing of the entire adjacent section of the national road, as the main motivation for the construction was the high morality of game on this stretch. The two camera traps were installed immediately after the completion of the vegetation works on the site at the end of May 2023 and were in operation for the rest of the year, i.e. 216 days (31 weeks). There were 4,577 records (see Fig. 4), of which 4,144 (90.5%) were wildlife. Of the 4577 records, 4,144 (90.5%) were wildlife. Human activity was recorded on 430 occasions (249 men with or without dogs; 129 cyclists; 28 horse riders and 24 motor vehicles) while 3 cases remained unidentified. The immediate response of the animals to the new ecoduct was interesting, with the first records coming as soon as it was completed.

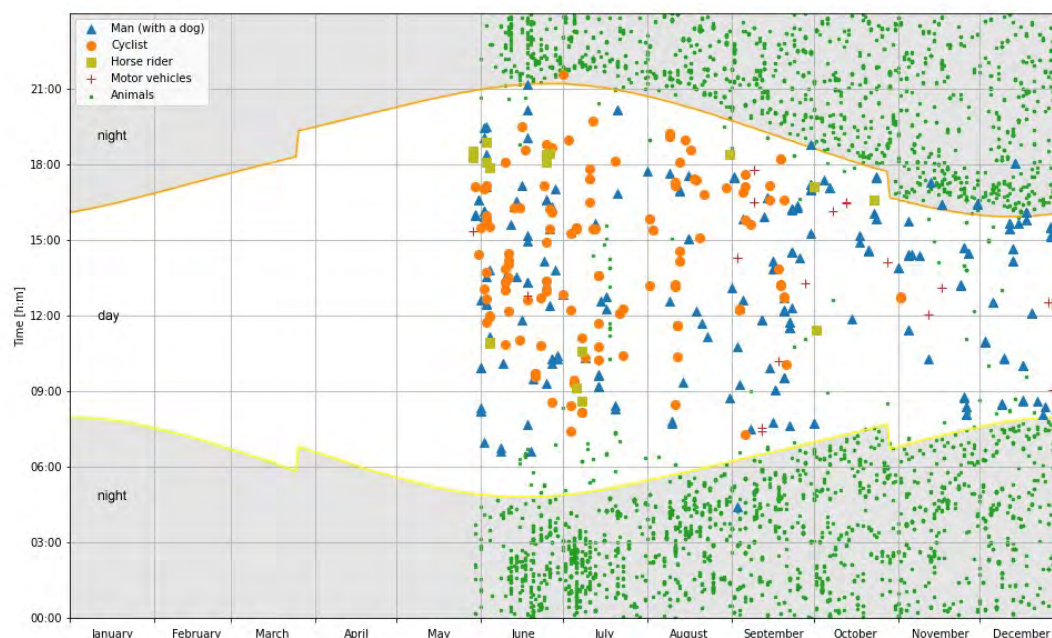


Fig. 4: All-year records of movement at Rozkoš ecoduct

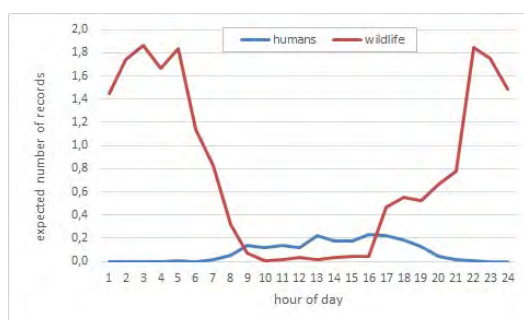


Fig. 5: Daily pattern – Rozkoš

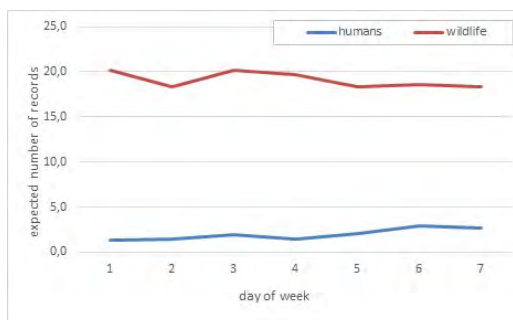


Fig. 6: Weekly pattern - Rozkoš

In terms of diurnal pattern, the trends are similar to Václavice, but in this case, there is an even more noticeable difference between the use of the object by wildlife at night and during the day.

Again, there are two nocturnal peaks (1.84 and 1.87 expected records per hour), but daytime use is virtually nil, with only single records during the entire monitoring period. Human activity overnight was also completely zero all the time, but daytime activity peaked in the afternoon (0.24 expected record per hour). The weekly pattern for humans is similar to Václavice, with a weekend peak of 2.93 expected daily records) including a minor peak on Wednesday (1.97 daily records), while for animals are nonsignificant peak days on Monday, Wednesday, and Thursday.

Discussion

In addition to their primary function of facilitating wildlife migration, ecoducts also serve as objects for improving the recreational function of the landscape - its permeability for people, especially in their leisure activities, e.g., walking in the vicinity, walking dogs, recreational running, cycling, horse riding (Warnock-Juteau et al., 2022). In particular, the distance from the nearest settlements, or the presence of hiking trails, bike paths, or local roads, is crucial for the intensity of people's daily movement on the ecoduct; the surrounding terrain and elevation also play a role. From this point of view, the Rozkoš ecoduct has a greater potential for human use (immediate proximity to the cycle path, closer distance to the settlement). The representation of cyclists here is significantly higher than at the Václavice ecoduct. As expected, the results confirmed that wildlife migration on ecoducts takes place mainly at night and that human movement on ecoducts during the day is only slightly restrictive for animals. Nevertheless, especially in the morning and evening hours, some species can take advantage of the absence of humans to pass through the ecoduct undisturbed.

Conclusion

The newly built ecoducts have multifunctional significance in the cultural landscape. Primarily they are designed for the migration of wildlife, but they are also used by people, especially for leisurely everyday activities - walking, dog walking, cycling, and horse riding. The proximity of settlements, the proximity of hiking and cycling trails, or the attractiveness of the surrounding area in terms of tourism and hiking are particularly important for the intensity of human movement. However, even with possible human disturbance, the monitored ecoducts are subject to intensive wildlife migration, especially at night or in the morning or evening.

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Souhrn

Ekodukty řeší hrozbu poklesu biologické rozmanitosti v důsledku antropogenních činností tím, že zachovávají propojení krajiny. V této studii jsou hodnoceny interakce člověka a volně žijících živočichů na ekoduktech v České republice. Byly analyzovány výsledky ze ekoduktů Rozkoš a Václavice v Libereckém kraji sledovaných fotopastmi v rámci širšího projektu zahrnujícího celkem 23 migračních míst po celé republice. Aktivita volně žijících živočichů vrcholí v noci, což kontrastuje s denním využíváním lidmi. Blízkost sídel ovlivňuje lidskou aktivitu, přičemž Rozkoš díky své poloze přitahuje více cyklistů. Diskuse zdůrazňuje dvojí roli ekoduktů při usnadňování migrace volně žijících živočichů a posilování rekreace v krajině. Navzdory lidské přítomnosti zůstává migrace volně žijících živočichů odolná, zejména v noci. Pochopení vzorců využívání slouží jako informace pro budoucí navrhování a správu ekoduktů pro ochranu biodiverzity a rekreaci lidí.

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EFFICIENCY OF FOREST NATURAL HABITATS CONSERVATION IN THE OUTER WESTERN CARPATHIANS (CZECH REPUBLIC)

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Abstract

The Outer Western Carpathians (OWC) in the Czech Republic is forested mountain region interesting from the viewpoints of biodiversity conservation. Currently, the OWC region is covered by Beskydy and White Carpathians protected landscape areas (PLAs). In this study, the original expert method the NCEI (Nature Conservation Efficiency Index) is applied to the assessment of the forest natural habitats conservation efficiency in the OWC. The assessment is based on mapping of natural habitats in the frame of establishment the Natura 2000 network. NCEI has been calculated as a ratio of the total area of a particular habitat type in both PLAs divided by the total area of that same habitat in the Czech Republic. The conservation efficiency of FNH reflect their area cover in OWC and does not directly correlate with the threat rate of individual FNHs.

Keywords: forest biodiversity, habitat mapping, Natura 2000, Nature Conservation Efficiency Index

Introduction

The Outer Western Carpathians (OWC) in the Czech Republic is a forested mountain region interesting from the point of view of biodiversity conservation (Wolf et al., 2013). Conservation importance of this region is supported by the presence of large carnivores (Kovářík et al., 2014) and extraordinary plant diversity (Otypkova et al., 2011). The OWC in the territory of the Czech Republic consist of the two main mountain systems: Beskydy Mountains and White Carpathian Mountains. Both of these mountains belong to the Flysch Belt of the OWC. Most of the OWC in the Czech Republic was not influenced by human activities even up to the end of 16th century when extensive grazing activity and deforestation occurred. This period is so-called Wallachian colonization of montane forestland (Gebica et al., 2013). Extensive grazing can be considered as one of the main factors forming the current cultural landscape of Beskydy and White Carpathians (Opršal et al., 2016) with very high alpha-biodiversity of natural habitats. Currently, both Beskydy and White Carpathians are proclaimed as protected landscape areas (PLA). The prevailing land covers (matrix) of the landscape of both PLAs are formed by forest habitats. Major part of these forest habitats have been transformed into spruce monocultures with low alpha-diversity in the past, while some have maintained the character of forest natural habitats. These remaining forest natural habitats represent important biodiversity refuges of Carpathian forests within the OWC. The aim of the study is to assess the efficiency of protected areas for conservation of Carpathian forest biodiversity in territory of the Czech Republic.

Materials and methods

We applied the NCEI index (Nature Conservation Efficiency Index, see in detail Pechanec et al., 2018) to measure the effectiveness of habitat conservation. The NCEI index is calculated for specific habitat types as the total area of a particular habitat type in the studied PLAs (Beskydy and White Carpathian) (TANHPLA) divided by the total area of particular habitat in the Czech Republic (TANHcz):

$$\text{NCEI} = \text{TANHPLA} / \text{TANHcz} \quad (1)$$

The method is used the data from the mapping of natural habitats in the Czech Republic within the of Natura 2000 system. Natural habitats are defined in the Catalogue of Habitats in the Czech Republic (Chytrý et al., 2010). The NCEI index ranges from 0 (absence of protection) to

1 (totally effective protection). The calculated value of NCEI > 0.75 indicates a highly effective habitat protection (more than 75% of the total area of all identified natural habitats are protected by means of PLA), values between 0.74–0.50 indicate intermediate habitat protection (more than 50% of the total area of natural habitats are integrated in PLAs, and values NCEI ≤ 0.49 indicate low habitat protection (PLAs cover less than 50% of the total area of a particular natural habitat).

Results

Of the total of 43 types of forest natural habitats in the Czech Republic, there are 12 types in the WCPLA and 15 types of forest natural habitats (FNH) in the BPLA. In the south-located WCPLA, thermophilous types of FNH: L3.4 (Pannonian oak-hornbeam forests), L6.1 (Peri-Alpidic basophilous thermophilous oak forests) and L6.2 (Pannonian thermophilous oak forests on loess) were mapped. These FNH types occur in the low-level part of WCPLA in a few mapped segments (Table 1), where the southern boundary of the WCPLA reaches the northern boundary of Pannonian biogeographic provinces.

Tab.1: Mapped forest natural habitats in WCPLA

Habitat	Habitat code according to Catalog	Total area of habitat in the PLA [km ²]	Total area of habitat in Czech Republic [km ²]	NCEI
Alder carrs	L1	0.01	37.47	0
Ash-alder alluvial forests	L2.2	9.98	796.04	0.01
Hardwood forests of lowland rivers	L2.3	0.19	241.38	0
Willow-poplar forests of lowland rivers	L2.4	0.01	26.43	0
Pannonian-Carpathian oak-hornbeam forests	L3.3	74.79	437.58	0.17
Pannonian oak-hornbeam forests	L3.4	0.22	57.05	0
Ravine forests	L4	1.62	209.33	0.01
Herb-rich beech forests	L5.1	117.21	1229.28	0.1
Acidophilous beech forests	L5.4	2.66	1473.99	0
Peri-Alpidic basophilous thermophilous oak forests	L6.1	0.01	9.11	0
Central European basophilous thermophilous oak forests	L6.4	3.41	39.18	0.09
Dry acidophilous oak forests	L7.1	0.23	397.51	0

On the contrary, in the BPLA with dominating higher altitudes, the FNH segments typical for the climatically cooler Carpathian mountain areas (Table 2) were mapped in the mountainous locations: L2.1 (Montane gray alder galleries), L8.1 (Boreo-continental pine forests), L9.1 (Montane Calamagrostis spruce forests), L9.2 (Bog and waterlogged spruce forests) and L9.3 (Montane Athyrium spruce forests). The situation of the northwest BPLA into the Polonian biogeographical region is the cause of FNH L3.2 occurrence (Polonian oak-hornbeam forests). Several segments of FNH L7.2 (Wet acidophilous oak forests) are bound by their occurrence on the specific ecological conditions of pseudogley soils that rarely occur in the BPLA in regions dominated by FNH Acidophilous beech forests (L5.4).

All forest natural habitat types both in the WCPLA (Tab. 1) and in the BPLA (Tab. 2) are associated with low efficiency of protected areas (NCEI ≤ 0.49). The low conservation efficiency by NCEI (Tab. 1 – 2) of both studied PLAs for forest natural habitats reflects i) their large total area within the Czech Republic and ii) the fact that the landscape in the OWC has been seriously changed by human activities in the past.

Discussion

The results of the mapping of forest natural habitats in the OWC have shown differences in the representation of habitat types in the BPLA and the WCPLA, although both the PLAs are immediately adjacent. Differences between the occurrence of FNH types in the WCPLA and the BPLA are subject to a slight difference in the geographical location of both PLAs combined with the different altitude range of both areas, which is manifested in a different representation of the vegetation stages. Habitat protection in the Czech Republic is concentrated primarily on the smallest segments of rare natural habitats. The maximum conservation efficiency (NCEI = 1) in the form of protected areas in the Czech Republic applies to 22 types of natural habitats, for example to almost all natural habitats of the alpine zone above the tree line, which represents a unique environment threatened by the climate-induced upward tree-line shift (Machar et al., 2017). The analysis performed in the OWC by NCEI index calculation for each of FNH show very low conservation efficiency of both PLAs. NCEI index calculation, of course, contains a certain degree of uncertainty, characteristic of each environmental index, based on data visualization through GIS (Brus et al., 2017), so its interpretation must take into account the specific regional context. This context for both studied PLAs is due to the priority focus of both PLAs on the protection of non-forest habitat types (Machar, 2012). Therefore, the very low NCEI values (Table 1 and Table 2) indicate little significance for both PLAs for the protection of forest biodiversity in the OWC. So far, the most commonly used method for the assessment of the efficiency of protected areas is the conceptual procedure proposed by IUCN (Plesník, 2012). Under this approach, good care for protected areas is based on an understanding of its existing values and threats that is followed by reasonable planning and funding. The care for protected areas should then foster ecosystem services, providing local people with concrete benefits (Alexander, 2008). Detailed data from field mapping of natural habitats are a very valuable source of information on biodiversity in the protected PLAs. The authors of this article believe that data from the field habitat mapping can be considered as one of the key positive benefits of European nature conservation legislation in the EU Member States, unlike the practical use of Natura 2000 to protect biodiversity that is sometimes lacking practicality (Opermanis et al., 2013).

Tab. 2: Mapped forest natural habitats in BPLA

Habitat	Habitat code according to Catalog	Total area of habitat in the PLA [km ²]	Total area of habitat in Czech Republic [km ²]	NCEI
Alder carrs	L1	0.32	37.47	0.01
Montane grey alder galleries	L2.1	1.07	5.56	0.19
Ash-alder alluvial forests	L2.2	6.63	796.04	0.01
Polonian oak-hornbeam forests	L3.2	2.39	112.58	0.02
Pannonian-Carpathian oak-hornbeam forests	L3.3	12.89	437.58	0.03
Ravine forests	L4	14.93	209.33	0.07
Herb-rich beech forests	L5.1	72.07	1229.28	0.06
Montane sycamore-beech forests	L5.2	0.85	19.51	0.04
Acidophilous beech forests	L5.4	111.67	1473.99	0.08
Dry acidophilous oak forests	L7.1	0.54	397.51	0
Wet acidophilous oak forests	L7.2	0.22	104.13	0
Boreo-continental pine forests with lichens on sand	L8.1A	0.01	11.73	0
Montane Calamagrostisspruce forests	L9.1	4.59	438.81	0.01
Bog spruce forests	L9.2A	0.46	60.02	0.01
Waterlogged spruce forests	L9.2B	2.91	298.13	0.01
Montane Athyriumspruce forests	L9.3	1.59	9.44	0.17

Conclusion

This research on forest biodiversity has a great conservation potential, for example as a decision support tool for landscape management (Czajkowski et al., 2009). Analyses are based on field mapping of natural habitats in 2001 - 2005. This field habitat mapping was implemented within the Natura 2000 European network. The presented results of analyses can support conservation effort of natural forest habitats in the OWC. It can be also important in the wider frame of forest ecosystem services evaluation because of biodiversity is directly joining with ecosystem service provisioning (Nadrowski et al., 2010).

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Souhrn

V této studii je expertní metoda aplikována na hodnocení účinnosti ochrany lesních přírodních stanovišť v oblasti západních Karpat. Hodnocení je založeno na datech mapování přírodních stanovišť v rámci vytvoření evropské sítě Natura 2000. NCEI byl vypočten jako podíl celkové plochy konkrétního typu biotopu v CHKO děleno celkovou plochou stejného biotopu v ČR. Účinnost ochrany přírodních lesních biotopů odráží jejich plošné pokrytí v karpatské oblasti a přímo nekoreluje s mírou ohrožení jednotlivých biotopů. Prezentované výsledky analýz mohou podpořit úsilí o ochranu přirozených lesních biotopů nejen v této lokalitě. Mohou být důležité i v širším rámci hodnocení lesních ekosystémových služeb, protože biodiverzita se přímo propojuje s poskytováním ekosystémových služeb.

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ENVIRONMENTAL EDUCATION OPPORTUNITIES FOR FUTURE TEACHERS

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Abstract

With the ever-increasing impact of human activity on the environment, it is necessary to fully realize that the current trend of interference with nature cannot be continued, as we are reaching a situation where the very essence of life on Earth is beginning to be threatened. Environmental or ecological education is becoming increasingly important as a result of the ongoing serious environmental problems that are beginning to have a very significant impact on human living conditions.

The aim of environmental education carried out in schools should be to guide children and young people not only to act responsibly and create attitudes that support sustainable life on Earth, but also to accept their responsibility for the state of the environment and to spend their free time in the proper and sustainable way.

Keywords: environmental education, experiential pedagogy, forest pedagogy, recreation, free time

Introduction

Průcha and Veteška (2012 p. 93) define it as "education and training of youth and adults for nature protection, environmental care and sustainable development." Within adult education, environmental education is most often implemented in the form of awareness-raising activities or as part of vocational education programmes (Průcha and Veteška, 2012, p. 94).

A full understanding of the concepts of 'sustainable development' and 'sustainable life on Earth' can only be achieved through responsible environmental education that will accompany pupils and students throughout their studies at all levels of school. Environmental education (EE) is therefore essential to raise awareness of the need to protect the environment, preserve and improve the quality of life, now and for future generations (Severiche-Sierra et al., 2016).

In order to achieve the goals of environmental education, it is important that teachers who engage in such activities are themselves convinced of the importance and relevance of developing the necessary knowledge and skills for sustainable living. According to Bendel and Kucharska (2008), quality education can only be realized by qualified and motivated teachers, which can be related not only to the direct educators of students, but also to the education of future teachers. In this context, great emphasis is placed on current teachers, as they should possess the necessary professional competencies to be able to transfer their knowledge and skills to future candidates for the teaching profession. In this regard, Dytrtová and Krhutová (2009) emphasise the necessary shift in teacher education, as they point out that it is necessary to move from a model of imparting knowledge to students to guiding students to take ownership of their own learning.

Environmental education in the Czech Republic

It can be stated that environmental education in the Czech Republic is trying to adequately adapt to the rapid changes in the field of sustainable development and environmental protection. The Ministry of the Environment (MoE) is the guarantor of environmental education in the Czech Republic, through the State Programme of Environmental Education, Education and Awareness, the so-called "State Programme of Environmental Education". In the Czech formal school system, in both primary and secondary education, EVVO is implemented through the Framework Educational Programmes (FEPs), which are developed by the Ministry of Education, Youth and Sports (MoEYS) and are binding for schools. The curricula are subsequently developed into school education programmes (SEPs), the content and implementation of which is fully within the competence of individual schools, taking into account

the focus and level of education provided. EVSE in primary and secondary schools is most often implemented within the framework of a so-called cross-cutting theme that cuts across relevant subjects, e.g. Man and the Environment (Framework, 2023). Veteška and Tureckiová (2008, p. 144) state that awareness of the basic ecological context, environmental problems and the principles of sustainable development of society form an integral part of the civic competences, which are part of the system of so-called key competences in the framework educational programmes.

It is evident that in recent years more and more researchers have become interested in environmental issues in the concept of man in relation to nature in their research and professional studies, both abroad and at home, not only in relation to the education and training of young people of all ages, but also with a focus on the adult public. The field of environmental education is developing very rapidly as a result of changes in the changing environment. In response, educators and their future students need to be prepared to deal with environmental issues in their daily lives, because human well-being is closely linked to environmental well-being and the long-term future of society depends on attitudes towards sustainability. The preparedness and contribution of teachers, influencing a change in their thinking and their own understanding of the importance of sustainable development for society and the education of future generations is therefore considered significant. This fundamental importance of the role of the teacher, which is reflected in the relationship with the pupil, must also be reflected in a change in the way future teachers are educated. The professional qualifications of each teacher are certainly of paramount importance within the profession, but the level of social, emotional and civic competences also plays a very important role.

High-quality preparation for the teaching profession should be based on a perfect combination of theory and practice. This fact is also becoming increasingly important in the field of environmental literacy of teachers and, consequently, in the implementation of ESD. However, numerous studies show that teachers often lack systematic support in their own environmental and sustainability education (cf. Kiraz et al., 2023). Horká (2005) points out that environmental education in Czech schools is education only about nature, not for nature. Teachers are unsure of the information and therefore prefer to avoid topics related to current environmental issues. We believe that this is one of the reasons why teachers make use of professional training centres that can stand in for them. This fact is very alarming and needs to be addressed.

Environmental education in secondary schools is reflected in the curriculum only cross-curricularly, within the aforementioned theme of Man and the Environment. However, this does not appear to be sufficient. This is also confirmed by Činčera (2013), who, based on his research, points out the narrow interpretation of the objectives of environmental education by teachers. At the same time, he reports another worrying finding, that teachers include programs that are not interrelated with each other with problematic effectiveness, such as talks, competitions or lectures. The author believes that activities conducted in this way can have only a minimal impact on the creation of the necessary environmental competences in pupils. Ilovan et al. (2018) point out that the most effective methods of EVVO tend to be informal outdoor activities (hikes, walks, camps, expeditions), travel and visits to different places, campaigns for reforestation, trips to nature and specific activities in nature. This finding is echoed by Horká (2005) who states that teachers should use teaching methods that lead to an understanding of the relationships and connections between living and non-living nature and human activities. The Framework Educational Programmes (FEP) support these ideas, as one of the main objectives is to understand the position of humans in relation to nature, the effects of human activity on the environment in the context of their own responsibility for their actions. Not only knowledge and skills, but also an understanding of values in relation to the natural environment are seen as important outcomes.

Experiential and forest pedagogy

In line with the above, we therefore believe that effective educational methods and techniques in ESD are particularly those that activate and stimulate pupils' awareness of the importance of the environment and sustainable development, i.e. methods that enable self-directed and experiential learning. According to Kotrba and Lacina (2011, p. 48), the principle of activating educational methods is mainly the dynamics of the educational process, which draws pupils into the subject matter in a non-violent way, thus "increasing their interest" in the educational content and activating pupils' own learning work with an emphasis on thinking and problem solving

(ibid.). Experiential learning is then defined by Veteška (2016, p. 218) as an activity that is based on "active search for non-traditional creative approaches and collaborative problem solving in the field." Experiential learning, according to Veteška (ibid.), usually takes the form of a group training, program, or game." Experiential learning very significantly promotes learning through personal experience, emphasizing personal responsibility, activation and teamwork. In this type of learning, the process of reflection and self-reflection on the activities undertaken also plays an important role, consolidating the information learned and fixing the lived experience.

Thus, experiential pedagogy, i.e. educational activities implemented in direct interaction with nature (and in nature), is becoming increasingly important in the practice of ESD. In the context of the system of pedagogical sciences, experiential pedagogy can be considered a borderline pedagogical discipline. Over time, the partial experimental author's educational courses in nature have established themselves as content-stable practical courses and educational activities for a wide range of interested people, including university students. An important example of good pedagogical practice in the field of experiential pedagogy is the Lipnice Holiday School, which has been pioneering the development of experiential pedagogy in the Czech environment for almost half a century (Prázdňinová, n. d.), both practically, i.e. Hanuš et al., 2021, p. 58). It is clear that as a result of expanding urbanization and modern lifestyles, which entail, among other things, an increasing proportion of sedentary jobs and stress levels, the health status of today's society is gradually deteriorating. It is evident that current, albeit highly modern, health care cannot satisfactorily address these problems. However, natural and green areas have been shown to have significant potential to improve human health (Karjalainen, Sarjala, & Raitio, 2010). Forest environments support 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. However, being in nature does not necessarily have only a recreational and relaxing function. A wide range of educational activities can also be carried out in the forest environment. Another example of an activating educational method and inspiration for experiential forest pedagogy is the educational system of forest wisdom, which, according to Hanuš et al. (2021, p. 22), in accordance with the teachings of the founder of the so-called woodcraft, i.e. forest wisdom, Ernest T. Seton, highlights human instincts, namely "the ability, the skill to live and survive in nature" (ibid.). The relevance of forest wisdom to experiential pedagogy lies particularly in "the recognition of the individual path and respect for one's own free growth," (Hanus et al., 2021, p. 23) and in "education through nature, where nature is not only the environment and means of education, but also a wise teacher of life" (ibid.).

An example of good practice in environmental education for future teachers

As an example of good practice in the professional training of future teachers aiming to transform thinking towards a responsible attitude towards sustainable development is the Institute of Lifelong Learning of Mendel University in Brno, which prepares students for the future profession of teaching at secondary vocational schools within the framework of the Bachelor's degree programme Teaching Practical Education and Vocational Training (hereinafter referred to as UPVOV). Within this training, great emphasis is placed on the connection between theory and practice.

In direct relation to the aim of this paper, we draw on a selected part of the profile of a graduate of the UPVOV study programme, where graduates of the teacher training programme acquire the ability to lead students to an interest in environmental issues. Future teachers will learn to use methods and forms of teaching that will lead pupils to understand the interconnections and interdependence between human society and nature. This way of teaching will create a space for understanding the true value of nature as a prerequisite for their environmentally conscious behaviour in their personal and professional lives. This knowledge and skills will lead to responsible behaviour and therefore to the promotion of sustainable development and sustainable living.

Experts from this workplace aspire to create a multidisciplinary research team that will combine professional pedagogical and didactic knowledge in the field of EVVO with practical activities implemented by experts from the field of forestry, agriculture and regional development from Mendel University in Brno. The aim of these activities is to connect innovative, activating, self-experiential and experiential pedagogical methods with the practice of forest pedagogy and

experiential education with nature and in nature. This interdisciplinary connection also aims to appeal to change the thinking of future educators and increase their environmental literacy, to strengthen their understanding of the position of humans in nature and their awareness of their own responsibility for their actions towards the environment and, last but not least, to empower future educators to take a responsible approach to environmental education of future generations.

Examples of how the environment of the Masaryk Forest School Křtiny can be used for teaching future teachers

The best environment for future teachers who are preparing for their future career at MENDELU is certainly the Masaryk Forest School Křtiny (hereinafter referred to as the Křtiny Forest School), which is owned by the University.

The first practical example of educating future teachers with an emphasis on environmental content is the Trail of Praise for Trees. This educational trail leads from the square in Křtiny to the Křtiny Arboretum along a path among the trees. The trail has 13 stops, the trail information panel can be found on the square in Křtiny, a map is included. Nothing prevents teachers from following the trail of 13 stories of trees along a path about 2 km long. Birch, hornbeam, larch, fir, maple, oak, spruce, pine, ash, lime, crane, beech and the beauty of exotic trees will be presented. The trees were planted 15 years ago, but in order to allow visitors to observe the features of each species, compare and properly perceive the forest, the creators of the trail from the School Forest Enterprise Křtiny made it accessible after the trees had grown. Throughout the years there was a need for care, which culminated in recent years, and in 2023 the trees were tagged and panels were installed at the individual sites, from which the teacher and his pupils can learn a lot of interesting things about the individual trees. The panel also includes a QR code which, when scanned, also provides information on the species planted.

The second example of an educational activity that teachers can apply in environmental education is a demonstration of an active approach to the issue of sustainable development and its involvement in environmental education. This is the School Forest activity, where the teacher leads his/her pupils to long-term care of the landscape and forest in cooperation with experts and forest managers on the territory of the Křtiny State Forest Enterprise. This professional workplace offers the opportunity to establish your own school forest, which is cared for by the class collective from the first class to the last. ŠLP Křtiny will clear and level the clearing so that the pupils can plant new trees. Pupils go to the forest at least twice a year - in spring and autumn. They monitor the condition of the trees, observe, record and photograph the increasing biodiversity of the site. If necessary, after a few years, they cut the grass to avoid choking the small trees, paint the terminal part of the trees to prevent them from being eaten by wild animals, and monitor the trees for any pests or fungi. If necessary, they pick up trash. Patronage of memorials and wells can be carried out in a similar way. A school class, under the guidance of a teacher, adopts a selected forest well or memorial to be cared for at regular intervals throughout their primary school attendance. If necessary, they will carry out the cleaning of the well, either on their own or, if major intervention is necessary, they will report the repair to the person in charge of the care of these forest attributes. The whole class participates in the activity as a school collective. The class receives a patronage plaque signed by the director of the Křtiny Forest Management Unit, which the class can have framed and hang in the classroom as a reminder of their own work and involvement in activities aimed at protecting the forest and nature. The most important thing is to realize the value of human work and conscious care. Pupils and future teachers can get the info how to spend their free time and recreate themselves in the forest and do it in the most sustainable way they could.

Conclusion

In the context of the above, we therefore strongly see the preparation of future teachers as a key factor in changing mindsets towards sustainable development and sustainable recreation for future generations. If teachers themselves are not only sufficiently informed about what environmental protection, sustainable development, and a friendly approach to environmental issues are, but also take the importance of the above as their own, accepting the necessity to change their own thinking and approach to the environment and sustainable development, they can much more effectively transmit their attitudes, knowledge and experience in the field of ESD to their pupils and students. At the same time, they will realise the importance of the need to

care for the forest environment and the benefits for teachers and especially pupils resulting from this when implementing the practice in the field of EVVO on the territory of ŠLP Křtiny.

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Souhrn

Vzhledem ke stále rostoucímu vlivu lidské činnosti na životní prostředí je nutné si plně uvědomit, že v současném trendu zásahů do přírody nelze pokračovat, neboť se dostáváme do situace, kdy začíná být ohrožena samotná podstata života na Zemi. Environmentální či ekologická výchova nabývá na významu v důsledku přetrvávajících závažných problémů životního prostředí, které začínají mít velmi výrazný dopad na životní podmínky lidí. Cílem environmentální výchovy realizované ve školách by mělo být vést děti a mládež nejen k odpovědnému jednání a vytváření postojů podporujících udržitelný život na Zemi, ale také k přijetí odpovědnosti za stav životního prostředí a k vhodnému a udržitelnému trávení volného času.

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ENVIRONMENTAL PROTECTION AND SUSTAINABLE TOURISM OF CROSS-BORDER NATIONAL PARKS IN KOSOVO, MONTENEGRO AND ALBANIA: CONTINGENT VALUATION METHOD

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Abstract

The border triangle between Kosovo, Montenegro, and Albania, comprising national parks in the Western Balkans, is experiencing a surge in mountain tourism, posing environmental conservation and sustainable tourism challenges. Concerns about preserving these parks have prompted an investigation into visitors' willingness to support sustainable practices financially. This study used willingness-to-pay (WTP) methods to examine visitor preferences based on demographic factors such as age, country of origin, and education. The Contingent Valuation Method (CVM) was employed to determine the monetary value visitors are willing to contribute to these parks. Results indicate that most (80%) visitors are willing to financially support improving services and sustainable tourism practices, with willingness to pay ranging from 1 to 4 €. However, willingness to pay tends to decrease with age, and visitors from Kosovo and Albania exhibit higher willingness levels than those from Montenegro. Interestingly, visitors with primary education show a negative inclination towards WTP. These findings offer valuable insights for stakeholders crafting sustainable tourism strategies in the Western Balkan countries.

Keywords: Cross-border forests, environmental conservation, Mountain tourism, National Park, Sustainable tourism; Western Balkans, Willingness to Pay

Introduction

In the south of the Dinaric mountain range, which includes the borders of Kosovo, Montenegro and Albania, mountain tourism has increased during the last decades (Porfido, 2020). This preceded the decision of each Western Balkan country in this border triangle to create their national parks, motivated by a commitment to protect ecological and social-historical locations while promoting sustainable tourism practices. Four national parks and one regional park have been created within this region. Bjeshkët e Namuna is the largest national park in this region, with an area of about 63,000 ha. This park lies south and west of Kosovo, along the border with Montenegro and Albania (Hasanaj & Kuqi, 2022). The announcement of this area as a National Park was made in 2013. Prokletije is a national park in Montenegro, with an area of about 16,000 ha (Young, 2008). Valbonë and Thethi are national parks in Albania, while Nikaj Merturi has the status of a regional park. These three parks together have an area of about 29,000 ha and are also known as the "Albanian Alps" (Young, 2008). For residents, creating national parks helps protect these areas and promotes ecological, social, and cultural values (Platania & Rizzo, 2018).

While the flow of tourists continues to increase, thus reinforcing the need for services, accommodations, and infrastructural facilities, the respective states must address these needs on time. This delay can be attributed to bureaucratic procedures, a need for more qualified personnel working in national parks and financial support. The lack of projects, relevant legislation and financial resources to actualise such initiatives has forced residents and businesses to increase their capacities to meet the demands of visitors, often without a clear strategic plan and sometimes without following all the rules of existing laws. The main consequences of unsustainable tourism practices can be economic and environmental (Eagles, 2009), underscoring the need for a balanced approach prioritising sustainable planning over immediate benefits (Hojeghan & Esfangareh, 2011).

The main challenge for managers of these National parks is the need for more funds for park management, which causes financial instability and affects sustainable management (Platania & Rizzo, 2018). Funds are limited and are mainly allocated for salaries and routine maintenance. Additional funds are needed to promote the development of sustainable tourism. They are establishing a tax to improve services and provide sustainable tourism as an acceptable alternative (Doli et al., 2021). Establishing this tax requires an insight into the perspectives of residents and visitors regarding their willingness to contribute financially to the parks (Fialová et al., 2019).

Being aware of the necessity of continuous funding for maintaining and promoting national parks, visitors' contributions are envisaged to transform proposed sustainable tourism projects into reality (Platania & Rizzo, 2018). However, the initiative has raised concerns among locals and visitors alike, with concerns that imposing entrance fees could reduce the number of potential visitors, subsequently reducing income for residents (Petcharat et al., 2022). A subset of dissenting voices argues that national parks, considered public property, should not charge entrance fees; instead, the government should fund projects directly.

The study's main objective was to assess visitors' willingness to contribute financially to improved services and the promotion of sustainable tourism within the National Parks. The application of the entrance fee serves a dual purpose: funding initiatives to improve visitor services and ensuring the conservation of these National Parks.

Material and methods

The Contingent Valuation Method (CVM) was used for field data collection. CVM, widely utilised for environmental assessment (Bamwesigye et al., 2020, Doli et al., 2021, Petcharat et al., 2022, Bamwesigye 2023), directly elicits individuals' opinions on the value they assign to a given resource and its associated services. The Contingent Valuation Method determines the economic value of a non-market good or service by asking individuals about their willingness to pay for it. This hypothetical non-market value is contingent on a scenario described to participants before the inquiry, outlining the conditions and characteristics of the evaluated resource (Doli et al., 2021).

The study calculated a sample size of approximately 368 surveys, considering an estimated population size of $P=100,000$ individuals who lived or have visited one of the National Parks mentioned in the research. The interviews were conducted in the field to get access and participation from different respondents from the different national parks mentioned in this study. Targeting individuals who had visited National Parks at least once, the study sought to capture a representative perspective on the experiences and preferences of this specific group of visitors. The 366 questionnaires were enough for our study to reach our desired conclusions.

Field surveys were conducted over four months (June to September 2022) during 12 visits to the national parks mentioned in this study. The questionnaire form was filled out by 366 respondents (after removing the incorrect forms).

Descriptive measures (mean, median and mode) were calculated to discern trends within the dataset. Variance, standard deviation, and range were computed for numerical data to gauge the spread and dispersion of values. Cross-tabulation was employed to explore relationships between willingness to pay (WTP) and national park visitor activities.

Results and Discussions

The demographic characteristics of the respondents are illustrated by the respondents who visited the National Parks. Variables include Gender, age, State, distance of residence from the National Park, and Level of Education. Each variable has categories, including the number of respondents (n) and the percentage.

Regarding Gender, the respondents are well-balanced, with 51.9% Male and 48% Female, ensuring diverse perspectives. Age distribution is varied, with the majority (45%) being in the 18-34 range, followed by the range 35-49 (32%) and 50-65 (16%) age groups. A smaller percentage (6%) are respondents aged 65 and above. Geographically, the majority of visitors are from Kosovo (44%), followed by Albania (23%) and Montenegro (20%). The rest are foreign visitors (13%). Data based on the distance of residence from the National Park shows that approximately 29% of visitors live within 0-50 km of National Parks, while around 75% are located within 0-150 km; the rest of the visitors belong to the group who live at a distance greater than 150 km. Specifically, the segmentation of visitors based on their residential

distances is as follows: 5-10 km (14%), 10-50 km (15%), 50-100 km (27%), 100-150 km (19%) and distances over 150 km make up 24.9%. The Level of Education is diverse, with the majority having a University education (53%). High school graduates constitute 26%, while those with primary school education and postgraduate qualifications represent 12% and 9%, respectively.

The willingness of visitors to pay

Numerous studies have shown that demographic variables significantly influence visitors' willingness to pay an entrance fee (Doli et al., 2021). Specifically, the findings highlight the role of age, education level, employment status and monthly income in shaping responses. Key determinants include visitor spending and the importance individuals attach to the presence of parks and green spaces. Notably, Gender did not emerge as a significant factor influencing individual decisions, a finding consistent with the results documented in our study (Doli et al., 2021).

Most visitors (81%) expressed a positive inclination to pay for national park entry, while a minority (20%) did not indicate readiness to pay. Specifically, 32% of visitors were willing to pay €1 (100 ALL), and the highest percentage (41%) opted to pay the range 2-4€. Approximately 8% of visitors expressed readiness to pay more than €5. Conversely, 19.5% showed unwillingness to pay a tax (€0/ALL). Visitors understand that more than relying on state funds is needed to effectively manage and maintain these national parks. Consequently, there is a willingness among visitors to contribute financially. This assertion supports previous studies where visitors from different countries have articulated their willingness to contribute financially to protecting the environment and sustainable tourism practices (Doli et al., 2021).

The willingness of Visitors to Pay by Groups of Age

Analysing willingness to pay by age groups showed a trend where the willingness to pay (WTP) decreases with the increase in the age of the visitors, but still, the WTP has a positive trend, higher than 50%. Younger individuals, mainly those aged 18-34, showed higher WTP (90%). This willingness decreases to 85% in the age group 35-49 and further to 58% in the age group 50-65, with almost equal proportions of willing and unwilling people 65+ (52-48%). Additionally, young visitors (18-34 years of age) showed a higher preference for paying 2-4€ (48%) and slightly more minor preferences for category 1 € (33%) and less for the last two categories "5€ (9 %) and "I would not pay 0 € (10%), which covers a smaller percentage across age group. The 35-49 age group showed a data distribution similar to the previous age group, although more moderate. In the 50-65 age group, the distribution of data is as follows: category 1 € / 100 ALL (31.5%), category 2-4 € (23%), with the lowest representation in the >€5 category (4%), and a significant percentage expressed unwillingness to pay, marked with 0 €/ALL (42%). The data distribution for the +65 age group is similar to that of the previous age group but with a more moderate representation in the categories indicating WTP.

The analysis of the proportion of visitors who are ready to pay based on their age reveals an apparent inverse correlation, which shows that with advancing age, the proportion of visitors' WTP decreases. This model is rationalised by the perception of older adults that mountains are public assets, and therefore, they refrain from rewarding the services provided by mountain tourism (Platania & Rizzo, 2018).

Willingness of visitors to pay by State

In Albania, approximately 80% of respondents are prepared to pay an entrance fee, with only 20% expressing unwillingness (Figure 1). The majority, 35.2%, are inclined to pay €1 (100 ALL), while the smallest percentage pertains to payments exceeding 5€. For Kosovo, the WTP percentage is similar to Albania, with the highest proportion (41%) favouring the 2-4€ category. In Montenegro, the WTP distribution is different, with 50% willing to pay an entrance fee and 50% unwilling. Among those willing to pay in Montenegro, 31.5% chose the 2-4€ category (Figure 1). In the "Others" group, comprising foreign visitors not from these three countries, the majority (97%) answered positively for WTP from 1 to 4 € (Platania & Rizzo, 2018).

Different responses regarding willingness to pay and the acceptable amount are evident among visitors from different countries. Mainly surveyed from the study countries - Albania, Kosovo and Montenegro, with a more miniature representation of international visitors - different perspectives emerge. Visitors from Albania and Kosovo show a marked tendency to pay for better services and sustainable tourism practices.

capital of Kosovo, Pristina, where citizens have expressed their willingness to pay for improved recreational services. Various prior studies have substantiated Visitors' WTP (Doli et al., 2021). This opinion contradicts other studies, emphasising the importance of public institutions taking responsibility for the care and maintenance of recreational areas, as opposed to the notion that these spaces are considered public property with unlimited access and no fees (Platania & Rizzo, 2018). As far as the WTP is concerned, in Montenegro, it is relatively lower than in the previous countries. The overall better infrastructure conditions and the creation of self-managed tourist villages potentially influence the decrease in willingness to pay in Montenegro. These factors contribute to a lower tendency of visitors to make financial contributions. Within the "Others" category, which indicates foreign visitors who have visited one of the national parks, the consensus in favour of an entrance tax is almost unanimous.

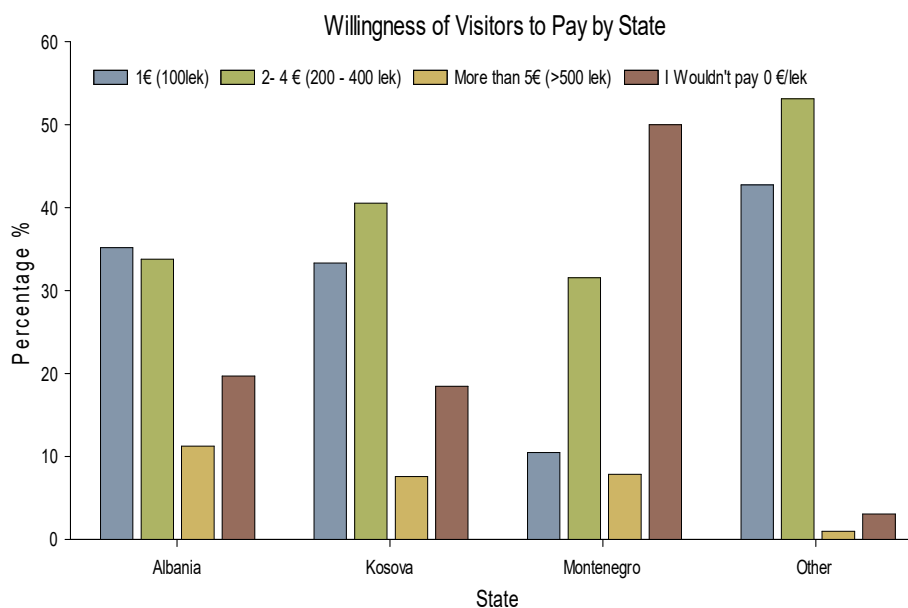


Fig. 1: Willingness to pay (WTP) based on the origin of visitors

This trend finds support in the case study of Gërmia Park (Doli et al., 2021), located close to the Examining willingness to pay based on respondents' Education, those with Primary School education predominantly (77%) expressed an unwillingness to pay (0 €/ALL). In comparison, the respondents with secondary Education expressed a willingness to pay around 63% for one of the categories; the remaining 37 % of the visitors did not want to pay any entrance taxes. The willingness to pay among visitors with a university education is higher (90%), and only 10% expressed their unwillingness to pay. Respondents with postgraduate and master's studies expressed a slightly lower willingness to pay than the previous group, with a percentage of around 81%. From the general view, we find that with the increase in the Level of Education, the willingness to pay also increases, based on the data of visitors who have visited one of the National Parks that are part of this study.

In the specific context of the first group (Primary School), the unwillingness to pay (€0/ALL) is 77%, with corresponding percentages for the categories 1/100 Lek, 2-4 €, and >5€ with 12%, 7% and 4%, respectively. For the group consisting of visitors with Secondary Education, the percentages are defined as follows: ALL 1/100 (29%), €2-4 (27.1%), > €5 (7%), and 37% express unwillingness to pay. Within the group of visitors with a university education, the percentages appear as follows: 1/100 ALL (36.9%), 2-4 euros (46%), >5 EUR (8%), with 10% expressing unwillingness to pay. In the last group, which includes visitors with master's and doctorate degrees, the percentage distribution is as follows: ALL 1/100 (23%), €2-4 (42%), > €5 (16%), and an unwillingness to pay rate of 19%.

The negative WTP of visitors with primary Education to contribute to a tax that supports sustainable development may be related to their ability to understand the principles of sustainable development and their Level of awareness regarding environmental issues. Mainly

living near national parks, respondents with primary education often perceive these areas as an integral part of their community, considering them communal spaces inherited from generations. As such, this demographic's prevailing sentiment questions the necessity of tax contributions, given their historical connection to these lands (Hough, 1988).

Conclusion

The study concludes that most visitors have expressed their willingness to contribute through an entrance tax provided to encourage sustainable tourism and facilitate the improvement of services in National Parks in Kosovo, Montenegro and Albania. In particular, the category from 2 to 4 euros (equivalent to 200 to 400 ALL) has accumulated the highest percentage of visitor support. The generated income can empower the park's management to implement sustainable mountain tourism development initiatives and improve services, addressing immediate needs within specific sectors. This study is a valuable resource for governing bodies overseeing National Parks, providing insights into a strategic approach to promoting sustainable tourism. The cooperative willingness of citizens to financially support sustainable mountain tourism is noted, advocating for cooperative engagement with the public. Additionally, stakeholders involved in these national parks can use this research to formulate business strategies consistent with sustainable tourism practices.

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Souhrn

Studie dospěla k závěru, že většina návštěvníků vyjádřila ochotu přispívat prostřednictvím daně ze vstupného na podporu udržitelného cestovního ruchu a na zlepšení služeb v národních parcích v Kosovu, Černé Hoře a Albánii. Zejména kategorie od 2 do 4 eur (ekvivalent 200 až 400 ALL) nashromáždila nejvyšší procento podpory návštěvníků. Získaný příjem může vedení

parku umožnit realizovat iniciativy v oblasti udržitelného rozvoje horské turistiky a zlepšovat služby a řešit okamžité potřeby v rámci konkrétních odvětví. Tato studie je cenným zdrojem informací pro řídicí orgány dohlížející na národní parky a poskytuje poznatky o strategickém přístupu k podpoře udržitelného cestovního ruchu. Je zaznamenána ochota občanů finančně podpořit udržitelný horský cestovní ruch, což obhájí spolupráci s veřejností. Kromě toho mohou zúčastněné strany zapojené do těchto národních parků využít tento výzkum k formulaci obchodních strategií v souladu s postupy udržitelného cestovního ruchu.

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EVALUATING THE RELATIONSHIP BETWEEN DEFORESTATION – PROTECTED AREAS: A NEW APPROACH IN CASE OF EASTERN CARPATHIANS FROM SUCEAVA COUNTY

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<https://doi.org/10.11118/978-80-7509-963-1-0086>

Abstract

Protected areas, greenspaces are strongly influenced by deforestation and related human activities such as overexploitation, roads construction or natural disturbances (fires, snow-slides) which influence the stability of protected areas.

On the other hand, they have a negative impact on recreational activities. It is obvious that forest areas are important for human well-being, mental health.

The proximity of protected areas to certain cities and towns positively influences the ways of spending free time, but also the demographic aspects. Thus, the aim of this paper was to evaluate the relationship between deforestation and protected areas in Eastern Carpathians from Suceava County. We investigated the impact of deforestation in protected areas based on the fact that fragmentation of forests affects the forests ecosystem services. The results indicate that it is necessary to analyze and know the anthropic and natural factors which must be understood to maintain forest preservation and its sustainability.

Keywords: recreational activities, human well-being, deforested areas

Introduction

Deforestation influences the climate by the fact that the increase in temperatures can increase the occurrence of forest fires and storms, but it also leads to a change in land use and desertification (Singh, 2022).

Forest cover expansion in European mountainous regions can be expected under all scenarios, with biophysical factors playing a key role in defining suitable locations and land use legacy playing a significant role in spatial patterns (Price et al. 2017).

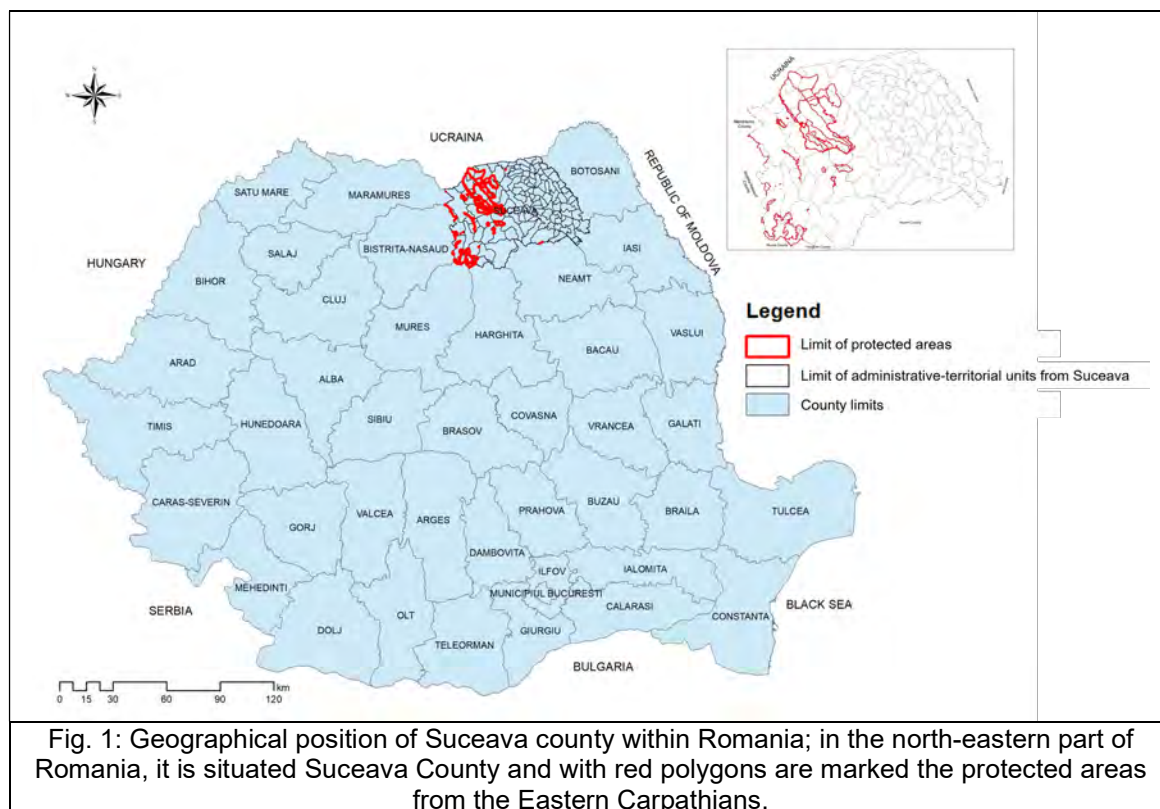
Protected areas in the Carpathian Mountains reduced forest disturbance by 1-50% in some countries, but their effectiveness varied across countries and time, with older areas being more effective in some countries (Butsic et al. 2017).

Researches showed the effectiveness of forest protected areas in preventing deforestation in mountainous regions (Gao et al. 2020).

We investigated the impact of deforestation in Eastern Carpathians from Suceava County based on the fact that fragmentation of forests affects the forests ecosystem services and forests stability.

Material and methods

The analysis of deforestation in Eastern Carpathians from Suceava County was realised based on the use of 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, we made additional geoprocessing and spatial analysis on deforested areas and protected areas from the study area (Figure 1).



Results

Distribution of deforested areas in Suceava County

Suceava County recorded the highest rates of deforestation in Romania. In the mountain areas from the Eastern Carpathians are most deforested areas (Carlibaba – 4884 ha; Brosteni – 2902 ha; Poiana Stampei – 2707 ha; Pojorata – 2198 ha; Fundu Moldovei – 2144 ha) (Figure 2). The lowest rates are in the Suceava Plateau, on the eastern part of the county.

The largest protected areas located in the Calimani Mountains and Obcinele Bucovinei and here also are the administrative-teritorial units with the highest rates of deforestation as are mentioned in Table 1.

Deforestation recorded the highest rates in the Obcinele Bucovinei even if here are avifaunistic special protection areas and community protection site whose conservation measures on flora and fauna are significantly important to the maintenance of natural habitats. Small deforested areas are also present in the Rarau Giumalau Mountains and even in the Calimani Mountains which is affected by overexploitation, roads construction for forests exploitation.

Discussion

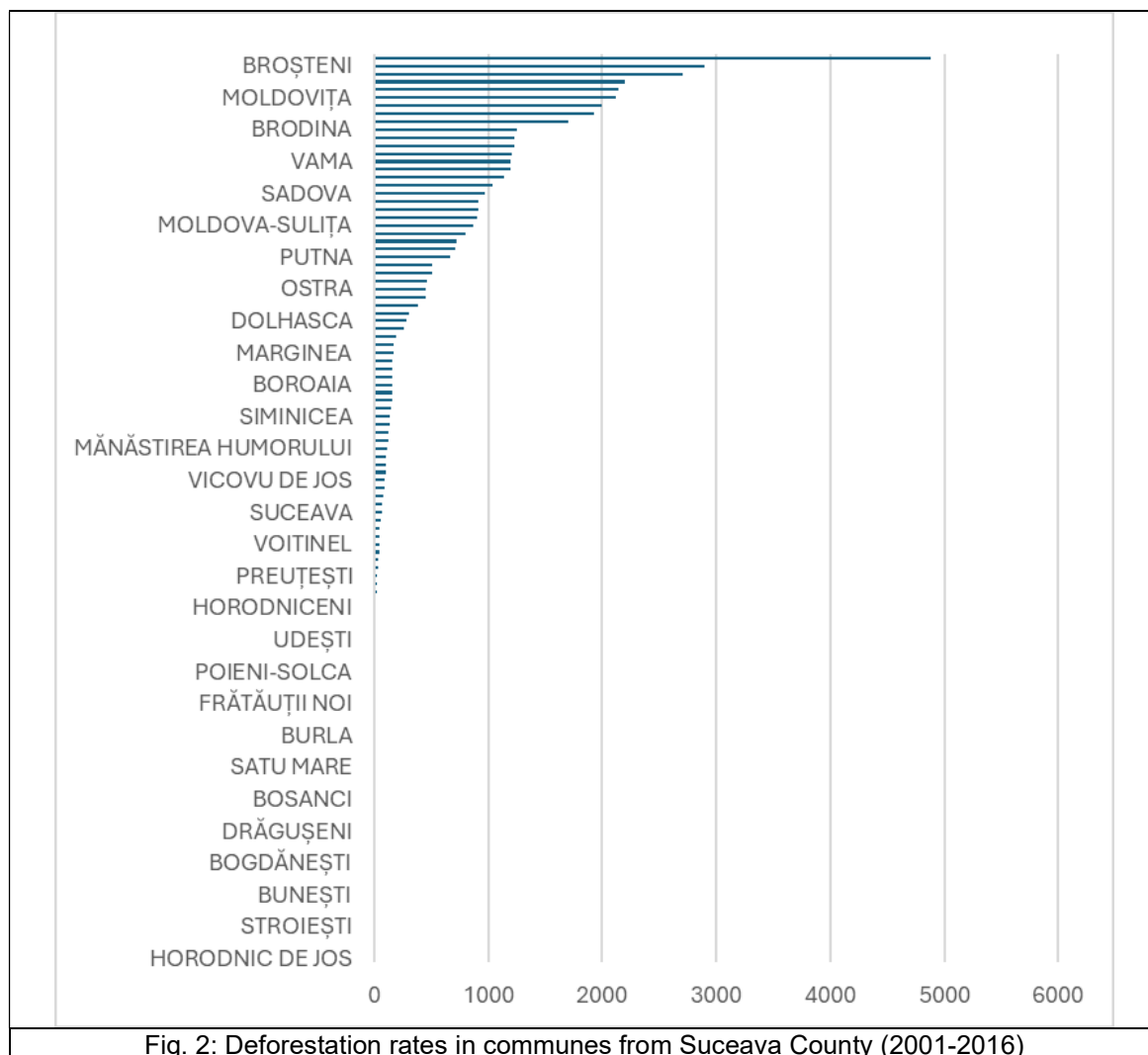
Protected areas from Eastern Carpathians from Suceava County are important to maintain the natural, ecological and climatic services of forests. Anthropogenic activities and natural hazards as flash floods or fires influence the forests fragmentation and theirs future sustainability. Also, we concluded that the ecosystem services offered by protected areas are vulnerable to human activities.

Conclusion

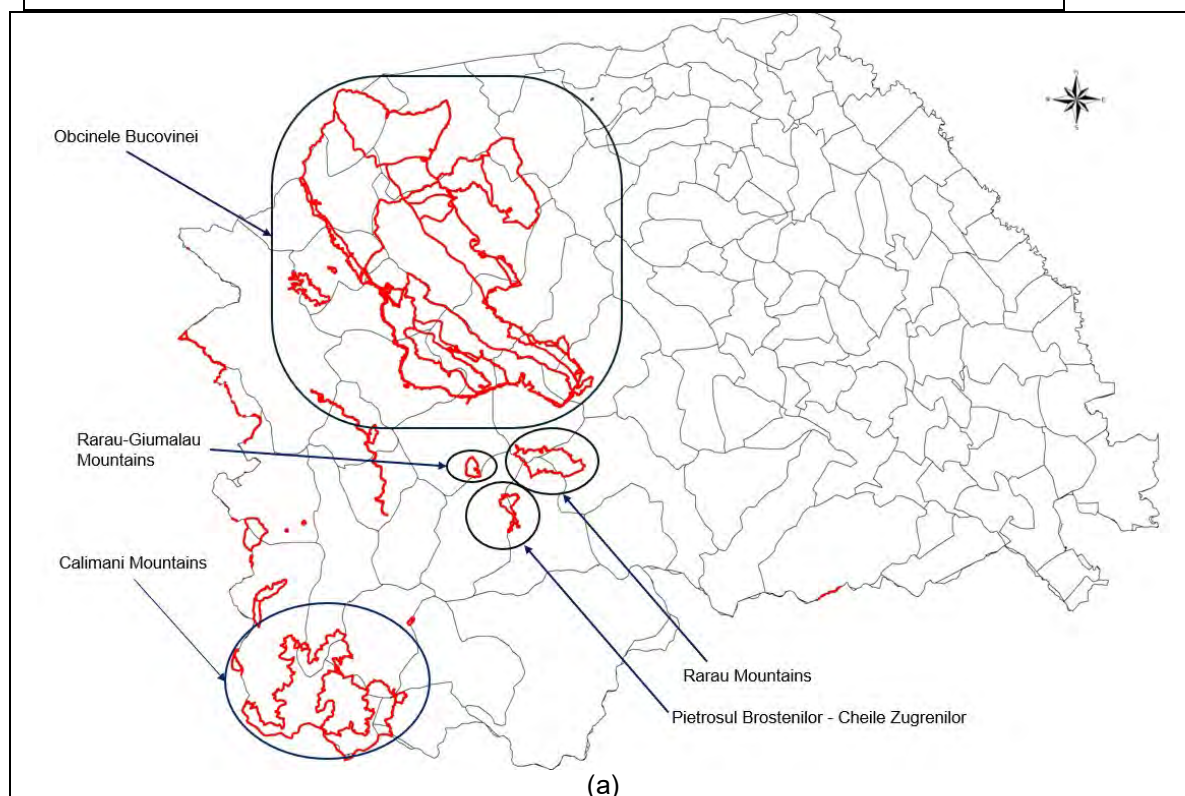
This paper demonstrated that is needed future strong management measures to protect the fragile environment from Eastern Carpathians especially from protected areas. The increased rates of deforestation from 2001-2016 demonstrated that the forests degradation and stability are threatened.

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The name of the locality (administrative-territorial unit)	Deforested areas (ha.)
CÂRLIBABA	4884
BROȘTENI	2902
POIANA STAMPEI	2707
POJORÂTA	2198
FUNDU MOLDOVEI	2144
MOLDOVIȚA	2115
DORNA-ARINI	1999
ȘARU DORNEI	1926
PANACI	1706
BRODINA	1250
IZVOARELE SUCEVEI	1229
DORNA CÂNDRENIOR	1226
COȘNA	1205
VAMA	1200
VATRA DORNEI	1198
Source: Data obtained from Hansen et al. 2013.	



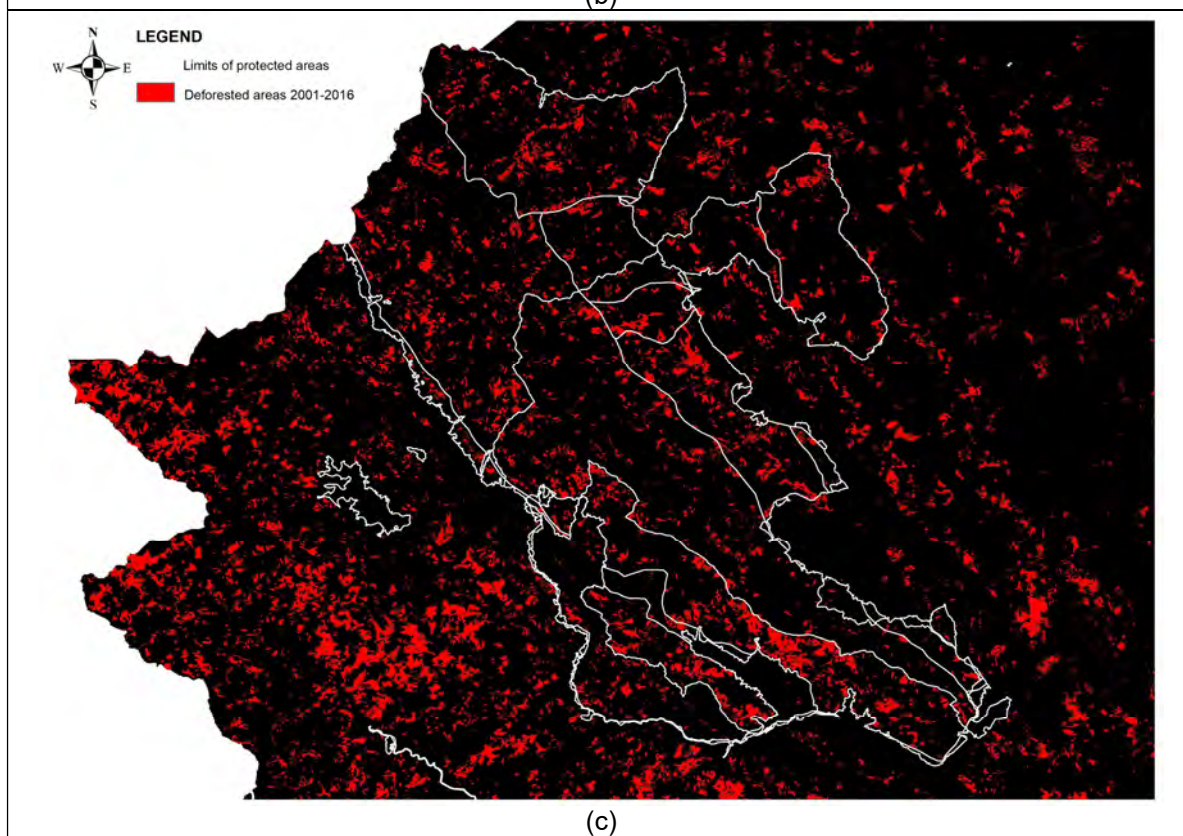
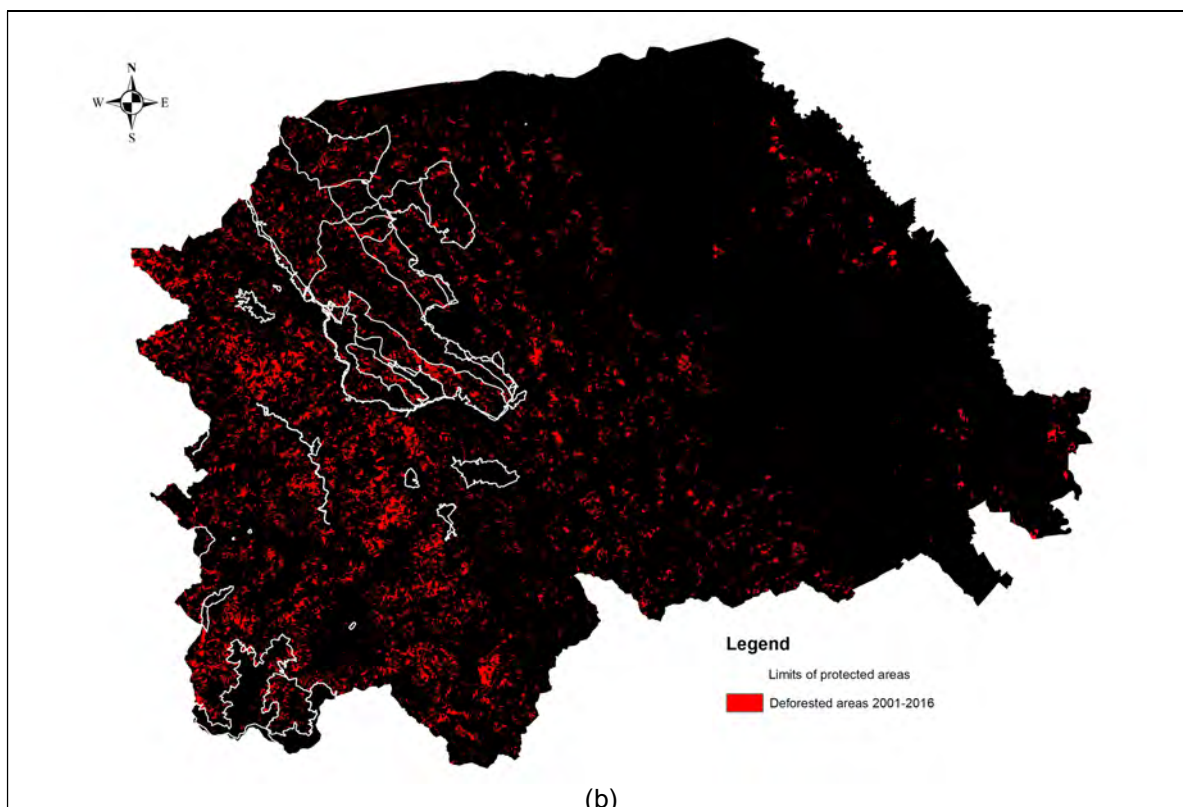


Fig. 3: (a). Protected areas from Eastern Carpathians from Suceava County; (b). Deforested areas in Suceava County 2001-2016; (c) Focus on deforested areas from Obcinele Bucovinei;

Souhrn

Chráněná území, zelené plochy jsou silně ovlivněny odlesňováním a souvisejícími lidskými činnostmi, jako je nadměrná těžba, výstavba silnic nebo přírodní disturbance (požáry, sesuvy sněhu), které ovlivňují stabilitu chráněných území.

Cílem tohoto článku bylo tedy zhodnotit vztah mezi odlesňováním a chráněnými územími ve Východních Karpatech z okresu Suceava. Zkoumali jsme vliv odlesňování na chráněná území na základě toho, že fragmentace lesních ploch ovlivňuje ekosystémové služby lesů. Z výsledků vyplývá, že je nutné analyzovat a znát antropické a přírodní faktory, které je třeba pochopit pro zachování lesů a jejich udržitelnost.

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FIELD LANDSCAPE AND ITS RESTORATION

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<https://doi.org/10.11118/978-80-7509-963-1-0092>

Landscape plain
pure as a human's hand,
among the mountains
it calls me back
soothes, caresses,
with good words

Song of Jana Kirschner

Abstract

The paper deals with the specifics of the field landscape, which belongs to common and neglected landscape types. It shows its specific values and characteristics and presents ways to restore it.

Keywords: Potential of field landscape, production, revitalization

Introduction

Intensively managed field landscapes are among the most common landscape types in Central Europe. It is a landscape so mundane that we do not pay much attention or care to it. It is shaped by natural, cultural and historical conditions, but also by man, who continuously co-creates the landscape and adapts it to his needs. In the conditions of the Czech Republic, the landscape was strongly influenced by forced collectivization and subsequent large-scale forms of large-scale agricultural production.

In my contribution, I would like to present the restoration of a typical field (rural) landscape in the cadastral area Zahnašovice, which was realised step by step in the period 1998 -2024

Materials and methods

The European Landscape Convention covers the entire territory of the Contracting Parties and covers natural, rural, urban and peri-urban areas. It includes land, inland bodies of water, and marine areas. It applies both to landscapes that can be considered remarkable and to landscapes that are common and disturbed.

Landscape is defined as an essential component of the environment in which people live, as an expression of the diversity of their common cultural and natural heritage and as the basis of their identity.

The field landscape is still shaped to the maximum extent by large-scale agricultural production. The pursuit of maximum yields entails huge fields with one and the same crop, without borders, field edges, field roads, green networks and other landscape features. The Czech Republic is the absolute record holder in Europe in the size of soil flanks (57% of arable land is in blocks over 20 hectares) and this fact alone is a major obstacle to higher natural diversity. (Vermouzek et al, 2018).

Efforts to restore the field landscape are highly fragmented. While farmers have the most important role to play, agricultural subsidies, which should be the main tool for recovery, are not yet sufficiently targeted. For landscape restoration, national programmes and European subsidies focused primarily on nature protection and support for biodiversity.

The institute of land consolidation has a comprehensive approach.

The institute of land consolidation has a comprehensive approach. Unfortunately, however, they are not solved across the board and their implementation is very lengthy. The basic basis for the full-scale restoration of the landscape is thus represented by the zoning plan in the chapters of the landscape layout concept.

The road to landscape restoration is thus quite winding, as the direction is determined by three ministries:

Ministry of Agriculture, Ministry of the Environment and Ministry of Regional Development. The interests of landowners, farmers and a wide range of other land users contribute to this

A key role in landscape restoration can currently be played by a conscious landowner, who is also supported by legislation. Owners or tenants have a general obligation to manage the land in accordance with the principles of protection of agricultural land under Section 3 of the Act on the Protection of the ALR, i.e. so that they do not pollute the soil, do not damage it and protect cultivated land according to approved modifications.

The owner can influence how his land is managed. If the owner does not manage it himself, he can influence how the land will be handled through a lease agreement.

The municipality, as a major landowner, can set an example in land management and in the care of the land entrusted to it. In this way, it shows the public that they value the environment and thus influence the behavior of others.

Results

The village Zahnašovice is there situated in the Zlín Region, in an intensive cereal growing area about 3 km south of the town of Holešov. It is a small village with about 340 inhabitants, which is adjacent to the emerging Holešov industrial zone. Before the start of the project, the area of interest represented an emptied agrarian landscape, with very low ecological stability and significant manifestations of wind erosion (see photos No 1 and No 2).

The representatives of the Municipality of Zahnašovice decided not to wait and embarked on a gradual and systematic restoration of the landscape as early as 1998 in cooperation with the design studio Arvita P spol. Otrokovice.

The aim of the project was the gradual restoration of all functions of the landscape. The project is aimed at revitalizing disturbed areas of agricultural land, reducing wind erosion, increasing the ecological stability of the landscape, retaining water in the landscape and restoring the landscape character. Part of the plan is to improve the permeability of the landscape and create recreational potential for the inhabitants of the village.

In the beginning, the settlement had the character of an island surrounded by a cultural desert without the possibility of going out into the countryside. The degree of ploughing of agricultural land was 96.4%. However, grasslands, small wetlands, margins, landscape-forming greenery and alleys of fruit trees lining the road network have completely disappeared from the landscape. The landscape mosaic was very rough. The typical silhouette of the settlement was disrupted by a spatially significant agricultural area.

The restoration of the landscape was carried out gradually, step by step. Over the course of 25 years, the following plans have been implemented:

- Establishment of Biocentrum Wmedřický, area 35 123 m²
- Restoration of the pond area. 3 000 m²
- Creation of small water and wetland areas in the floodplain of Ludslavka, area 2 200 m²
- Planting of new linear greenery with a total length of more than 9 km
- Planting of trees on TSES (territorial systém of ecological stability) in the number of 26 736 pieces
- Establishment forest, area 8 200 m²
- Recontruction of of the bank vegetation of the Ludslávka stream
- Change of the type of land in the area of 26.3 ha from arable land to grassland or orchard.

Municipal land registered at cadastral area Zahnašovice is primarily used for the implementation of the plans, as well as land of owners who have expressed their consent to the implementation of the project, including sustainability.

The current state of the landscape has thus improved significantly, its biodiversity has increased, and new species have appeared. In the Biocentrum Medřický Biocentre is there family of beavers that have relocated from the nearby Záhlinické rybníky Nature Park.

The paths planted with alleys of fruit and natural trees are ideal for walks and rides. Outdoor events such as Hunter's Day, Children's Day, Pond Unlocking, etc., are held at the restored sites.

Over the past 20 years, the current state of the landscape has improved significantly, its biodiversity has increased, and new species have appeared. In the Medřický Biocentrum, for example, is living a family of beavers that have moved from the nearby Záhlinické rybníky Nature Park.

The paths planted with alleys of fruit and natural trees are ideal for walks and rides. Outdoor events such as Hunter's Day, Children's Day, Pond Unlocking, etc., are held at the restored sites.

The implementation of the plans was ensured in cooperation with the Nature Conservation Agency, Zlín workplace. From year to year, available subsidy titles were used, especially the Landscape Care Program. Follow-up care is provided by the municipality with its own resources with the substantial help of the local Hunting Association and other units
small example of the implemented changes is shown in photos No. 3 and 4.



Fig.1: Emptied field landscape - eastern view – 1998



Fig. 2: Emptied field landscape – view of Holešov- 2002



Fig. 3: New plantings in the eastern part of the cadastre – 2022



Fig. 4: Wetland in the floodplain of Ludslávka - 2023

Discussion

Field landscapes with intensive large-scale agricultural production are very vulnerable. They are not a pleasant environment for biota life, including humans.

On the example of a small village, it is shown that the most important role in landscape restoration is not played by the legal framework or subsidies, but by the active approach of the inhabitants and the municipality, which is usually a significant owner of the land.

The basis of a successful renewal is a high-quality long-term plan, which is continuously updated and gradually, in partial steps, implemented. For a small village, it is very important to have a reasonable size of new biotopes, so that quality follow-up care can be ensured.

This project shows the positive impact of long-term cooperation between the landscape designer, the municipality and its inhabitants, including farmers. Long-term cooperation also enables the monitoring of restored landscape segments and possible direction of development at restored sites.

The landscape studio has similar positive experience with other, small and large municipalities like. Dolní Němčí, Žlutava, Šakvice, Vítovice, Machová, etc.) These are municipalities have already been awarded in the Competition Village of the Year as part of the Rural Renewal Program.

Conclusion The aim of the project is to restore the agricultural landscape, which has been used for large-scale agricultural production for a long time. The implemented measures are beneficial for the inhabitants of the village, but they are also a place of environmental education for children and students and a destination for observers of life in nature.

The revitalization of the landscape is being implemented in gradual steps based on the extremely active approach of the mayor, the council and the citizens of the small village of Zahnašovice in the Kroměříž district. The municipality, as a major owner, sets a good example of how to dispose of land.

The restored sites are monitored by the developers of the plan in the long term and the management of the established biocentre and other landscape elements is regulated. The implementation of the project is not the end of the interest of the municipality and citizens in the restoration of the landscape. On the contrary, other plans are being prepared aimed at retaining water in the landscape and measures to adapt the landscape to climate change.

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Souhrn

Príspevek se zabývá problematikou polní krajiny, která je významně ovlivněna a stále ovlivňována intenzivní velkovýrobním zemědělstvím. Jedná se o krajinu narušenou, s nízkou ekologickou stabilitou, která není dobrým domovem pro biotu včetně člověka. Na příkladu malé, ale velmi aktivní obce, je ukázána možnost obnovy vyprázdněné polní krajiny v krajinu sice produkční - zemědělskou, nicméně přátelskou k biotě a otevřenou obyvatelům i návštěvníkům, kteří zde najdou obnovené zajímavé lokality.

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FLOOD PROTECTION OF THE NIŽNÝ HRUŠOV VILLAGE USING WATER RETENTION MEASURES

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Abstract

Green-blue infrastructure elements provide a wide range of ecosystem services, such as water purification, air quality, space for recreation, and climate change mitigation and adaptation. Their integration makes our urban spaces more resilient, pleasant, and healthy places to live, work and play.

The contribution is focused on the proposal of suitable water retention measures in the village of Nižný Hrušov (Slovakia) with the aim of ensuring the safe drainage of rainwater and the protection of the inner village against flood flows in the stream during increased surface rainwater flows. The result of this study is the design of several separate objects, such as an infiltration pipe - a trench, inspection and cleaning shafts, a detention tank, and a rain garden, whose technical and social functions are interconnected.

Keywords: green-blue infrastructure, rain garden, infiltration system, detention tank, floods

Introduction

The consequences of climate change have different frequency and intensity in different regions, and we observe their manifestations in Slovakia more and more frequently in the form of floods (Zeleňáková et al. 2017), landslides, long-lasting periods of drought, etc. It is climate change that results in frequent and intense rainfall that leads to floods (IPCC 2023). These floods can have devastating consequences on people's lives, infrastructure and the economy and therefore require an active solution.

The selected adaptation measures can be implemented as a set of measures aimed at improving the country's hydroclimatic conditions, primarily by influencing its water retention function (ME SR 2018). The implementation of water retention measures for adaptation to climate change in settlements and the landscape and preparation for floods are key for reducing the risk of floods and their impacts. Their goal is to retain water and thus slow down its outflow into rivers, which reduces the risk of floods. Already in 2006, the Association of Cities and Towns of Slovakia proposed a new approach to flood prevention, which consists in restoring the water-holding capacity of a sub-basin and reducing erosion processes (e.g. Junakova & Balintova 2012) in the territory of the municipality (ZMOS 2007). The implementation of such measures will make it possible to prevent the occurrence of floods in the territory of the municipality to a minimum.

An important element that complements the function of water retention measures not only in reducing the risk of floods is green infrastructure (Jarosińska & Gołda 2020). It creates a pleasant environment for rest and recreation, offers various possibilities for active and passive relaxation, thereby contributing to the improvement of the quality of life in cities and towns.

The aim of this contribution is the proposal of suitable water retention measures in the village of Nižný Hrušov (Slovakia).

Material and methods

Study area

The cadastral territory of the village of Nižný Hrušov extends on the Ondava ridge of the East Slovak Plain on the terraces of the Ondava river, which pass into the Pozdišovská upland. Based on the administrative division, the village of Nižný Hrušov is located in the Prešov region and the Vranov nad Topľou district. The center of the village is at an altitude of approx. 130 m a.s.l. The assessed cadastral territory falls into the warm climatic region, moderately humid sub-region, with cold winter. The average annual temperature is 7.8 °C, the average temperature in January ranges from -2.5 to -5 °C, the temperature in July is from 17 to 18.6 °C. The average amount of precipitation is 700 to 720 mm per year. The richest months for precipitation are July

and August, the poorest are February and March. The number of days with snow cover reaches 80 days. From a hydrological point of view, the territory of the village of Nižný Hrušov belongs to the Bodrog watershed. The Ondava watercourse and its tributary Kyjov watercourse, Hrušovský stream and other small watercourses flow through the village of Nižný Hrušov. The village is part of the water management important area called “River alluvium of the Ondava”.

Design of a rainwater management optimization system and its technical description

To improve the system for optimizing rainwater management in the village, several separate objects should be designed as part of water retention measures in the village such as an infiltration pipe - a trench, inspection and cleaning shafts, a detention tank, a rain garden and semi-vegetation panels. The main goal of this system is the collection of rainwater and its reuse in the studied location.

The system of collecting infiltration perforated pipes - trench offers an effective and sustainable solution for managing stormwater runoff and promoting groundwater recharge in urban and suburban areas. Their purpose is to improve the collection of rainwater from the surface, its retention and slowing the infiltration.

In a water retention system that uses infiltration trenches with perforated pipes, the use of **inspection and cleaning shafts** are crucial components (Fig. 1). They enable monitoring, maintenance, and ensure the system functions effectively and durably in managing stormwater runoff and promoting groundwater recharge.

Artificial structures - **detention tanks** - can be designed to temporarily retain stormwater runoff, where stormwater runoff enters through storm drains (Fig. 2). Surface runoff is collected in these structures until the maximum inflow volumes have fallen. From there, the retained rainwater is released at a controlled rate into nearby water bodies, or it can then be used for various purposes. This method of rainwater management helps reduce flooding in our municipalities. They can be installed either above ground or below ground. Underground detention systems are suitable because they allow the space above them to be used for parking lots, grass areas, etc.



Fig. 1: Example of inspection shaft



Fig. 2: Example of underground detention system

Rain garden is a practical tool for water retention strategies. It isn't a unit of measurement itself, but its design and function significantly impact how much rainwater is captured, stored, and infiltrated back into the ground. It can help reduce the risk of flooding in municipalities. During the design phase, it is necessary to estimate its potential water retention capacity based on its size, depth, and soil properties (Zeleňáková & Junáková 2023). This helps determine if the rain garden can manage the targeted amount of stormwater runoff for the specific area.

Other components of a water retention strategy that can indirectly influence water retention are **semi-vegetation panels**. They can be a contributing factor in a water retention strategy when used alongside other methods and with careful plant selection.

Results and discussion

Figure 3 shows the situation of wider relations of the designed water retention measures in the village of Nižný Hrušov.

Infiltration pipe - a trench (SO.01) with a clear width of 350 mm will be implemented in the places of the original sewer channel formed by concrete slabs in the shape of a trapezoid, where the width conditions of the road and the relevant plots do not allow the installation of an open channel. Sewerage will be implemented in a section of approximately 194 m in length in the green belt next to the road, where three cleaning shafts will be installed. Above the route and along the route of the infiltration pipe - trenches, trees must not be planted so that the roots do not enter the pipe and break it.

Three **inspection shafts** (SO.02) are designed on the inlet infiltration perforated pipe in front of the detention tank and along the length of the pipe.

A **sludge tank with cleaning shaft** (SO.03) is designed to collect coarse dirt. The design is based on the value of the 5-year rain ($q = 141 \text{ l.s}^{-1}.\text{ha}^{-1}$). Considering the terrain and the surrounding road, the design considers a surface factor of 0.8. $Q = (1,950 \text{ m}^2 \times 0.8 \times 141 / 10,000) = 21.99 \text{ l.s}^{-1}$. The proposal considers the nominal size of the trap NS 40 with a total volume of 4 m^3 . A self-supporting sludge tank made of fiberglass is designed, without the need for concreting. The tank has a total height of 2,050 mm and a diameter of 2,340 mm. An inspection shaft with a non-return valve will be installed on the supply sewage pipe in front of the detention tank. The flap will also be used as an inspection – service (cleaning shaft).

The collection of rainwater flows into a collection **detention tank** (SO.04), which will be installed in a green area at the end of the collection system and another near the cemetery. The retained water will be used for watering the greenery. The detention tank will be designed from system infiltration boxes with a permissible load of SLW30 (passenger transport). The proposed retention system will have a total system volume of $2 \times 12.0 \text{ m}^3$. The tank consists of basic elements ($800 \times 800 \times 660 \text{ mm}$), which are assembled into a connected block system.

The **rain garden** (SO.05, Fig. 4) is designed in the place of the safety overflow of the concrete threshold of the water flow in front of the municipal office, with a total area of approx. 120.0 m² with an irregular floor plan shape. Its task is the retention and slow the natural absorption of surface water from the banks of the water course in the studied area place. The rain garden is technically designed as a drainage depression at a depth of 500 mm below ground level. The planting and species composition of the plant formations respects the climatic conditions of the environment, and is designed to achieve a year-round effect with a minimum of necessary maintenance. The planting itself is handled in two zones - according to the state of wetting. At the edge of the garden - in zone 1, plants suitable for normal and partially wet environments are planted such as *Ajuga reptans*, *Anemone hybrida*, or *Liatris spicata*. Plantings with occasional flooding are intended for the 2nd zone (e.g. *Iris sibirica*, *Pachysandra*, *Physostegia*).

In order to mitigate the negative consequences of excessive rainfall, the paved areas will be designed as **semi-vegetated concrete grass panels**. The total proposed area of semi-vegetated areas will be 180.0 m².



Fig. 3: Location of individual proposed objects of water retention measures in the village of Nižný Hrušov (SO.01 Infiltration pipe - a trench, SO.02 – Inspection shaft, SO.03 – Sludge tank with cleaning shaft, SO.04 – Detention tank, SO.05 – Rain Garden)

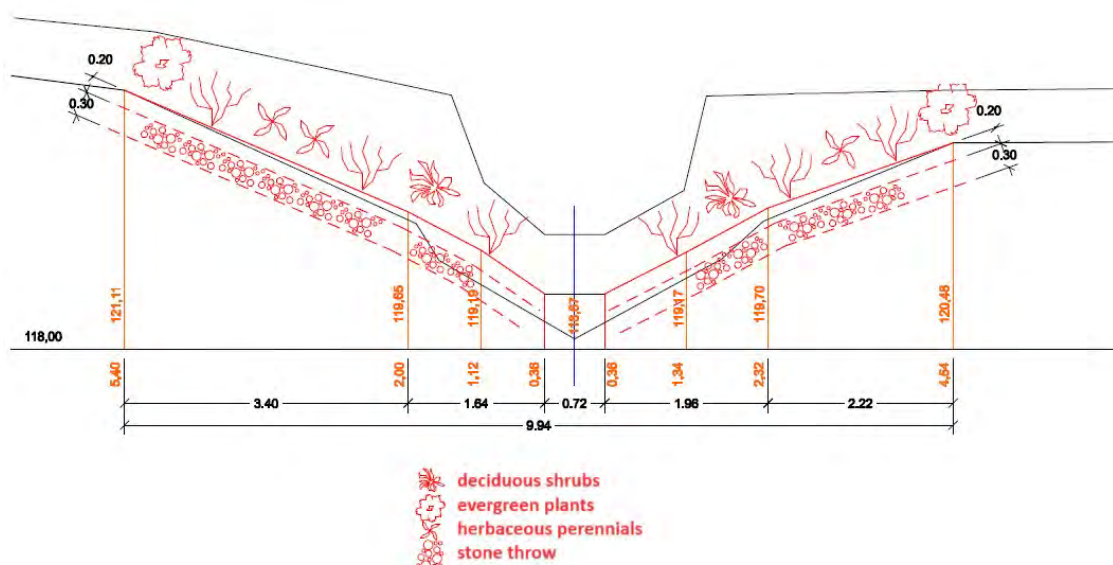


Fig. 4: Cross-section of a rain garden

Conclusion

The implementation of water retention measures and green infrastructure with recreational potential is an effective way to increase the quality of life in cities and towns, and at the same time to reduce the risk of floods and improve the quality of the environment.

In order to ensure the safe drainage of rainwater, to protect the urban area of the village of Nižný Hrušov (Slovakia) from flood flows, and to increase the quality of people's life, the paper proposes a combination of suitable water retention measures (an infiltration pipe - a trench, an inspection and cleaning shaft, a detention tank and a rain garden), which technical and social functions are interconnected.

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Souhrn

Zavádění opatření na ochranu vody a zelené infrastruktury s rekreačním potenciálem je účinným způsobem, jak zlepšit kvalitu života ve městech a obcích a zároveň snížit riziko povodní a zlepšit kvalitu životního prostředí.

Za účelem zajištění bezpečného odtoku srážkových vod, ochrany intravilánu obce Nižný Hrušov (Slovensko) před povodňovými průtoky v toku a zlepšení kvality života obyvatel je v příspěvku navržena kombinace vhodných vodohospodářských opatření - vsakovacího potrubí (příkopu), revizní a čistící šachty, retenční sběrné nádrže a dešťové zahrady, jejichž technické a sociální funkce jsou vzájemně propojeny.

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FLORA OF SOUTH MORAVIAN VINEYARDS AND THE EDUCATION OF THE ELDERLY CITIZENS

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Abstract

Vegetation surrounds and accompanies us at every step. Vineyards are a specific landscape element typical for South Moravia. From a botanical point of view vineyards are a very distinctive environment which is also reflected in their species variety. Species with common occurrence as well as weeds can be found in the vineyards. Endangered species, and on other hand invasive species also form a part of vineyards. The diversity of vineyard vegetation can be used in the education of elderly citizens. Human senses such as sight, touch and smell can be used to identify plant species. Physical movement, learning about the plant traits and employment of human senses motivate human memory and evoke memories. Wide-ranging stimulation enables better memorization of new information. Learning about the vegetation of the vineyards provokes diverse interactions that are very important in the education of elderly citizens. The combination of exercise and education is an interesting option for recreation of elderly citizens.

Keywords: vegetation, vineyards, University of the Third Age, education, recreation of elderly citizens.

Introduction

The species spectrum of vegetation in vineyards is influenced by location, climatic and soil conditions, method of protection (Winter et al., 2018), maintenance of rows and inter-rows (Kratschmer et al., 2018), and by the size of the vineyards as well as neighbouring habitats (Ragasová et al., 2019). Vineyard management can alter ecosystem services (Winkler et al., 2018). The plant species composition of the orchard vegetation is decisive for ensuring ecosystem functions (Vignozzi et al. 2019; Pfiffner et al. 2019; Denan et al. 2020; Sofo et al. 2020). The protection of native and rare plant species belongs to important ecosystem functions of traditionally managed vineyards (Von Hase et al., 2010). A high species diversity of vegetation creates a prerequisite for a successful provision of these functions. Vegetation is part of vineyards and provides ecosystem functions, and cultural services (Fagerholm et al. 2016, Winkler et al. 2023). Vineyards and fruit trees have aesthetic and cultural values, they carry the legacy of our ancestors who bred varieties and planted them (Baumgärtner and Bieri 2006).

Vineyards and wine cellars in South Moravia are a frequent destination for tourists. Interest in wine tourism keeps growing which contributes to the development of tourism and services. Wine tourism in South Moravia helps preserve local traditions and folklore in wine-growing villages (Prokeš 2013). The diverse vegetation of the vineyards brings also new potential to education.

Teaching about plant species should have a high priority especially in the context of global biodiversity loss (Pernat, et al. 2023). Learning to identify plant species requires time and patience, and also an expert mentor who can provide feedback and ensure improvement (Pearson et al. 2011). Various mobile applications can stimulate interest in learning about plants more easily and directly. This is also one of the main tasks of these applications, which is to motivate the general population to be interested in the environment and its protection (Bonnet et al. 2020). Learning to identify one or more groups of species is a lengthy process that cannot be shortened even by digitization. Human experts are extremely important, also for application capabilities, such as the verification or image labeling for the purpose of increasing accuracy

(Wäldchen et al. 2018). Teaching in the field confronts students and mentor with different conditions such as vegetation phenology and seasonal appearance of plant species (Pernat, et al. 2023). In the education of elderly citizens, it is important to consider not only their needs and interests, but also their specific desires, fears, lack of previous experience or physical limitations. Awareness of the needs and motivations of elderly citizens in education need to be taken into account when designing study programs. It is essential to create sustainable and long-term implementation of programs for older adults in subsequent years (Schirmer et al. 2023).

The aim of the work was to assess the vegetation potential of selected vineyards for the education of elderly citizens.

Materials and methods

The vineyard, where the field part of the work was carried out, is located in Žabčice, about 25 km south of the city of Brno in the district of Brno – venkov. Žabčice is a wine-growing village in the Velkopavlovice wine sub-region (vineyards: Staré vinohrady; Horní díly; Koválov; Čtvrtky and Zahrádky). The average altitude is 184 m above sea level. The long-term average of total precipitation is 480 mm. The average annual temperature is 9.2 °C.

Vegetation was evaluated using a floristic inventory of the identified species. The evaluation was carried out in June 2023. The paths through the vineyards were determined in the selected area within the wine lines. During passing the paths, the identified plant species were recorded. Subsequently, the plants were divided into functional groups for individual vineyards.

Results

A total of 96 plant species were identified on the vineyard lines during passing the paths through the vineyards.

In total, 64 different plant species were identified on the vineyard line of Stará Vinohrady. Rare plant species included *Filago vulgaris*, *Melica transsilvanica*, *Lappula squarrosa*, and *Cynoglossum montanum*. Several expansive and invasive species were also identified, which were *Amaranthus retroflexus*, *Tripleurospermum inodorum*, *Arrhenatherum elatius*, *Cirsium arvense*, *Robinia pseudacacia*, *Calamagrostis epigeos*, and *Epilobium ciliatum*. Several deep-rooting species were further identified, including *Securia varia*, *Humulus lupulus*, *Cirsium arvense*, *Rosa canina* and *Convolvulus arvensis*.

A total of 54 different plant species were recorded in the form of a floristic record on the Koválov vineyard line. Following rare species were recorded: *Filago vulgaris* and *Lappula squarrosa*. Several expansive and invasive species were also identified in this vineyard. These included *Tripleurospermum inodorum*, *Echinochloa crusgali*, *Urtica dioica*, *Arrhenatherum elatius*, *Cirsium arvense*, and *Calamagrostis epigeos*. Several deep-rooting weeds were identified and included *Securia varia*, *Amaranthus retroflexus*, *Parthenocissus quinquefolia*, *Cirsium arvense*, *Rosa canina*, *Cornus sanguinea*, and *Convolvulus arvensis*.

The last monitored vineyard line was the vineyard line Horní Díly, where 71 plant species were recorded. Identified rare species were *Melica transsilvanica* and *Lappula squarrosa*. Following expansive and invasive species were *Amaranthus retroflexus*, *Sambucus nigra*, *Tripleurospermum inodorum*, *Echinochloa crus-gali*, *Urtica dioica*, *Chenopodium pumilio*, *Arrhenatherum elatius*, *Cirsium arvense*, *Robinia pseudacacia*, *Calamagrostis epigeos*, *Epilobium ciliatum*, and *Solidago canadensis*. Several deep-rooting plants *Sambucus nigra*, *Cichorium intybus*, *Trifolium pretense*, *Rubus sp.*, *Cirsium arvense*, *Rosa canina*, *Convolvulus arvensis*, and *Robinia pseudacacia* were also identified.

Discussion

Educational practices supporting a continuous development and a healthy learning environment in which knowledge is co-created and shared are referred to as sustainable learning (Cascio et al. 2014). They involve continuous, responsive, purposeful and proactive learning where students effectively build and transform their skills and knowledge base through a changing environment (Hays, Reinders, 2020). Part of the duty of sustainable education is to follow current educational processes (Gómez-Galán et al. 2020), where teachers still play a key role in shaping students' interest and success in education (Fauth et al. 2019).

Vineyards are an important element in cultural landscape. Part of the vineyards consist of specific vegetation that grows together with the grapevine. Vegetation in vineyards is highly

important as it provides ecosystem functions to the soil, the vineyards and people. These include e.g. a food source for pollinators, oxygen production and enrichment of the soil with atmospheric nitrogen. Vegetation also prevents wind and water erosion, unwanted evaporation and regulates the occurrence of pathogens and pests. Some types of plants can be used for medicinal purposes. Last but not least, vegetation provides aesthetic services that increase the tourist attractiveness of the locality.

Conclusion

The vegetation in the vineyard represents a very interesting teaching space for the education of elderly citizens. The variety of vineyard vegetation can be used in the education of elderly citizens. People use senses such as sight, touch and smell to identify plant species. Physical movement, learning about the traits of plants and using the human senses motivates the human memory and evokes memories. Wide-ranging stimulation enables better memorization of new information. Learning about the vegetation of the vineyards provokes diverse interactions that are very important in the education of elderly citizens. The combination of exercise and education is an interesting option for recreation of elderly citizens.

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Souhrn

Vegetace nás obklopuje a doprovází na každém kroku. Vinice jsou specifickými krajinným prvkem typickým pro jižní Moravu. Z pohledu rostlin jsou vinice velmi specifickými prostředím a to se odráží v druhové pestrosti. Ve vinicích nacházíme druhy s běžným výskytem, jsou zde také druhy označované za plevel. Součástí vegetace vinic jsou ohrožené druhy, ale také druhy invazní. Rozmanitost vegetace vinic může být využita ve vzdělávání seniorů. K identifikaci druhů rostlin jsou využívány lidské smysly jako zrak, hmat a čich. Fyzický pohyb, poučení o znacích rostlin a využití lidských smyslů motivuje lidskou paměť a vyvolává vzpomínky. Mnohostranná stimulace umožňuje lepší zapamatování nových informací. Poznávání vegetace vinic vyvolává různorodé interakce, které jsou velmi důležité ve vzdělání seniorů. Kombinace pohybu a vzdělávání představuje zajímavou variantu pro rekreaci seniorů.

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FLOWERING DYNAMICS OF SELECTED PLANTS WITH ALLERGENIC POLLEN

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Abstract

The Lednice-Valtice area is one of the important recreational areas that offer a wide range of recreation. The surroundings are also interesting for visitors, bike rides are popular. It is advisable to arrange the stay of visitors suffering from allergies with regard to the flowering of plants with allergenic pollens. Plants whose pollen is allergenic were selected from the database of phenological observations of the Czech Hydrometeorological Institute in the Lednice area. The data of the flowering phenophase were statistically processed and on their basis the periods with the occurrence of allergenic pollens were defined. It is a question whether there is sufficient information for tourists about periods with allergens.

Keywords: Flowering phenophase, allergies, Lednice-Valtice area, air temperature

Introduction

In connection with the earlier onset of higher air temperatures in spring, especially in recent years, plants are also flowering earlier. Consequently, pollen is released into the air earlier, triggering an inappropriate immune response in sensitive individuals, a condition referred to as "seasonal allergic rhinitis". Pollen particles, present in the air, can settle on the skin, in the eyes, nose, and bronchi, inducing symptoms such as profuse runny nose, itching, and sneezing (often paroxysmal), swelling of the nasal mucosa resulting in a stuffy, red nose, watery eyes, and difficulty breathing. Most individuals with pollen allergies are sensitive to several types of pollen and may also react to certain foods containing similar proteins, a phenomenon known as "cross-allergy". A classic example is the cross-allergy between birch pollen and apples (<https://www.pylovasluzba.cz/alergie/pylova-alergie>). Pollen allergens have the capability to stimulate the release of pro-inflammatory and immunomodulating mediators, accelerating the development of IgE-dependent sensitization and allergy. Studies have indicated that plants exhibit enhanced photosynthesis and reproductive effects, producing more pollen in response to elevated atmospheric carbon dioxide levels (Chong-Neto et al., 2020).

As reported by Asam et al. (2015), pollen allergy affects approximately 40% of allergic individuals. Tree pollen allergies, in general, are predominantly triggered by allergenic trees belonging to the orders Fagales, Lamiales, Proteales, and Pinales. Over 25 years ago, the gene encoding the major birch pollen allergen Bet v 1 was the first of its kind to be cloned, and its product characterized. Since then, 53 pollen allergens from trees have been identified and recognized by the WHO/IUIS Allergen Committee. Among the most effective and common sources of allergens are pollens from trees of the beech family (Fagales), olive trees (Oleaceae), and cypresses (Cupressaceae) (Mothes et Valenta, 2004).

Pollen allergy issues in urban areas are also attributed to inadequate urban design and selection of ornamental species, contributing to one of the most prevalent diseases in urban populations: pollen allergy. The primary causes of this extensive allergenicity include low species biodiversity at planting, overpopulation of certain species acting as key specific pollen sources, planting of exotic species causing new allergies, selection of male individuals producing pollen in dioecious species, and the presence of invasive species. Clear guidelines are necessary regarding the design and planning of urban green spaces to minimize allergy impacts (Cariñanos & Casares-Porcel, 2011).

According to Lake et al. (2017), ragweed is poised to become a common health issue across many parts of Europe due to its allergenic pollen. Sensitization to ragweed is expected to more than double, rising from the current 33 million to 77 million people by 2041–2060. Sensitized individuals may experience more severe symptoms due to higher levels of ragweed pollen and

prolonged pollen seasons, lasting until September and October in many parts of Europe. These projections primarily stem from climate change assumptions (66%) but also reflect current trends in the spread of this invasive plant species across Europe.

Puc (2003) defines allergies as excessive reactions of the body to foreign substances (antigens) that are harmless to others' bodies in similar amounts and under similar conditions. Allergic reactions occur when the natural immune defense mechanism, responsible for the appropriate response to environmental factors, is disrupted. The most common allergens from the natural environment are inhaled allergens present in plant pollen. Allergens from the natural environment typically consist of proteins with a high molecular weight, greater than 10 kDa. Pollen allergens are water-soluble proteins or glycoproteins with molecular masses ranging from 10 to 70 kDa. The most significant contributors to pollen allergy include genetic and environmental factors (air pollution, allergen exposure, respiratory infections, diet), and the microflora of plant pollen.

Chen et al. (2016) propose a model explaining how pollen allergens were created and maintained in plants. Prediction and systematic analysis of pollen allergens in model plants indicate that pollen allergens arose by gene duplication and subsequent functional specification. This study provides insight into the phylogenetic and evolutionary scenario of pollen allergens, which will be useful for future characterization and pollen allergen epitope screening.

Vrtala et al. (1993) investigated the kinetics of allergen release from birch pollen (*Betula verrucosa*) and timothy grass pollen (*Phleum pratense*) using various protein extraction procedures, immunoblotting with specific antibodies, and immunoelectron microscopy. Major birch pollen allergen Bet v I, major timothy grass pollen allergens Phl p I and Phl p V, and group II/III allergens from timothy grass pollen and profilin were rapidly and abundantly released from hydrated pollen. Pollen allergens could be detected within minutes in aqueous supernatants prepared from birch and grass pollen with serum IgE or specific antibodies. Consistent with previous observations, they concluded that the allergenic properties of proteins are more closely associated with the quantity and rate of dissolution from airborne particles than with intrinsic properties. The length of specific phenophases was reduced by 2.3 days in oak, 0.8 days in hawthorn, and 1.3 days in wild garlic. The onset of phenophases shifted by 9 to 10 days over a 47-year period.

Materials and methods

The phenological observations, conducted by Assoc. Prof. Zdeněk Bauer, CSc., Data on the phenological phase of flowering of *Tillia cordata*, *Fraxinus angustifolia*, *Acer campestre*, *Sambucus nigra* in the area of Lednice in Moravia were analyzed. The date of each phenophase was converted into so-called Julian days, as sequential days in the year counted from January 1 of the given year. These data were processed using basic statistical methods, and the temporal variability of the onset of phenophases was defined for the period from 1961 to 2015.

Results

The results of the statistical analysis are presented in Table 1. They include the occurrences of the earliest and latest onsets of the phenophases of initiation and full flowering. Furthermore, the difference between these onsets, the average ordinal day for a given phenophase, the standard deviation, and the coefficient of variation are provided. Environmentally, *Acer campestre* burdens the surroundings with its pollen first, followed by *Tillia cordata*, and finally, *Fraxinus angustifolia*, with *Sambucus nigra* being the latest.

Tab. 1: Statistical characteristics of the phenophases of initiation and full flowering, Lednice na Moravě

Tilia cordata Bud		Tilia cordata Full development	
min	29.3.1974	min	20.4.1989
max	28.4.1980	max	20.5.1980
amp	31	amp	31
average	104	average	124
standard deviation	7.832	standard deviation	6.540
coefficient of variation	0.075	coefficient of variation	0.053

Fraxinus angustifolia Bud		Fraxinus angustifolia Full development	
min	12.4.1974	min	8.5.2009
max	13.5.1982	max	8.6.1980
amp	31	amp	32
average	117	average	142
standard deviation	7.705	standard deviation	7.286
coefficient of variation	0.066	coefficient of variation	0.051

Acer campestre Bud		Acer campestre Full development	
min	20.3.1990	min	16.4.1989
max	21.4.1969	max	13.5.1980
amp	32	amp	28
average	96	average	121
standard deviation	7.442	standard deviation	6.582
coefficient of variation	0.078	coefficient of variation	0.055

Sambucus nigra First flower		Sambucus nigra Full bloom	
min	5.5.2000	min	11.5.2000
max	5.6.1980	max	15.6.1966
amp	31	amp	34
average	140	average	149
standard deviation	7.175	standard deviation	7.112
coefficient of variation	0.051	coefficient of variation	0.048

Discussion

In recent decades, much research activity has been devoted to studying the manifestation of climate change. The increasing dynamics of weather and demonstrable changes in climate, especially rising temperatures, alter conditions for plants and thus their reactions. The timing and duration of phenological phases are changing. From the perspective of conditions for human outdoor activities, knowledge of the flowering phenophase and its duration is important because pollen from certain plants causes allergies. As documented in the literature review, the occurrence of pollen allergens is a serious issue receiving considerable attention. Our results demonstrate that it is necessary, also from a recreational standpoint, to know the flowering periods of plants with allergenic pollen. Due to the evident warming and thus earlier onset of flowering phenophases, and thus earlier pollen occurrence, conditions for the beginning of the recreational period are essentially improving. This is because the largest numbers of visitors to the Lednice-Valtice area come during the summer months. At its beginning, elderflower pollen is prevalent, thus improving conditions for allergy sufferers due to its earlier flowering.

Conclusion

The data on the phenological phases of flowering in *Tillia cordata*, *Fraxinus angustifolia*, *Acer campestre*, and *Sambucus nigra* were analyzed. Statistical analysis indicates that *Acer campestre* blooms first, with the latest onset of full flowering occurring in the second decade of April. The latest full flowering occurs in *Tillia cordata*, at the turn of the second and third decades of May. *Fraxinus angustifolia* exhibits the latest occurrence of full flowering at the end of the first decade of June. Among the evaluated species, this phase is the latest in *Sambucus nigra*. However, considering the earlier onsets of flowering, it is reasonable to assume that full flowering in *Sambucus nigra* will also occur earlier, resulting in significantly less manifestation by early May. In this regard, warming will have a positive impact on recreational conditions. Certainly, the extent to which high air temperatures will burden visitors to the area is a question. A comprehensive assessment of the occurrence of allergenic pollen would require an analysis of the flowering of all plants with this pollen; however, phenological data are not available for most of them.

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Souhrn

Změna klimatu, která se projevuje statisticky prokazatelným zvyšováním teploty vzduchu, ovlivňuje také fenologické projevy rostlin. Z hlediska podmínek pro pobyt člověka v přírodě jsou důležité poznatky o fenofázi kvetení a její délce proto, že pyly určitých rostlin jsou příčinou alergií. Problematika výskytu a působení alergenního pylů je celosvětovým tématem a je studována z mnoha pohledů.

Uváděny jsou výsledky statistického hodnocení fáze kvetení u druhů *Tillia cordata*, *Fraxinus angustifolia*, *Acer campestre*, *Sambucus nigra* v katastru Lednice. Naše výsledky dokládají, že je potřeba i z hlediska rekreace znát doby kvetení u rostlin s alergenním pylem. Díky prokazatelnému oteplování, a tím dřívějším nástupům fenofáze kvetení, a tím i dřívějšmu výskytu pylů se v podstatě zlepšují podmínky pro období počátku rekreace. Je to dáno tím, že

největší počty návštěvníků Lednicko-valtického areálu přichází až v letním období. Na jeho počátku jde o výskyt pylu bezu černého, jeho dřívější kvetení tak pro alergiky podmínky zlepší. V tomto ohledu se oteplování projeví na podmínky rekreace pozitivně. Jistě, že je otázkou, nakolik zatíží návštěvníky areálu vysoké teploty vzduchu. Pro jednoznačné posouzení výskytu alergenního pylu by bylo potřebné provést analýzu kvetení všech rostlin s tímto pylem, ovšem u většiny nejsou k dispozici fenologická data.

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FOREST CEMETERIES – USAGE AND DIRECTIONS OF DEVELOPMENT. EXAMPLE OF CENTRAL POLAND AND EAST GERMANY

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Abstract

The aim of our research is to determine what changes in cultural and natural values as well as land use are visible in the selected forest cemeteries located in the central region of Poland in Central Europe (especially from Poland). We also look for trends of ecological burials in forests visible strongly in Eastern (East Germany). In our preliminary study we test multiple forest cemeteries regarded to the ecological premises of burial and how they can be preserved and used for future generations. In our research, we selected different Polish forest cemeteries especially in communities, many neglected and abandoned historic cemeteries are material evidence that not only Polish but also German or Dutch communities lived in these areas.

Keywords: Central Poland, confessional cemeteries, ecological burial, memorial forests, sacred zone

Introduction. Research of multiaspects of cemeteries

The main reason for undertaking research on forest cemeteries is the study of urban cemeteries on the example of large cities in Poland (such as Warsaw, Łódź) and Germany (Leipzig). For a long time, we have been interested in people's relationships and their attitude to cemeteries (Haase, Dushkova and Długoński 2018; Długoński 2021; Długoński, Dushkova and Haase, 2022). Nevertheless, an important but also little touched upon in previous research topics are cemeteries and specifically located in forests, i.e. outside cities. More and more often the idea of ecological cemeteries comes to us from neighbouring countries, but nowadays it conflicts quite strongly with the law (Dz.U. 2023 poz. 887) and the attachment of Poles to Christian religion traditions. What is more, especially in Poland, as a homogenous society we can distinguish a completely different idea about cemeteries in forests, e.g. strictly moral ones. These aspects we would like to focus in our article more strongly.

Material and methods

The research consists of camera and field studies which were then supplemented by a short synthesis and guidelines for further work and recommendations on ecological burials in cemetery forests. In the camera study, we reviewed the literature on cemetery forests and forest cemeteries. We also reviewed the literature on religious cemeteries in order to take a closer look at the specificity of forest cemeteries (Michałowski ed. 1996, Tanaś, 2008 Haase et al. 2020). Information about ecological burials was also important, and websites dedicated to research institutes and funeral companies dealing with ecological burials (Franczak 2020; Pogrzeb w lesie, 2024; UMŁ 2024). Moreover, we conduct a field vision (field research) of selected forest cemeteries located in different places in Central Poland in the Łódzkie, Mazowieckie, Świętokrzyskie voivodeships (Machejek 2019). In our paper we use an observation method for Zeisel (1981) and Niezabitowska (2014), which consisted in inspecting the actual development state of cemeteries. The material for further research was photographic documentation of forest cemeteries carried out in the years 2020-2024.

Results. Current usage and new ideas of forest cemeteries development.

In Poland we can distinguish 3 types of cemetery forests. The first group are memorial cemeteries commemorating the period of the First and Second World Wars. There are a lot of them, meanwhile in the central region of Poland where we gather front lines so-called little-known Battle of Łódź (Daszyńska 2023). From this period and so the years 1914-1915 (Machejek 2019) it is possible to select several small cemeteries small cemeteries with a symbolic monuments eg. located only in the close vicinity of of the Łódź city, Zgierz, Gąska Stara (Łódzkie voivodeship), or Palmiry close to Warsaw city (Mazowieckie voivodeship)

in Central Poland. Also from this period there are many mausoleum cemeteries commemorating these war events meanwhile in the Łódź region. The second group of forest cemeteries in Poland are also cemeteries-monuments commemorating the plane crash, e.g. in Kabaty district in Kabacki forest in Warsaw city. It should be mentioned here that monuments and commemoration of history, especially in Poland, has been very popular since times. The last group of forest cemeteries can be referred to places where it was planned to bury the dead in forest site. This issue is presented by cemeteries forest located eg. in Izabelin / Laski near Warsaw city, (Figure 1).



Fig. 1: Burials in Izabelin / Laski near Warsaw city (Mazowieckie voievodeship). Central Poland. Photo by Hubert Śmetanka, 15.12.2006

The cemetery in Laski is buried, among others, eminent persons such as the Prime Minister of Poland Tadeusz Mazowiecki. The cemeteries have a typical forest character and there are no tombstones and the natural wood and other local material is used in cemetery equipment.

In addition, instead of tombstones, plants that decorate cemeteries are used. Nowadays, this idea is far away for the Polish thinking about cemeteries because to a large extent several granites are used which reach the right size. By this the cemetery area ceases to place any form of green. This is a problem and a challenge for the future. It can be mentined that only the vegetation in the composition is still used on the territory of rural cemeteries in the south of Poland, which largely results from the gardening tradition and the past from the times of partition and attachment of a given ethnic group (e.g. Małopolsanie, Silesian). These trends are also visible in Germany and southern Europe, for example. Czech Republic and Slovakia where the German nations in the past had a great influence on the cultures of these regions. It should be noted that there is also another group of forest cemeteries which over time have become forest forms. These are former religious cemeteries of ethnic groups living in the area of present-day Central Poland. The Evangelical-Augsburg cemeteries together with characteristic vegetation still preserved from interwar times e.g. Maples (*Acer sp.*), linden (*Tilia sp.*), ivy (*Hedera helix*) are a bit wild and unfortunately falling into ruin due to lack of funds and erroneous management of de facto monuments which are not necessarily but often listed on the list of monuments and heritage. This is undoubtedly the last moment to take care of these places in the future showing the history more readable for future generations. However, Polish law does not provide for special conservation of these sites. On the contrary, it is proposed that historic sites be dismantled, especially if their physical condition is critical or if they threaten the safety of users. It is therefore necessary to motivate different social groups to prevent the loss of this valuable cultural heritage in the future. A good example is the forest cemetery area of a former Dutch settlement near Kielce city (Świętokrzyskie Voivodeship)- Holendry located near Chmielnik (Figure 2). In 2013, a group of interested volunteers decided to find the location of the old cemetery where were buried the indigenous Dutch Mennonites who came to Poland before the 1st World War. The place was found on the basis of information of locals and their families in the nearby forest on a hill where, according to the literature of the subject, it fits into the information about the location of many evangelical cemeteries located, for example, in the

territory of East Prussia (Ogrody Pamięci, 2024). Nowadays the place is restored although after the old buried found many elements it however put on this hill a large cross and a keel of stones together with an information board about the whole event and place. There are certainly more such places in Poland, but their memory is no longer salvaged. Therefore, it may be necessary to save just such cemeteries located in forest scenery.

In eastern Germany we can observe burials in forests under trees with a minimum amount of information. Sometimes it is a sign on a tree with a name or a separate zone where there are only symbolic stones. These burials are more and more often chosen form of burial. In Poland, the stage of development and storage in biodegradable urns is only at the stage of ideas. However we observe the first such idea in Łódź, where it is planned to build such a place in the Szczecińska municipal cemetery in forested part. It is to be a designated area of about a few hectares on the territory of the current cemetery surrounded by old trees. The local authorities wants the name of this place to be a memory place so-called the Forest of Remembrance (UMŁ, 2024). In this case, it is estimated that the first burials could take place in June 2024, but currently it is still impossible due to Polish law restrictions.



Fig. 2: Location of forest cemetery hill in Holendry village near Kielce city (Świętokrzyskie voievdeship). Central-Eastern Poland. Photo by Andrzej Długoński. 7.04.2024

Discussion. Forest cemeteries – traditional sacred zones or ecological burials sides

In Poland forest cemeteries are still considered sacred. However, modern cemeteries resemble concrete squares rather than green areas (as originally planned) due to the fashion for erecting a granite monument even after the period of the PRL (1989 - present). The managers of historical cemeteries are more and more often decide to cut down historic trees and placed in their place other graves (formal barrier, impossibility of widening the boundaries of the cemetery, e.g. within the city or village). Moreover, Poles, as ardent Catholics, especially in All Saints, will find it difficult to break with the tradition of buying chrysanthemums and lanterns. For this, a generational and systemic change is needed. Thus, in this way cemetery forests idea will be adopted also in Poland. Given Poles' attachment to tradition and reluctance to cremate, and traditional form of burial may become popular only in a few decades. Besides, at the moment Polish law does not allow introduction of such activities (Dz.U. 2023 poz. 887). However, the first ideas for a memorial forest were created, for example, in Łódź city (Central Poland) instead of the traditional burial in the open area of the communal cemetery, is possible to bury the ashes of peoples loved ones among the trees. This trend known and common also in USA, Canda or Western Europe like Germany or Switzerland might be a premise to introduce sch kind of burial also in Poland.

Conclusion. The developmntal premises of forest cemeteries

It is worth noting that forest cemeteries are currently the least recognized group of green areas, which is poorly characterized in terms of spatial management and landscape architecture field as well as ecological purposes of development. In order for this issue it is worth noting to returning to the idea of memorial green areas or museum parks with the left sepulcher architecture and valuable historic vegetation of these places testifying to the history of these areas, which may become newly available not only for the needs of passive recreation but also for thanatourism, especially for the needs of visitors looking for their old relatives or recreating family genealogy. In turn, fashionable ecological burial sites designated cemeteries can be a challenge for local authorities to cope with the lack of burial space. Such a place may be surrounded by a graveyard who may be more anonymous in accordance with nature, which corresponds to modern trends in ecology.

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Souhrn

V Polsku jsou lesní hřbitovy pamětními místy a parky připomínajícími historii (např. období první nebo druhé světové války), stejně jako staré konfesní hřbitovy dané komunity viditelné ve středních oblastech Polska. Je jich hodně, zejména ve středním Polsku, kde se nacházela frontová linie tzv. Operacja łódzka/ Bitwa łódzka (1914-1915). Z hlediska počtu se jedná o hřbitovy německé, evangelické nebo sovětské a židovské. Některé z nich, například v Holendrech u Kielců (Świętokrzyskie vojvodství), získaly rekultivačním procesem novou funkci,

nově se pohřbívá například v památném lese v Lodži (Łódzkie vojvodství). Přestože jsou kulturním dědictvím, zůstávají kvůli nedostatku finančních prostředků nebo špatnému hospodaření do značné míry znehodnoceny. Existuje několik novodobých lesních hřbitovů (např. Laski, Izabelin), kde je forma pohřbívání v souladu s přírodou (hrob z prken, kříž z větví, květiny v zemi) jako les. Ve východním Německu převažují lesní hřbitovy jako nová forma pohřbívání spíše anonymní a biologicky rozložitelné urny se skromnou symbolikou. Těžko říci, zda se nové ekologické využití lesních hřbitovů prosadí také v Polsku. Nicméně první myšlenky smírčího parku vznikly například ve městě Lodž (střední Polsko). Místo tradičního pohřbívání na volné ploše obecního hřbitova je možné popel blízkých pohřbít kolem stromů.

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FREQUENCY ANALYSIS SEVERE METEOROLOGICAL DROUGHT IN THE EASTERN PART OF SLOVAKIA

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Abstract

This study deals with two drought indexes: Standardized precipitation index (SPI) and Reconnaissance drought index (RDI) during the time interval 1972-2022. Then the identification of severe meteorological drought event was detected if the index value was less than -1.5. In the recent years eastern Slovakia has faced intensify meteorological drought due to climate change and it will be more frequent in the future. This fact establishes importance to analyze and predicted the meteorological drought in monitored territory in order to minimize the negative effect on fauna and flora as well as environment.

Keywords: assessment of drought, Standardized Precipitation Index, Reconnaissance Drought Index, severe droughts, Slovakia

Introduction

Meteorological drought is a natural phenomenon with temporally negative and severe deviation from average value of precipitation totals (COM (2007)). The primary cause of the meteorological drought in eastern Slovakia is a persistent deficit of rainfall, and its severity is additionally influenced by other factors like air humidity, wind speed, sunlight. Characteristics of meteorological drought (such as duration, severity, intensity, inter-arrival time) in a specific region can be assessed using drought indexes such as SPI or RDI. These indexes measure the drought on numerical scale that reflect unusually wet, normal and unusually dry periods. RDI can truly represent the water availability of a region because it based on the difference between precipitation and evapotranspiration while SPI depends only on precipitation (Marini et al., 2018). Some studies such as: Tsakiris et al., 2007, Merabti et al., 2017, Khalili et al., 2010, Marini et al., 2018, Zarch et al., 2011, Pashuadis and Michaelides, 2008, Surendran et al., 2019, Sobral et al., 2018 have compared the Standardized Precipitation Index (SPI) and the Reconnaissance Drought Index (RDI) in different locations. Local-scale comparisons have demonstrated that both indices exhibit similar performance in identifying and assessing the severity of dry and wet events in spite of the SPI relies on monthly precipitation (P), whereas RDI is based on the ratio of P to monthly potential evapotranspiration (PET).

Surendran et al., (2019) quantified complex natural phenomenon by deciles, SPI, RDI and Streamflow drought index SDI in Madurai region in India during the year 1901-2004 and they detected that the Streamflow drought index SDI gave a different trend than SPI or RDI and that SPI is better index than deciles. Marini et al., (2018) investigated the meteorological drought events in Apulia region using two drought indices (SPI and RDI) for the period 1960–2012 and they found that the east zone is drier than the west zone of Apulia. Khatiwada et al., (2019) explored dynamics of spatio-temporal variation of drought events across the Western Nepal by the different meteorological drought indexes (SPI, SPEI, RDI and PDSI) and hydrological drought indices (SPI and PDSI). Ramkar et al., (2018) dealt with temporal analysis of meteorological drought by RD, RDI, and SPI during the years 1981-2013 in the west-central part of India. Comparison of the RDI and SPI showed different results considering the severity and the period of drought event and results of RDI appeared to be slightly more accurate than SPI. They concluded that the agricultural area of Girna River is more vulnerable to drought. Mohamed et al., (2023) examined the long-term precipitation anomalies by RDI and SPI indices in Tunisia during the years 1958-2020 and found that drought conditions were similar in frequency, duration and severity. They stated that SPI-12 is better for planning and

management of water resources in Tunisia. Nagy et al., (2020) examined dry and wet periods from 1960 to 2015 using drought indices (SDI, SPI, RDI and SPEI) with a 12-month timescales. The findings revealed alternating dry and wet periods. Despite various input indicators among the indices, common assessment periods were identified, particularly in the Poprad/Svit stations.

Due to simplicity calculation of RDI, same authors: Dastorani et al., (2011), Alemu et al., (2023), Ogunrinde et al., (2023), Ashraf et al., (2022), Zarch et al., (2015) and Akbari et al., (2016) made an assessment of future drought occurrence using climate models. Others authors examined the agricultural drought by RDI for instance: Tian et al., (2022), Vergoni et al., (2021), Abdelmalek and Nouiri (2020), Zarei et al., (2021).

The aim of this paper is an identification and quantification of severe precipitation anomalies over an annual time scale across eastern part of Slovakia for the last fifty-year time period using RDI and SPI.

Materials and methods

The monitored area is shown in Figure 1. It is presented by four synoptic stations; Bardejov (49°18'56"N, 21°12'44"E), Červený Kláštor (49°23'30"N, 20°24'19"E), Košice (48°42'58"N, 21°15'39"E), Spišské Vlachy (48°56'54"N, 20°47'38"E). The metropolis of eastern Slovakia is Košice while the total area of mentioned territory is 16 179 km² and with a population of 1.6 million. The northwest border with Poland is formed by the High Tatras mountain. The northern border is further formed by the lower mountain Spišská Magura and the very extensive Nízke Beskydy extending from the northwest of eastern Slovakia to northeast. The Vihorlat mountain rises above the town of Humenné. The Východoslovenská lowland stretches in southeastern part of territory. The Slovak Rudohorie, Slovak Karst and Slovak Paradise are located in the southwestern part of the territory. This territory is located in a temperate climate zone, whereas the area around Červený Kláštor is characterized by the highest average precipitation value and the area around Košice is characterized by the lowest average precipitation value. From the water management point of view, this territory (eastern, northern and western part of the territory) is classified as a moderately sensitive to a very sensitive territory (south-eastern Slovakia) to the occurrence of hydrological drought (MŽP SR, 2018). Values of monthly precipitation, minimum and maximum temperature were provided by Slovak Hydrometeorological Institute of Košice for a period of years 1972-2022 for presented stations.

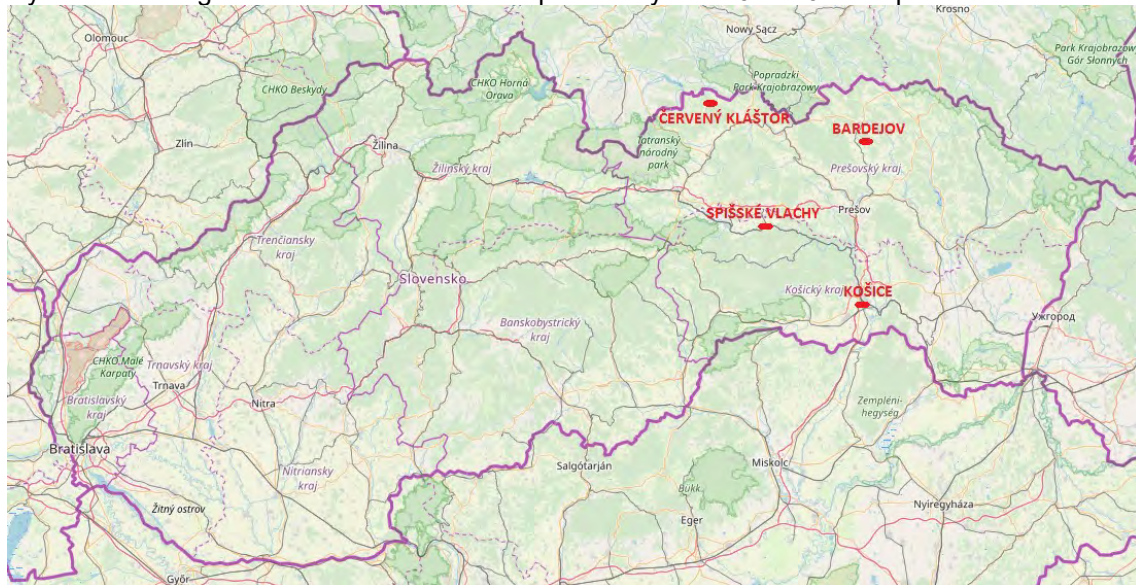


Fig. 1: Monitored area of eastern Slovakia

The methodology includes three steps. The first step involves completing statistical files. Monthly precipitation series, along with minimum and maximum temperatures series for a reference period are condensed into 12-month time scales. The second step consist of calculating the two drought indexes namely SPI and RDI in a DrinC program. The third step

contain the determination of the main characteristics of severe meteorological drought at four meteorological stations.

In the context of drought management, it is crucial to categorize the risk of drought into distinct levels, as these categories play a significant role in assessing the severity of the drought. The classification of meteorological drought based on the Standardized Precipitation Index (SPI) or Reconnaissance drought index (RDI) is presented in Table 1, comprising eight distinct categories (Blain, 2012), (Sienz et al., 2012) (Zarch et al., 2011). This study specifically focuses on events classified as severe drought. The identification of the historical severe drought events spanning from 1972 to 2022 employed the RUN method (Yevjevich, 1967). Subsequently, the primary characteristics of drought, including duration, severity, number of drought events and average inter-arrival time were determined. A threshold drought level of ($Z = -1.5$) was utilized to detect the initiation of severe drought event. Consequently, if ($Z < -1.5$), drought conditions were recognized, and the duration of a drought (D_d) was defined as the period during which index values consistently remained below -1.5. The severity of a drought (S_d) was calculated as the cumulative value of the index throughout the drought period. The inter-arrival time (T_d) denoted the duration between two consecutive droughts (Madadgar et al., 2011).

Tab. 1: Classification of meteorological drought using index Z (SPI or RDI_{st})

Z intervals	Z 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

For the analysis of meteorological drought in the eastern part of Slovakia covering an area of 16 179 km², data spanning 50 years was utilized. The objective of this study was to examine the historical occurrence of severe drought, determine the average recurrence of prolonged meteorological drought, and assess the region's vulnerability to drought. Identification of prolonged meteorological drought events was based on the 12-month Standardized Precipitation Index (SPI) and the 12-month Reconnaissance Drought Index (RDI). The outcomes of the temporal analysis at the four stations are presented in Figures from 2 to 7. Figures 2 and 3 show the frequency of the severe drought event by SPI-12 and RDI-12 respectively at the four stations.

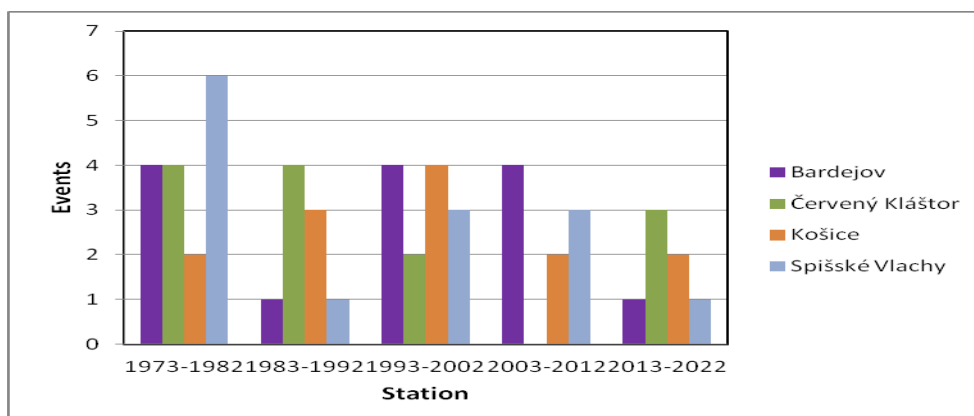


Fig. 2: Frequency of the severe drought event by SPI-12 at the four stations

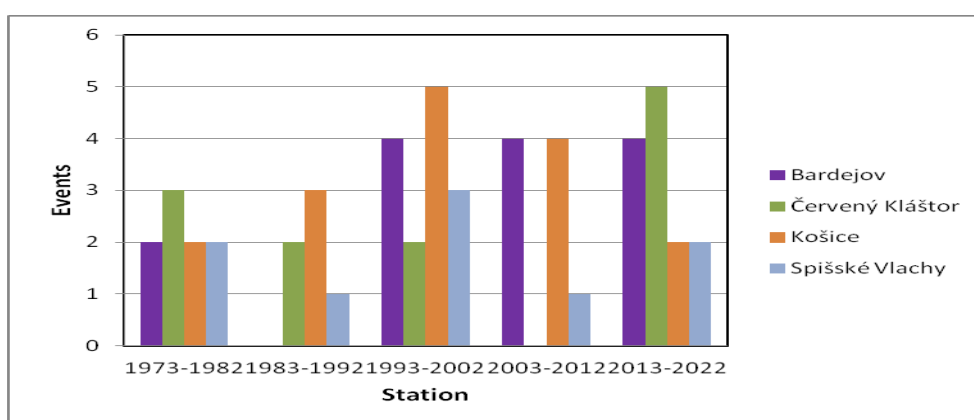


Fig. 3: Frequency of the severe drought event by RDI-12 at the four stations

The frequency analysis of severe drought identified by the indices is not completely identical. The results from the SPI-12 index show that the most severe decade was in 1973-1982 while the RDI-12 index was the period of 1993-2002. It is clear that the meteorological drought deepened in this decade also due to the influence of climatic factors. The Characterization of severe meteorological drought by SPI-12 and RDI_{st}-12 are shown in Table 2.

Tab. 2: Characterization of severe meteorological drought by SPI-12 and RDI_{st}-12

Water meter station	Events		Duration (months)		Cumulative severity		Inter-arrival time (year)	
	SPI	RDI _{st}	SPI	RDI _{st}	SPI	RDI _{st}	SPI	RDI _{st}
Bardejov	14	14	24	26	-43.7	-47.8	3.45	3.45
Červený Kláštor	13	12	44	40	-75.5	-79.7	4.07	3.76
Košice	13	16	31	29	-56.8	-49.9	4.03	2.98
Spišské Vlachy	14	9	39	42	-70.8	-76.3	3.46	5.36

Comparison between RDI and SPI at the four stations for the period from 1972 to 2022 are shown in figures 4 to 7.

For RDI-12, a total of 14 episodes of severe drought were recorded at the Bardejov precipitation station with a total cumulative severity of -47.8 and total duration 26 months. In years: 1994, 2003 and 2022 were prolonged severe meteorological drought. The average drought return time at Bardejov station is 3.45 years. The severe episodes of drought lasted a short time (Figure 4). Sometimes histogram of RDI-12 is overestimate mainly in year 1978-79, 1980-81 and sometime curve of RDI-12 is underestimate mainly in year 2016-2018, 2019-2020 in confront of curve of SPI-12, but in a larger time scale the curve of RDI-12 is similar to curve of SPI-12 in Bardejov station. The number of severe drought episodes in Bardejov station turned out to be the same, even if with some differences in timing, the years with the same record of severe drought are 1974, 1982, 1993, 1994, 2003, 2011, 2016 and 2022.

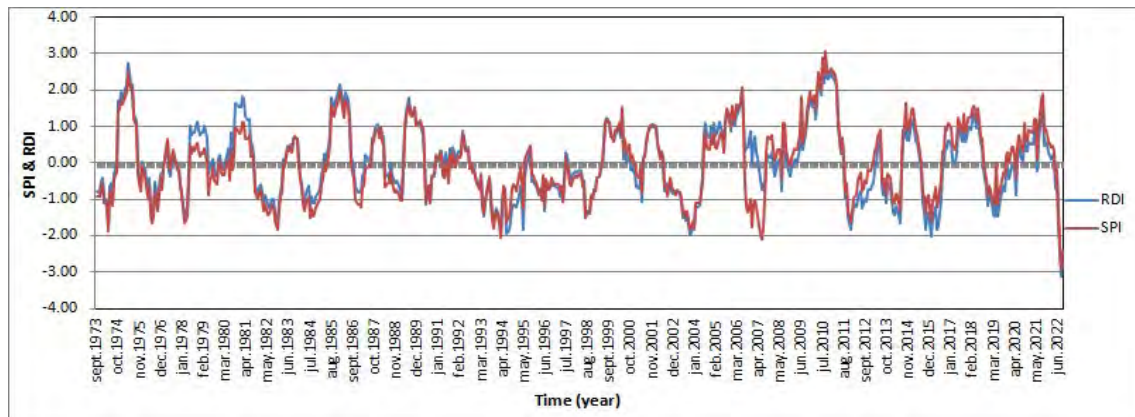


Fig. 4: Annual drought indexes at station Bardejov for the period (1972-2022).

For RDI-12, a total of 12 episodes of severe drought were recorded at the Červený Kláštor precipitation station with a total cumulative severity of -79.7 and total duration 40 months. In years: 1973, 1986, 1993, 1994, 2012, 2022 were prolonged severe meteorological drought. The average drought return time at Červený Kláštor station is 3.76 years. The severe episodes of drought lasted a short time (Figure 5). Sometimes histogram of RDI-12 is overestimate mainly in year 1978-81, 2004-05 and sometime curve of RDI-12 is underestimate mainly in year 1994-1995, 2012-2013, 2016-2020 in confront of curve of SPI-12, but in a larger time scale the curve of RDI-12 is similar to curve of SPI-12 in Červený Kláštor station. The number of severe drought episodes in Červený Kláštor station is different with small differences in timing; the years with the same record of severe drought are 1973, 1974, 1978, 1986, 1991, 1993, 1994, 2012, 2014 and 2022.

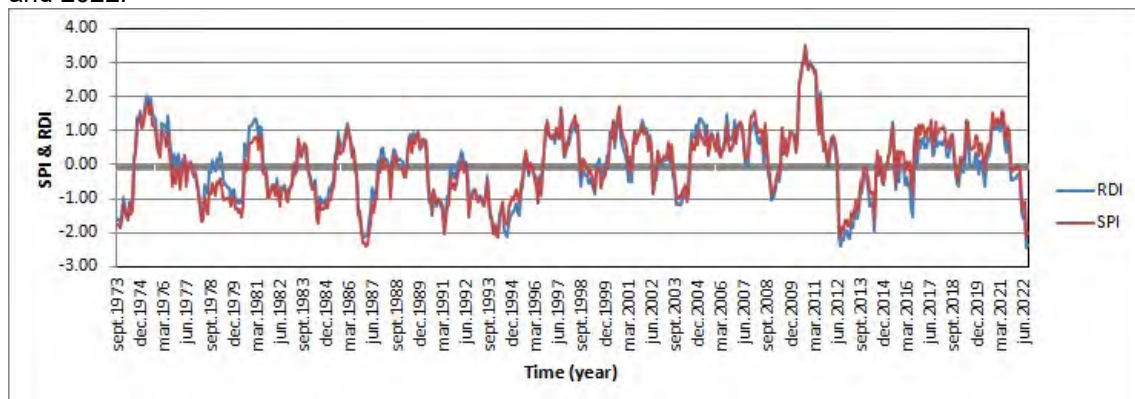


Fig. 5: Annual drought indexes at station Červený Kláštor for the period (1972-2022).

Košice precipitation station recorded a total of 16 severe drought episodes for RDI-12 accumulating to a severity -49.9 over 29 months. Prolonged meteorological drought occurred in 1973, 1986 and 1993. On average, the drought return time at Košice station is 2.97 years, mainly with short-lasting severe drought episodes (see Figure 6). The RDI-12 histogram

occasionally overestimates especially in 1978, 1980 and 2005 while the RDI-12 curve underestimates in 2007-2008, 2011-2013 and 2015-2016 compared to the SPI-12 curve at Košice station. Notably, RDI-12 identifies more drought events than SPI-12, with shared severe drought records in 1977, 1986, 1990, 1991, 1993, 1994, 1995, 2007, 2018 and 2022.

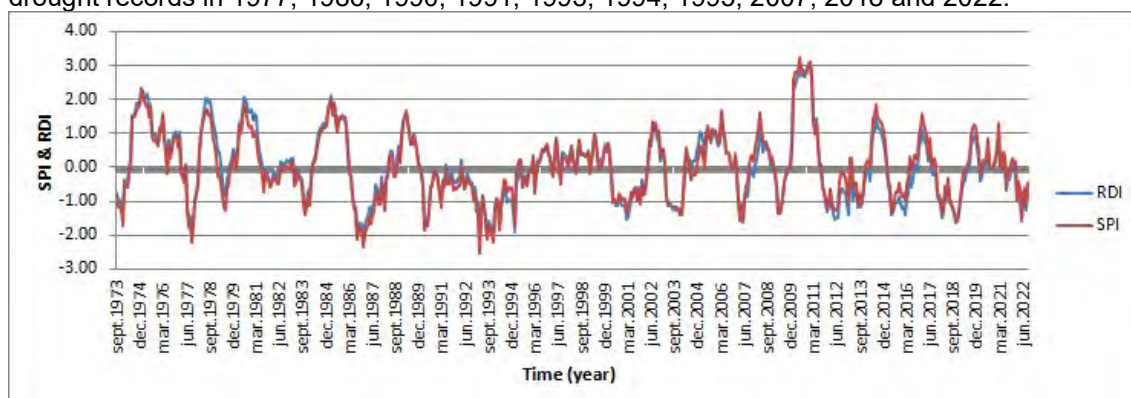


Fig. 6: Annual drought indexes at station Košice for the period (1972-2022).

Spišské Vlachy precipitation station recorded a total of 9 severe drought episodes from RDI-12, with a cumulative severity of -76.3 over 42 months. Prolonged severe meteorological drought occurred in the years 1974, 1986, 1993, 2011, 2015 and 2022. The average drought return time at the Spišské Vlachy station is 5.36 years. The severe drought episodes were generally of short duration as shown in Figure 7. Occasionally, the histogram of RDI-12 overestimates particularly in the year 1978-80, 1991-92, 1996-98 while sometime the curve of RDI-12 underestimates mainly in the years 2000-2001 compared to the curve SPI-12. However in a larger time scale the curve of RDI-12 is similar to the curve of SPI-12 at the Spišské Vlachy station. The number of severe drought episodes detected by RDI-12 is slightly less than SPI-12, with small differences. The years with the same record of severe drought are 1974, 1986, 1993, 1994, 2011, 2015 and 2022.

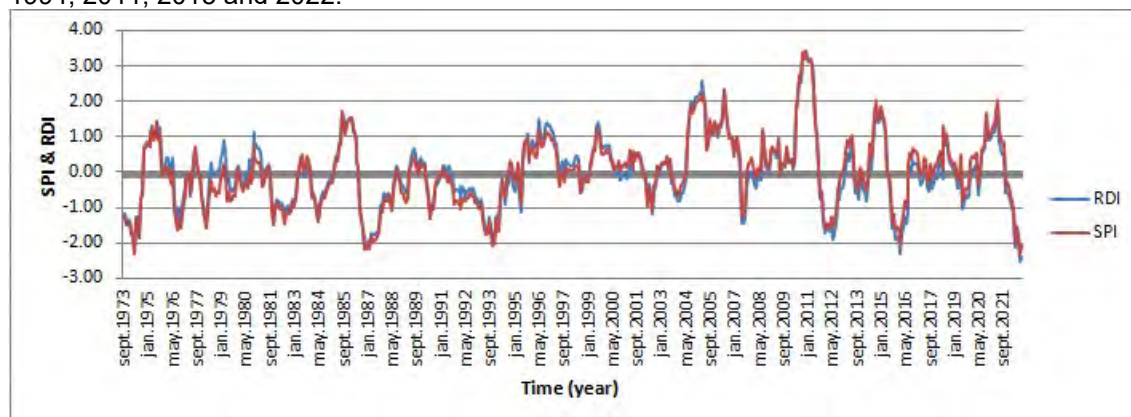


Fig. 7: Annual drought indexes at station Spišské Vlachy for the period (1972-2022).

Conclusion

Occurrence of drought in the area complicate the possibilities for recreation of visitors. The article presents the assessment of drought in eastern Slovakia. Drought constitutes a hydro-climatic risk at the regional level, and its adverse impacts may intensify due to climate change. In this study, we employed the Standardized Precipitation Index (SPI) and Reconnaissance Drought Index (RDI) to analyze drought conditions at four precipitation stations in the eastern part of Slovakia. Drought index approaches (SPI and RDI) were used to assess severe historical meteorological drought events during the period (1972-2022). The annual drought analysis revealed that the average return time for severe meteorological droughts varies between 3.45 to 5.36 years. More frequent severe droughts are identified in Košice station, and there is the smallest average return time. The results showed that the northern part of eastern Slovakia surrounding city Červený Kláštor is more vulnerable to drought because there are

estimated events with the biggest cumulative severity and the longest duration. In the central part of the studied area in Spišské Vlachy, an almost annual event of severe meteorological drought occurred in October 1986, and the longest eleven-month event was detected in the northern part in the Červený Kláštor city. The years 1993, 1994 and 2022 represent severe years with extensive, severe and widespread occurrence of meteorological drought. The findings highlight the susceptibility of individual weather stations to the infrequent incidence of meteorological drought, providing valuable insights for improved coordination and management of this phenomenon when it occurs for purpose to minimize negative impact on animate and inanimate components of nature as well as human activities in the investigated area.

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Souhrn

Tato studie se zabývá dvěma indexy sucha: Standardizovaný srážkový index (SPI) a průzkumný index sucha (RDI) v časovém intervalu 1972-2022. Identifikace závažného meteorologického sucha pak byla zjištěna, pokud byla hodnota indexu menší než -1,5. Východní Slovensko se v posledních letech potýká s intenzivním meteorologickým suchem v důsledku klimatických změn a v budoucnu se bude vyskytovat častěji. Tato skutečnost zakládá důležitost analýzy a předpovědi meteorologického sucha na sledovaném území s cílem minimalizovat negativní dopad na faunu a flóru i životní prostředí.

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FROM POTENTIALS TO ECOSYSTEM SERVICES - THE ASSESSMENT OF ECOSYSTEM SERVICES IN SLOVAKIA

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Abstract

This paper aims to evaluate selected ecosystem services at national level (Slovakia). In this research we used our own data created by use the methodology for assessing the natural capital of the country developed during our solution of the ENVIRO PLUS project, based on geosystem approach with use of our nationwide land-use data. Each assessed ecosystem service has created statistic. The results of our study consist of two types of outcomes. Firstly, we provide tables with average and median values for each assessed ecosystem service in Slovakia and secondly, we have created maps which can help to see a broader image of spatial arrangement of benefits. We see that this research can be very helpful to provide the basis for further evaluation and environmental management of the Slovakia.

Keywords: ES, potential, benefit, recreation potential

Introduction

Exploring the relationship between nature and human societies is essential in addressing modern environmental concerns. Appreciating the pivotal role of ecosystem services is fundamental in guiding policies and practices towards sustainable development, as they constitute the natural capital upon which our societies depend (Daily et al., 1997). If we want to make a high-quality assessment of natural potential and capital, we need sufficient and objective information, whether about the properties of individual landscape-forming components that determine the value of natural resources and potentials, as well as information about the requirements, demands and effects of human activities on the landscape and individual resources. The availability and processability of open information and its quality is an important factor for the correct derivation of the properties of the country's natural capital. The amount of spatial information that is used in geography, ecology, landscape ecology or environmental science in the evaluation of the country's resources and potentials has increased many times in the recent period. New sources of information increase the potential for better assessment and management of the use of the country's natural capital. The main aim of our study is assessment of ecosystem services in Slovakia. The outcome of the evaluation of individual ecosystem services are separate maps (raster with 10x10 meter resolution) and for purpose of this paper also calculation for values for geomorphological units and table for each assessed ecosystem service providing a picture of spatial arrangements of benefits and its amount.

Material and methods

When evaluating selected ecosystem services, we used the procedures we developed as part of the ENVIROPLUS project (2023), aimed at evaluating natural capital of Slovakia, with the use of our other data and procedures.

ES01 Biomass for wood production and ES02 Biomass for food production - providing agricultural crop yields

For assessment of two ecosystem services – ES01 Biomass for wood production and ES02 Biomass for food production - providing agricultural crop yields, we used Absolute bioproduction potential as base (Izakovičová, Miklós, & Špulerová, 2024). The absolute bioproduction potential expresses the capability of the primary structure of geoecosystems - the abiotic complex - to produce biomass. This potential represents the fundamental utility value for the primary ecosystem service to human life - the production of biomass as food and other essential bioproducts - thereby fundamentally conditioning the utilization of various geoecosystems.

This base potential has been created based on following determinants:

Climate conditions, Potential natural vegetation, Terrain relief, Substrate (geology), Soil subtype, Soil depth, Rock content in the soil, Soil granularity and Slope.

Each category of each determinant was assigned a value of potential for bioproduction and a weight of each determinant in the calculation of bioproduction potential. Subsequently, we used the land use layer created by us (ESPRIT, 2020) to identify areas where this potential is actually used as Biomass for food production - providing a harvest of agricultural crops or Biomass for wood production. Finally, we categorized the resulting values for both ecosystem services into 10 categories using the Quantile method.

ES03 Summer tourism

Summer tourism is one of the lighter forms of tourism. It is mostly hiking, which includes shorter and longer walks in the mountains as well as easier hikes on flatter trails. For modelling we use habitats, tourist paths density, average temperature in July, average rainfall in July, duration of sunshine, slope- type of relief, and land use.

ES04 Winter sports

Sports related to snow represent sports and recreational activities that are seasonally limited and related to the winter season. Among the most important activities in this area in our country are cross-country skiing, sledding and downhill skiing, ski mountaineering has also developed more recently and snowboarding. The development of sports and recreational activities depends on several factors. Of the natural factors, it is mainly the relief (types and forms, altitude, slope of the territory, angle of inclination, orientation, glare) and climate (air temperature, snow cover).

For assessment we used layers of habitats, climate, number of days with snow coverage, average temperature in January, relief, slope and land use.

ES05 Scientific and educational tourism

This is a special type of tourism, the main goal of which is to observe landscape structures as well as to learn and understand the phenomena and processes taking place in the country. Scientific tourism refers to special groups that carry out scientific activities in selected locations. For assessment we used layers of habitats, endemic species, genetic fund areas, historical landscape structures, historical gardens and parks, tourist paths density, protected areas, internationally protected areas, spa places, hunting areas, ecological networks, land use, naturalness degree, traditional agriculture landscape and important geological areas.

ES06 Natural heritage

Natural heritage represents a set of valuable natural components that arose as a result of the evolutionary processes of nature. From the point of view of landscape-ecological significance, natural ecosystems with a rich representation of rare and endangered plant species, their communities and animal species bound to them belong to the most valuable. For assessment we use layers of habitats, historical landscape structures, protected areas, ecological stability coefficient, naturalness coefficient, internationally protected areas and land use.

ES07 Support of species and ecosystem diversity

For the assessment of the service of support of biodiversity and ecosystem diversity, we created tool in ESRI ArcGIS for assessment of Support of species and ecosystem diversity. For assessment is necessary to determine four characteristics for each polygon included in the assessment in the area of interest: Significance of the habitat, state of habitat, expansion of habitat and ecosozological importance. Based on the specified characteristics, the final value of the ecosystem service was calculated. Results of assessment of this ecosystem service for whole Slovakia is not present in this paper due to need of assessment of all habitats in the territory, which is time-consuming in the case of all-Slovak assessment, but it is possible to use this procedure to assess any smaller areas, while the resulting values are mutually comparable in within the whole of Slovakia.

Summary assessment of selected ecosystem services

For the purposes of this paper, for greater clarity, we have recalculated the values of the assessed ecosystem services to areas. We selected geomorphological units for suitable calculation. We calculated minimum, maximum, average and median values for each

geomorphological unit using zonal statistics tools. At the end, the total value of selected evaluated ecosystem services was calculated.

Results

We present the recalculated results and geomorphological units in Table 1. In the table, we present the average and median value for each evaluated service. The initial intention was to also list the minimum and maximum values achieved, but they were the same for most geomorphological units, and due to the large scale of the table, we decided not to list these data. Summary value of assessed ecosystem services are shown in Table 1 and also in Figure 1.

Tab.1: Results of assessment (mean, median and summary values)

Geomorphological unit	REPGES CODE	ES01		ES02		ES03		ES04		ES05		ES06		SUMMARY VALUE
		M	MDN	M	MDN	M	MDN	M	MDN	M	MDN	M	MDN	
Burda	1.1.1	6,43	6	4,23	4	8,29	10	3,86	4	3,82	4	6,57	7	28,35
Krupinská planina	1.1.2	7,19	8	1,87	2	4,13	4	4,92	5	3,01	3	5,13	6	21,64
Cerová vrchovina	1.1.3	8,25	9	4,17	3	6,02	6	4,65	5	5,07	5	5,54	7	28,07
Slovenský kras	1.1.4	5,68	6	3,69	3	7,52	8	5,44	5	6,23	7	7,61	9	30,65
Bodvianska pahorkatina	1.1.5	9,25	9	3,09	3	5,37	5	3,73	4	2,72	3	4,32	5	21,79
Juhoslovenská kotlina	1.1.6	9,35	10	6,18	6	3,30	2	3,21	3	2,23	2	2,99	1	13,08
Dolnomoravský úval	1.2.1	9,95	10	7,06	7	6,49	6	2,48	2	3,42	3	3,65	3	19,67
Borská nížina	1.2.2	9,46	10	5,94	6	6,03	5	2,56	3	3,49	3	4,57	5	20,36
Chvojnická pahorkatina	1.2.3	9,21	9	5,10	5	3,77	3	2,47	2	2,63	2	2,06	1	12,62
Podunajská rovina	1.2.4	9,88	10	7,65	8	2,73	1	1,27	1	2,82	2	1,97	1	11,24
Podunajská pahorkatina	1.2.5	9,66	10	6,01	6	2,42	1	2,02	2	2,42	2	1,89	1	11,11
Košická kotlina	1.2.6	8,89	9	3,96	4	3,08	2	3,46	3	2,04	2	2,52	1	11,43
Východoslovenská rovina	1.2.7	9,83	10	6,98	7	2,41	1	2,50	2	3,32	2	2,59	1	11,02
Východoslovenská pahorkatina	1.2.8	9,29	9	4,54	4	3,55	2	3,31	3	2,84	2	3,13	1	11,65
Zemplínske vrchy	1.2.9	7,11	8	5,43	4	6,27	7	3,91	4	6,37	6	4,63	5	26,50
Malé Karpaty	2.1.1	6,56	7	2,48	2	8,29	9	4,65	5	8,36	9	6,89	8	34,51
Myjavská pahorkatina	2.1.2	7,78	8	1,92	2	5,34	4	4,07	4	3,22	3	3,37	2	15,66
Považský Inovec	2.1.3	5,33	5	2,49	2	7,70	9	5,44	5	3,70	4	5,92	7	28,41
Tribeč	2.1.4	6,54	7	2,42	2	7,92	8	5,00	5	6,16	7	6,77	7	30,71
Strážovské vrchy	2.1.5	3,74	3	2,44	2	6,80	7	6,84	7	4,76	4	6,69	7	26,85
Súľovské vrchy	2.1.6	3,86	3	1,21	1	6,78	7	6,76	7	6,27	7	6,94	7	29,65
Žiar	2.1.7	4,28	4	2,19	3	7,73	8	6,93	7	3,55	3	6,67	7	27,92
Branisko	2.1.8	2,59	2	1,02	1	6,15	6	8,05	8	4,30	4	6,72	7	26,03
Veporské vrchy	2.1.9	3,30	3	1,06	1	6,98	7	8,01	8	4,72	4	6,86	7	28,15
Spišsko-gemerský kras	2.1.10	2,71	3	1,14	1	6,42	6	8,25	8	6,82	7	8,73	9	30,99
Stolické vrchy	2.1.11	3,67	3	2,17	1	6,66	7	7,52	7	3,75	3	6,55	7	26,03
Revúcka vrchovina	2.1.12	6,23	6	2,77	2	6,03	6	5,56	6	3,01	3	5,70	7	25,78
Volovské vrchy	2.1.13	3,51	3	1,11	1	6,43	6	7,45	8	5,38	5	6,70	7	27,75

Čierna hora	2.1.14	4,83	5	1,61	1	6,47	7	6,18	6	4,05	4	6,19	7	25,75
Vtáčnik	2.1.15	4,94	5	4,23	2	7,00	7	6,70	6	5,11	4	6,84	7	27,52
Pohronský Inovec	2.1.16	5,89	6	1,64	2	8,29	9	5,80	6	4,55	5	6,41	7	31,40
Štiavnické vrchy	2.1.17	5,84	6	2,52	2	6,97	8	5,52	6	7,18	7	7,11	8	32,80
Kremnické vrchy	2.1.18	4,56	5	1,76	1	6,88	7	7,36	7	4,92	5	6,31	7	28,90
Poľana	2.1.19	3,58	3	1,05	1	7,12	7	8,32	8	7,24	7	7,68	8	32,00
Ostrôžky	2.1.20	6,34	6	1,44	1	6,97	8	6,05	6	2,75	3	6,16	7	27,54
Javorie	2.1.21	5,50	6	1,19	1	6,75	7	6,68	7	3,14	3	6,32	7	26,76
Slanské vrchy	2.1.22	4,78	4	1,42	1	6,95	8	6,61	7	5,10	5	6,55	7	29,93
Vihorlatské vrchy	2.1.23	4,53	4	2,49	1	5,74	6	6,91	7	6,35	6	7,37	7	27,84
Považské podolie	2.1.24	7,65	8	4,56	5	4,52	3	3,37	3	2,98	3	2,95	2	14,40
Hornonitrianska kotlina	2.1.25	8,22	9	3,54	3	5,61	5	4,01	4	3,15	3	3,50	3	17,75
Žiarska kotlina	2.1.26	8,88	9	3,86	3	4,62	4	3,58	3	2,60	2	3,08	2	13,31
Zvolenská kotlina	2.1.27	6,79	7	2,86	3	6,18	7	4,95	5	4,01	4	4,43	5	23,80
Pliešovská kotlina	2.1.28	8,20	8	2,18	2	4,06	3	4,23	4	2,55	2	3,55	4	14,96
Horehronské podolie	2.1.29	6,09	6	1,68	2	6,50	7	6,04	6	5,67	6	5,99	7	28,47
Rožňavská kotlina	2.1.30	8,21	9	3,34	3	5,21	4	4,23	4	3,54	4	3,45	3	17,44
Biele Karpaty	2.1.31	6,10	6	1,54	1	6,72	7	5,99	6	5,95	7	6,49	7	30,77
Žilinská kotlina	2.2.1	6,79	7	1,96	1	4,89	4	4,94	5	2,75	3	3,53	3	16,37
Malá Fatra	2.2.2	2,45	2	2,16	1	4,98	5	9,02	10	5,92	6	7,65	7	29,16
Veľká Fatra	2.2.3	2,25	2	1,71	1	5,25	5	8,94	9	7,29	7	8,23	8	29,92
Starohorské vrchy	2.2.4	2,65	3	1,26	1	6,03	6	8,44	9	8,01	8	7,43	8	32,98
Chočské vrchy	2.2.5	2,29	2	1,04	1	5,41	5	8,69	9	6,30	6	7,38	7	28,11
Tatry	2.2.6	1,91	2	1,00	1	2,77	2	9,08	9	7,19	7	8,88	9	27,11
Nízke Tatry	2.2.7	1,65	1	1,15	1	4,71	5	9,24	10	7,01	7	8,39	8	30,49
Kozie chrbty	2.2.8	3,12	3	1,10	1	7,22	8	7,58	8	5,32	5	6,87	7	29,39
Turčianska kotlina	2.3.1	7,98	9	2,83	2	5,05	4	4,68	4	3,75	3	3,52	3	16,29
Podtatranská kotlina	2.3.2	6,51	7	1,54	1	5,08	5	5,48	5	4,73	5	4,86	5	21,38
Hornádska kotlina	2.3.3	5,73	6	1,43	1	4,63	3	5,10	5	3,04	3	3,37	3	15,47
Javorníky	2.4.1	4,47	4	1,84	1	6,25	6	7,48	7	5,17	5	6,46	7	27,80
Moravsko-sliezske Beskydy	2.4.2	3,25	3	0,00	0	5,82	6	9,24	9	8,20	8	8,00	8	33,44
Turzovská vrchovina	2.4.3	5,13	5	1,39	1	6,11	6	7,54	8	5,87	6	6,42	7	29,94
Jablunkovské medzihorie	2.4.4	5,50	5	1,41	1	5,46	6	6,49	7	4,02	4	5,04	5	24,14
Kysucké Beskydy	2.4.5	3,63	4	1,15	1	5,51	5	8,36	9	6,11	7	7,13	8	32,07
Kysucká vrchovina	2.4.6	4,06	4	1,47	1	5,66	6	8,01	8	6,00	6	6,86	7	29,50
Oravské Beskydy	2.4.7	3,75	4	1,00	1	5,45	5	8,76	9	7,76	8	7,82	8	33,11
Podbeskydská brázda	2.4.8	6,99	8	1,22	1	4,51	4	6,58	6	7,08	8	5,41	7	27,01
Podbeskydská vrchovina	2.4.9	4,60	4	1,81	1	5,17	5	7,98	8	7,53	8	6,77	7	30,26

Oravská Magura	2.4.10	2,93	2	1,38	1	5,92	6	9,33	10	6,09	6	7,20	7	30,55
Oravská vrchovina	2.4.11	5,30	6	2,20	1	5,62	6	6,95	7	4,72	5	5,02	5	25,36
Skorušinské vrchy	2.4.12	3,61	3	1,39	1	5,60	6	8,24	8	4,10	4	6,09	7	26,97
Podtatranská brázda	2.5.1	5,76	6	1,26	1	5,40	6	7,65	8	5,73	6	6,79	7	28,89
Oravská kotlina	2.5.2	7,49	8	1,62	1	4,65	4	5,07	5	5,82	5	4,54	5	19,59
Pieniny	2.5.3	3,84	4	1,11	1	4,98	5	7,95	8	5,60	6	7,30	8	28,20
Ľubovnianska vrchovina	2.5.4	4,26	4	1,36	1	5,89	6	7,57	8	4,16	5	6,25	7	28,68
Čergov	2.5.5	3,31	3	1,07	1	6,08	6	8,10	8	4,70	5	6,83	7	28,47
Spišská Magura	2.5.6	4,30	5	1,67	1	5,33	5	8,06	8	4,86	5	7,06	7	28,05
Levočské vrchy	2.5.7	2,86	3	1,09	1	4,86	5	8,29	8	3,37	3	6,21	7	24,72
Bachureň	2.5.8	4,17	4	1,18	1	5,91	6	7,61	8	3,11	3	5,58	6	25,02
Spišsko-šarišské medzihorie	2.5.9	6,51	7	2,04	2	3,72	3	5,61	5	2,81	3	3,72	5	17,84
Šarišská vrchovina	2.5.10	6,38	6	1,43	1	4,93	5	5,58	5	2,33	2	4,25	5	19,38
Busov	2.5.11	4,88	5	1,02	1	6,98	7	7,48	7	4,95	5	6,59	7	29,44
Ondavská vrchovina	2.5.12	6,65	7	1,91	2	5,40	6	5,57	6	3,44	3	5,03	5	23,64
Laborecká vrchovina	2.5.13	6,26	7	1,73	2	5,01	4	6,61	7	5,19	4	6,57	7	26,87
Beskydské predhorie	2.5.14	6,90	7	2,65	2	5,14	5	4,93	5	3,45	3	4,48	5	21,25
Bukovské vrchy	3.1.1	5,24	5	1,73	1	5,71	6	7,41	7	7,60	8	8,47	9	33,18

Legend: M-Mean Value, MDN – Median Value, ES0x- Code of Ecosystem Service

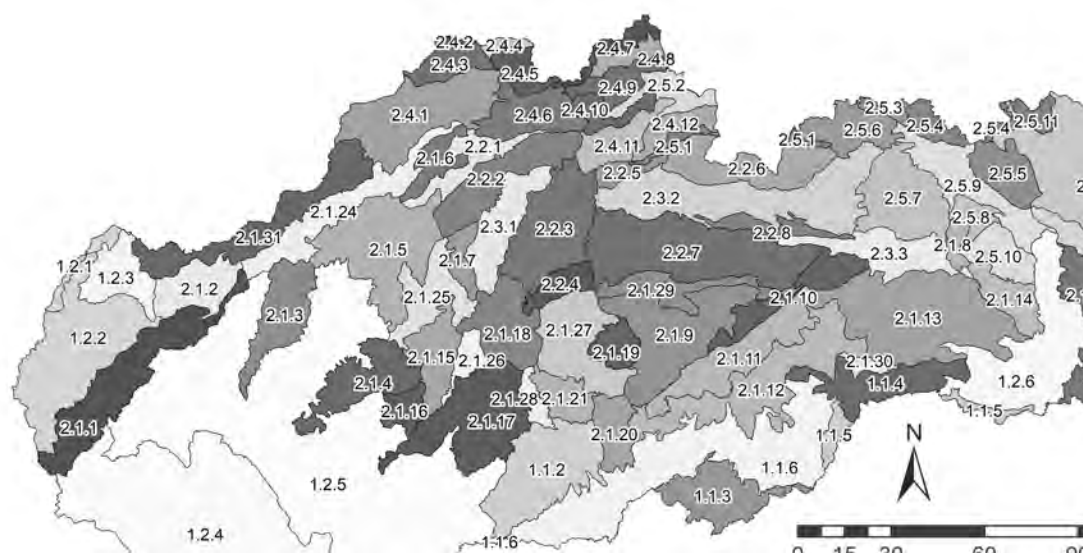


Fig.1: Location of Geomorphological units with codes and summary values

Discussion

The highest total values in Slovakia are achieved by mountain areas, due to the fact that the majority of evaluated services are cultural ecosystem services, where protected areas, the presence of tourist routes, etc. are often included in the evaluation as an important factor. In further research, we would like to focus on how to weigh individual services in a summary assessment of ecosystem services. We also plan to focus on factors that threaten the provision of ecosystem services or reduce their level. Environmental loads, residential development,

construction of roads as well as increasing the intensity of agriculture are significant threatening factors for biomass production, but also the quality of soil and water resources, which have an impact on the overall bioproduction potential of the territory and represent a hygienic risk for living organisms, including human health. The bioproduction potential of agricultural soils is also limited by erosion-accumulation processes, such as landslides, and manifestations of water and wind erosion. We need to find out how much this factors affects level of providing of ecosystem services and how to include these factors in the assessment.

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 Slovakia. We see that this research can be 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 článek důkladně zkoumá ekosystémové služby na Slovensku, přičemž využívá data získaná v rámci projektu ENVIRO PLUS a používá geosystémový přístup. Hodnotí řadu služeb, od produkce biomasy po cestovní ruch, s přihlédnutím k různým faktorům, jako je klima, charakteristika terénu a způsob využívání půdy. Pomocí podrobných tabulek a map studie nabízí detailní pochopení toho, jak jsou tyto služby prostorově rozděleny po celé zemi. Zdůrazňuje zásadní vzájemné působení mezi přírodou a lidskou společností a zdůrazňuje význam ekosystémových služeb pro podporu udržitelného rozvoje. Do budoucna si výzkum klade za cíl hlouběji prozkoumat váhu jednotlivých těchto služeb a zabývat se naléhavými hrozbami pro poskytování ekosystémů, jako je degradace životního prostředí a rozšiřování měst. V konečném důsledku tato studie představuje inovativní metodiku hodnocení ekosystémových služeb, čímž vytváří základ pro informovaný environmentální management a další zkoumání přírodních zdrojů Slovenska.

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FRUIT TREES AS IMPORTANT ELEMENTS OF URBAN GREEN SQUARES' VEGETATION – ON THE EXAMPLE OF THE MOKOTÓW DISTRICT IN WARSAW, POLAND

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Abstract

Fruit trees in urban green areas become an alternative method of urban gardening and edible landscape appreciated by city residents. The aim of the study was to identify fruit trees in green squares in the Mokotów district in Warsaw, Poland. Their quantitative share among deciduous trees was identified in general and by species. Changes in the number of plantings of selected species divided into periods (before 2000, in 2000-2019 and 2020-2023) were also recognized. The results show that fruit trees grow in 16 out of 18 squares and currently constitute from 2.0 to 75.0% of deciduous species, with an average share of 24.5%. Most species with edible fruit were planted before 2000 (e.g. *Malus domestica*). In the years 2000-2019, the number of fruit trees increased mainly through the planting of ornamental varieties (with inedible fruit, e.g. *Prunus serrulata* 'Kanzan'). The share of trees with edible fruits has increased since 2020, but the diversity of species has reduced – new plantings are dominated by selected species and their varieties (mainly ornamental apple trees, e.g. *Malus* 'Evereste'). The increasing number of fruit trees has a positive impact on the biodiversity of green squares and development of edible landscape.

Keywords: trees, urban green areas, biodiversity, urban orchard, edible landscape

Introduction

Fruit trees play an important role in the city by providing numerous ecosystem services. In particular, they contribute to increasing biodiversity, offer shelter for birds and insects, and improve the aesthetics of urban space (Winkler et al., 2023). They are also part of the edible landscape (Lafontaine-Messier et al., 2016; Rada et al., 2022). Therefore, the preservation and care of fruit trees are important to improve the functioning of the urban environment, green areas (Kimic et al., 2023), as well as the health and well-being of communities (Colinas et al., 2019).

The history of growing fruit trees in cities dates back to antiquity, but in the following centuries they were planted only in private gardens. They began to be introduced into cities in the 19th century, planted along streets and in public parks (Kimic, 2019). And although the share of these plants decreased in the following decades, at the end of the 20th century the fruit-growing tradition was restored to counteract climatic and economic problems. Old fruit trees have been preserved in many public parks, and they are increasingly introduced in the form of organized urban orchards combining decorative and utilitarian functions (Lisandru et al., 2016). The importance of these trees for the sustainable development of cities is appreciated in the 21st century. Orchard varieties of fruit trees can be found in many green areas (Sobieralska, 2004). Initiatives such as plant mapping and the creation of community gardens are organized (Poe et al., 2014; Colinas et al., 2019; Bihuňová et al., 2021). Many old specimens of fruit trees have been preserved in Warsaw (Kimic, 2021), and new ones are being planted in various public spaces (Agenda 2030..., 2015).

The aim of the study was to identify fruit trees in squares in the Mokotów district in Warsaw and determine their share among all deciduous trees, along with their division into species. This made it possible to analyse changes in the number of planted trees of various species and show leading trends in their selection in 3 periods: before 2000, in 2000-2019 and 2020-2023.

Material and methods

The area of research on the identification of fruit trees included 16 out of all 18 squares in the Mokotów district in Warsaw – 2 squares devoid of these plants were omitted. The initial

collection of information on the occurrence of fruit trees in squares was based on the analysis of data from the map service of the capital city of Warsaw (Mapa koron drzew (zielen), 2023). The current status was verified as part of field visits carried out in the squares from June to December 2023. As part of the inventory, data on the number of trees and species was collected, and measurements of the trunk diameter at breast height of each tree were made to estimate its age. To determine the time of planting trees, historical aerial photos from 1976-2023 available in the map service of the capital city of Warsaw (Mapa historyczna, 2023) and images from Google Street View were analysed. On this basis, three periods of planting fruit trees were indicated, for which a detailed species composition was established: before 2000, in 2000-2019 and from 2019 to the end of 2023.

Results

At the end of 2023, a total of 319 fruit trees of 10 species were identified in 16 squares in the Mokotów district in Warsaw (Table 1). The dominant ones are: *Pyrus* sp. (6.3%), *Sambucus* sp. [8.5%] and *Sorbus* sp. [8.5%], *Crataegus* sp. [9.7%], *Malus* sp. [13.2%], *Prunus* sp. [48.9%]. Less numerous species include: *Elaeagnus* sp. [0.3%], *Mespilus* sp. [0.3%], *Morus* sp. [2.2%], as well as *Juglans* sp. [2.2%], which constitutes mainly self-seeding.

Tab. 1: Number of fruit trees in squares in the Mokotów district in Warsaw (as at the end of 2023).

Fruit tree species	Square name															
	A. Stolarski	A. Steinsbergowa	B. Broniewski "Orsza"	Chonwacki	Grupy AK "Granat"	Gwiazda Polski	J. Brzeska	J. Kaczmarek	M. Zimnińska	O. and A. Małkowskich	Ormiański	Pokolenia Kolumbów	at Gościńiec Str.	at Marynarska Str.	Słowiński	Starych Panów
<i>Crataegus</i> sp.											9	5		2	1	1
<i>Crataegus x media</i>	1				8	3					1					
<i>Elaeagnus angustifolia</i>												1				
<i>Juglans regia</i>	1	1										5				
<i>Malus</i> sp.	4				2							4				1
<i>Malus baccata</i>											1					
<i>Malus domestica</i>											1					
<i>Malus floribunda</i>																1
<i>Malus sylvestris</i>												1		3	4	
<i>Malus x purpurea</i>						1					2	2				3
<i>Malus x purpurea</i> 'Ola'	2															
<i>Malus</i> 'Evereste'						1					2					
<i>Malus</i> 'Royalty'						5										
<i>Malus</i> 'Rudolph'						2										
<i>Mespilus germanica</i>											1					
<i>Morus alba</i>							7									
<i>Prunus</i> sp.												1				1
<i>Prunus cerasifera</i>		2			10	9	1			7	21	28				4
<i>Prunus cerasifera</i> 'Pissardii'						11							9			
<i>Prunus cerasus</i>	31														2	
<i>Prunus domestica</i>	1															
<i>Prunus padus</i>												1				
<i>Prunus serrulata</i>															3	
<i>Prunus serrulata</i> 'Kanzan'				2						5		4				
<i>Prunus spinosa</i>											3					
<i>Pyrus</i> sp.					1					1						1
<i>Pyrus calleryana</i>							2							4		
<i>Pyrus calleryana</i> 'Redspire'						2										
<i>Pyrus calleryana</i> 'Chanticleer'										3						
<i>Pyrus pyrastrer</i>	1										2	1		2		
<i>Sambucus nigra</i>	13		1		1	3	2			3		2		1		1
<i>Sorbus aucuparia</i>						1	1					2				
<i>Sorbus aucuparia</i> 'Pendula'										12						
<i>Sorbus intermedia</i>						1				5	5					

The analysis of the species composition of fruit trees showed that at the end of 2023, they constituted from 2.0 to 75.0% of the deciduous stand, with their average share being 24.5%. Only in 4 squares the share of fruit trees was below 10.0% (T. Szewczenko Square [7.5%], A. Steinsbergowa Square [6.0%], Chorwacki Square [6.3%], S. Broniewski 'Orsza' Square [2.8%]). The green structure of most squares included from 10 to 50% fruit trees. Only in two squares this share was above 50% and these are: Gwiazda Polski Square [50%] and the square at Gościniec Str. [75%].

The analysis of the share of fruit trees in relation to all deciduous trees indicated that in the largest squares (area >1.8 ha) their share ranged from 14.4 to 32.2% (Grupy AK 'Granat' Square [14.4%], O. and A. Małkowskich Square [19.0%], Ormiański Square [28.7%], Pokolenia Columbusów Square [32.2%]). However, for the remaining squares (area <1.8 ha), this range was from 2.0 to 75.0%. At the same time, only 4 of them had more than 32.2% of fruit trees in the plant structure (A. Słonimski Square [38.8%], Słoweński Square [43.5%], Gwiazda Polski Square [50.0%], the square at Gościniec Str. [75.0%]). The share of fruit trees in the largest squares is not the highest due to the large number of other species. At the same time, these facilities have from 22 to 57 fruit trees, which is one of the highest results in the ranking. Gwiazda Polski Square has a large number of fruit trees (39) with a high share of deciduous trees, and A. Słonimski Square – despite the average share of fruit trees – has as many as 54 of them. In the remaining squares, the number of fruit trees ranges from 1 to 13, which is the lowest share.

The obtained results also indicate a significant correlation between the area of squares and the number of fruit tree species (Table 2). Squares with a larger area are characterized by greater species diversity, which results from greater availability of space for planting and diversity of habitat conditions. The number of species in these facilities ranges from 5 to 14. Also the above-mentioned Gwiazda Polski Square and A. Słonimski Square fall within this range. In the remaining squares there are on average 1 to 5 species of fruit trees.

Tab. 2: The share of fruit tree species in relation to other deciduous tree species in squares in the Mokotów district in Warsaw - trends in changes of new plantings in the period before and after 2019.

Period	Square (area [ha])																	
	0,95	0,26	0,47	0,27	1,80	0,63	0,48	0,10	0,42	2,00	2,05	1,78	0,06	0,78	0,26	0,45	0,56	0,17
	A. Słonimski	A. Steinsbergowa	B. Broniewski "Orsza"	Chorwacki	Grupy AK "Granat"	Gwiazda Polski	J. Brzeska	J. Kaczmarek	M. Zimińska	O. and A. Małkowskich	Ormiański	Pokolenia Columbusów	at Gościniec Str.	at Marynarska Str.	Słoweński	Starych Panów	T. Szewczenko	W. Lipiński
before 2019	51 (78)	3 (46)	1 (40)	0 (26)	22 (125)	24 (38)	10 (33)	0 (13)	0 (0)	22 (146)	44 (96)	51 (113)	0 (1)	8 (55)	10 (13)	8 (48)	3 (31)	2 (12)
2019 2023	3 (7)	0 (1)	0 (3)	2 (4)	0 (6)	15 (1)	3 (3)	0 (0)	0 (13)	14 (7)	4 (23)	6 (7)	9 (2)	4 (18)	0 (0)	0 (3)	0 (6)	0 (0)
Total	54 (85)	3 (47)	1 (43)	2 (30)	22 (131)	39 (39)	13 (36)	0 (13)	0 (13)	36 (153)	48 (119)	57 (120)	9 (3)	12 (73)	10 (13)	8 (51)	3 (37)	2 (12)

X – number of fruit trees; (X) – number of other deciduous tree species

Most trees with edible fruit were planted before 2000 and they constitute 22.1% of the fruit species introduced then (e.g. *Malus* sp., *Malus domestica*, *Malus sylvestris*, *Morus alba*, *Prunus cerasifera*, *Prunus cerasus*, *Prunus padus*, *Pyrus pyrausta*, *Sambucus nigra*) (Table 3). Between 2000 and 2019, the increase in the number of fruit trees included mainly ornamental varieties (especially those with inedible or less tasty fruit, e.g. *Prunus serrulata* 'Kanzan', *Sorbus intermedia*). Since 2020, the share of fruit-bearing trees has increased, as opposed to species diversity. The new plantings were dominated by selected species and their varieties, especially cherries, accounting for 41.7% of the specimens (e.g. *Prunus cerasifera* 'Pissardii') or ornamental apple trees (e.g. *Malus* 'Evereste', *Malus* 'Royalty', *Malus* 'Rudolph'), which

accounted for 20.0%. A similar situation concerned pear trees, which constituted 18.3% of the plant selection, with the dominance of selected species and their varieties (e.g. *Pyrus calleryana* 'Redspire', *Pyrus calleryana* 'Chanticleer'). The remaining species of fruit trees were scarce and also included selected varieties (e.g. *Sorbus aucuparia* 'Pendula') that favor the existence of animals.

Discussion

Identification of fruit trees in individual squares in the Mokotów district in Warsaw showed quite large differences in their number, species and share. It should be noted, however, that the average share of fruit trees at the level of 24.5% is important for supporting biodiversity within small ecosystems such as squares (Rada et al., 2022). Most trees with edible fruit were planted before 2000, which confirms the high awareness of the importance of these plants among green area managers, which is so important for promoting a sustainable approach. However, a disturbing phenomenon is the reduction in the diversity of fruit trees in favor of the dominance of ornamental species over fruiting ones (including those bearing edible fruit) in the period 2000-2019. This could be the result of increased investments in planting trees that require less maintenance. However, the increasing share of fruit trees in squares since 2020 should be positively assessed. This is consistent with the general trends in shaping the vegetation of urban green areas in recent years (Kimic, 2019) and the growing interest of the local community in growing edible plants (McLain et al., 2014; Lafontaine-Messier et al., 2016), while supporting sustainable development and self-sufficiency of cities (Agenda 2030..., 2015).

Tab. 3: Number of fruit trees planted in the following periods: before 2000, 2000-2019 and 2020-2023.

	Period	Fruit tree species																																			
		<i>Crataegus</i> sp.	<i>Crataegus</i> x <i>media</i>	<i>Elaeagnus angustifolia</i>	<i>Juglans regia</i>	<i>Malus</i> sp.	<i>Malus baccata</i>	<i>Malus domestica</i>	<i>Malus floribunda</i>	<i>Malus sylvestris</i>	<i>Malus</i> x <i>purpurea</i>	<i>Malus</i> x <i>purpurea</i> 'Ola'	<i>Malus</i> 'Evereste'	<i>Malus</i> 'Royalty'	<i>Malus</i> 'Rudolph'	<i>Mespilus germanica</i>	<i>Morus alba</i>	<i>Prunus</i> sp.	<i>Prunus cerasifera</i>	<i>Prunus cerasifera</i> 'Pissardii'	<i>Prunus cerasus</i>	<i>Prunus domestica</i>	<i>Prunus padus</i>	<i>Prunus serotula</i>	<i>Prunus serotula</i> 'Kanzan'	<i>Prunus spinosa</i>	<i>Pyrus</i> sp.	<i>Pyrus calleryana</i>	<i>Pyrus calleryana</i> 'Redspire'	<i>Pyrus calleryana</i>	<i>Pyrus pyraeaster</i>	<i>Sambucus nigra</i>	<i>Sorbus aucuparia</i>	<i>Sorbus aucuparia</i> 'Pendula'	<i>Sorbus intermedia</i>	Total	
2020-2023	2	16	11	1	6	11	1	1	8	8						7	2	76	7	33		1					3					6	27	1	11	238	
2000-2019	2				1																1		3	5	3								1		5	21	
	2										2	3	5	2	1			6	13					6			6	2	3				2	1	6	60	

Conclusions

The identification of fruit trees in squares in the Mokotów district in Warsaw indicates their significant share among the vegetation of these small green areas, which is important for shaping a sustainable urban landscape, especially on a local scale. The trends of the last four years aimed at increasing the share of fruit-bearing species, which slowed down in the period 2000-2019, should also be assessed positively.

The obtained results are crucial for managing squares in the district, in particular making decisions regarding the location of new plantings and the care of existing fruit trees. Increasing the share of plants from this group, especially in those squares where there are none or few of them, will support biodiversity. At the same time, it is crucial to maintain a balance between the share of ornamental and fruiting species, including those bearing edible fruit, in order to increase the environmental value of squares and make this unique edible landscape available to residents.

It should also be noted that research on the identification of fruit trees in squares initiated in one area of Warsaw should be continued in this type of green areas in other districts. Expanding

knowledge about the share of these plants will allow for systemic management of squares, increasing their attractiveness in the context of providing ecosystem services locally and on a city-wide scale.

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Souhrn

Ovocné stromy v městské zeleni se stávají alternativní metodou městského zahradničení a jedlé krajiny, kterou oceňují obyvatelé měst. Cílem studie bylo identifikovat ovocné stromy na zelených plochách ve čtvrti Mokotów v polské Varšavě. Jejich kvantitativní podíl mezi listnatými stromy byl zjišťován obecně a podle druhů. Byly také rozpoznány změny v počtu výsadeb

vybraných druhů rozdělených do období (před rokem 2000, v letech 2000-2019 a 2020-2023). Výsledky ukazují, že ovocné stromy rostou v 16 z 18 čtverců a v současnosti tvoří od 2,0 do 75,0 % listnatých druhů, přičemž průměrný podíl činí 24,5 %. Většina druhů s jedlými plody byla vysazena před rokem 2000 (např. *Malus domestica*). V letech 2000-2019 se počet ovocných stromů zvýšil především výsadbou okrasných druhů (s nejedlými plody, např. *Prunus serrulata* 'Kanzan'). Od roku 2020 se podíl stromů s jedlými plody zvýšil, ale snížila se druhová rozmanitost - v nových výsadbách převažují vybrané druhy a jejich odrůdy (především okrasné jabloně, např. *Malus* 'Evereste'). Zvyšující se počet ovocných stromů má pozitivní vliv na biodiverzitu zelených ploch a rozvoj jedlé krajiny.

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GEOHERITAGE ENDANGERED BY EROSION: EXAMPLES FROM THE PRACHOV AREA

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Abstract

The paper researches the erosion of sandstone rocks through the lens of geology and geography of tourism. It examines natural erosion, erosion caused by non-tourism human activities, especially tourism-induced erosion. Erosion disrupts sandstone formations and decreases the attractiveness of an affected geosite. Concretely, the paper focuses on the Prachov Rocks, one of the most visited zones in Bohemian Paradise, famous for its sandstone towers. The core of the Prachov Rocks, the Rock City, has paid entry and several information boards with tourist instructions. Nevertheless, they do not prevent further tourism-induced unintentional or intentional damage. Another source of erosion is non-tourist economic activities in the area. The paper presents the basic theoretical framework of the geology of the studied area and damage to geosites. It also brings connected innovative typologies. The authors strive to identify the most endangered landforms and shapes within the Rock City through field research and explain the mechanism of their damage. Field research also encompasses measurements of sandstone erosion and shifts. The photographic, map and table additions amend the text.

Keywords: sandstone rocks, damage, overtourism, Bohemian Paradise, Czech Republic

Introduction

The Prachov Rocks (named after the village Prachov, part of Holín Municipality), situated in the northern Czech Republic, have attracted many visitors with their distinctive rocky landscape since the 19th century. The rocks consist of Cretaceous sediments of the Upper Turonian and Coniac, shaped initially as a plateau. Natural processes such as wind and rain erosion have gradually worn away the rock, resulting in today's formations. Various types of sandstone layering and their variable grain size can be marked. Around the edges of the Rock City are several geodynamic phenomena (e.g. Leaning Tower). The base of the blocky sandstones consists of calcareous clay loams prone to landslides with thin intercalations of calcareous sandstones (ČGS 1998). The last big landslide happened in 2021 between Schlik's and Všetěčka's Viewpoints beside the tourist route.

Prachov Rocks is a protected natural reserve that is also a part of the Bohemian Paradise Protected Landscape Area and UNESCO Geopark, which are of the same name. Leaning Tower, Devil's Tower (towers with height up to 30 meters), Bohemian Paradise viewpoint, Schlik's Viewpoint, Haken's Viewpoint, Mouses Hole and Imperial Corridor, with their unique appearances, belong to the most attractive locations in the core area of the Prachov Rocks called Rock City. The Schlik noble family manages the Rock City and offers two paid excursion circuits, spanning 1.5 kilometers and 3.5 kilometers, respectively. The Rock City operates from April to December, with prolonged hours during the peak season in July and August. Especially during the summer, we can speak about overtourism there. A steady increase in tourists in the Rock City is connected to increased erosion, littering and overcrowding (Boháč, Vacek 2023).

Erosion is a significant environmental process that can affect various landscapes and surfaces. Erosion encompasses a wide range of types, each with unique characteristics and environmental impacts. We should mention water, ice, wind, gravitational, man-made and combined multiple sandstone erosion dynamics because these types are observable in the studied area.

Material and methods

The article is based on a thorough literature and map (Mapy.cz 2024) analysis and, especially, long-term field research in the Prachov Rocks. Field research included participant and non-participant observation, photographing, and conducting measurements to monitor the erosion. The second author is a resident of Holín, where the Rock City is located. He provided valuable insider knowledge. The text is amended by a table containing relevant types of erosion, a map

created using ArcGIS software, and photographs documenting selected erosion places. The authors created all amendments to the text.

Results

Sandstone is a weakly resistant and, at the same time, porous rock. Erosion in the past created contemporary Prachov Rocks, but nowadays, it is not desirable (except for the weathering of inscriptions on the stones, etc.). The permeability of sandstone is connected to chemical erosion manifested by the emergence of honeycombs. Physical (mechanical) erosion models all rock shapes in the area and is stronger during winter when cracks between rocks widen. The erosion causes the transport of tiny particles of sand (cf. Liang et al. 2019) as well as colossal sandstone blocks. Tiny particles of sand are noticeable at first glance on paths between rock formations. They act as shock absorbers of tourist steps, but tourists in their shoes, wind and water take them away, and they are gradually replaced by newly eroded material. Unruly tourists on illegally trodden paths create erosion grooves through which sand and stones are carried away.

The studied area is primarily natural, but some places, such as viewpoints and tourist footways with stairs and railings, were modified for the purposes of mass tourism in the past. Both genuine and modified parts suffer from erosion. Most modifications directly affected sandstone rock shapes and their natural surface crust, making them more susceptible to weathering. Erosion in the area endangers not only rocks but also soils (podzol, cambisol), which are poor, infertile and not deep. Their weathering exposes the bedrock. Forests, especially those with original composition and biodiversity, secure natural protection against erosion in the Rock City (AOPK ČR 2019). Firstly, we would like to show the types of erosion emerging in the studied area (Tab. 1) and the most prominent examples in the map (Fig. 1) because, on a small scale, the whole explored territory is affected by erosion. The most vigorous erosion is near viewpoints and choking points on tourist paths. Generally, with paid entrance, Rock City is more under control than the rest of the Protected Landscape Area, where illegal cycling outside bike trails or foresting emerges.

Tab. 1: Typology of erosion in the Prachov Rocks

Physical/chemical/biological natural erosion	Man-made erosion	
	Unintentional	Intentional
Water (direct – precipitation, humidity from rainfall or spring water – pseudocarst shapes, and humidity from capillary movements of solutions in sandstone pores – honeycombs and rock ledges) Frost (creates icefalls and tears sandstone) Wind (often together with water – rock windows) Gravitational (disturbed integrity caused by other types of erosion leads to rockslides) Biological (mosses and lichens slowly shaping the sandstones)	Walking (visible particularly on stairs) Climbers activities (mechanical weathering of rocks, maybe use of magnesium) Logging Installing and maintaining tourist infrastructure Activities of film crews	Engraving in the rocks (depth plays a role) Painting on the rocks Pollution by garbage and excrements (with possible chemical effects on the rocks) Walking outside the official tourist paths Searching with metal detectors and related digging Building stone figures

Climbers are allowed to climb on selected rocks between April and October. However, during the humid periods, climbing is forbidden because wet sandstone is prone to chipping. Using magnesium is permanently banned, although its effects on the rocks are still not thoroughly researched. Moreover, climbers are instructed to spare the rock (Prachovské skály 2024), which can sometimes be problematic. Repeated climbing on the same routes prevents rock surface crust regeneration and amplifies pre-existing erosion (see Fig. 2). In addition, the hollows used

as support points during climbing are deepened and rope rubbing against the rock creates notches. Nevertheless, the damage caused by climbers is not extensive in the studied geosite.

Erosion in Prachov Rocks in 2024

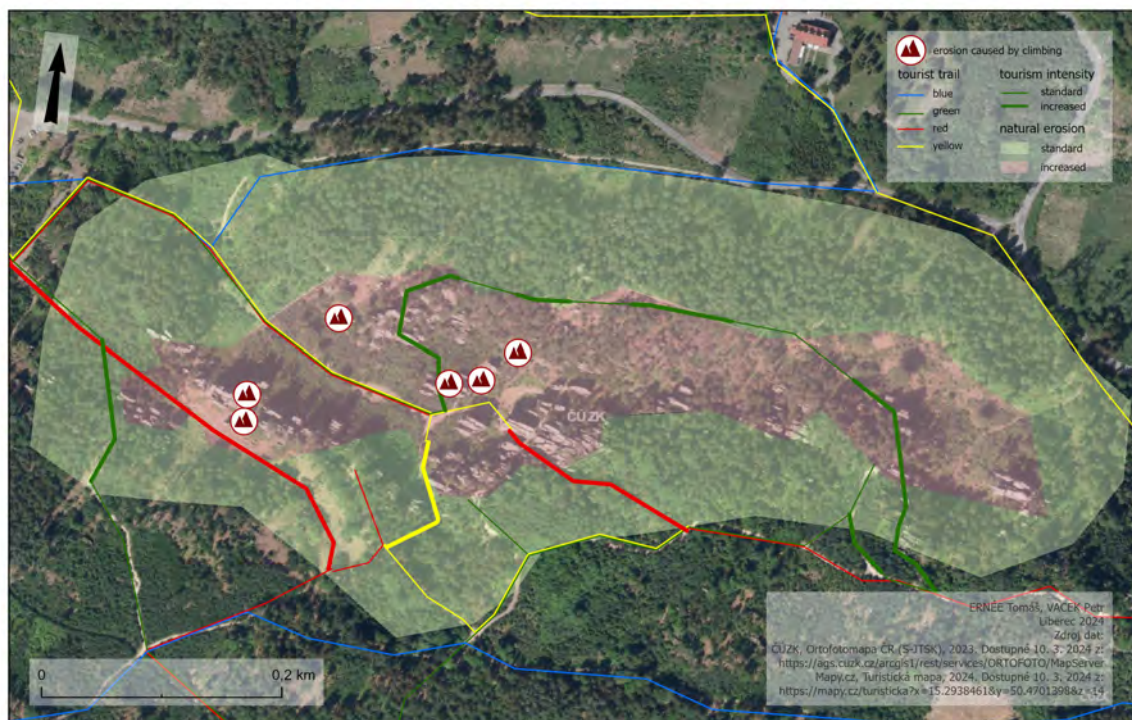


Fig. 1: Map showing the places of erosion in the Rock City and surroundings



Fig. 2: Photograph of honeycomb weathering amplified by the movement of climbers

Even recent natural erosion might bring interesting and potentially touristically attractive formation, somewhat similar to the famous Norwegian Kjeragbolten (see Fig. 3).



Fig. 3: Photograph documenting large-scale natural erosion

Conclusion

We have identified many manifestations of erosion (of various types) and endangered places in the Prachov area. Most frequently damaged are stairs and soils (e.g. exposed tree roots) on the tourist routes. It is difficult to fight natural erosion. Still, efforts, such as eco-friendly forestry with horses, installing wooden or concrete barriers, metal cross-bracing and rockfall nettings, have emerged in the studied area. The core of prevention lies in combating overtourism, tourist and climber misbehavior (cf. Drápela 2021) leading to man-made or combined erosion. However, the current management approach is far from ideal. Rock City, despite its massive profits, suffers from a lack of investments and application of modern installations (metal walkways and bridges instead of the use of wood or even concrete and mortar, the least convenient materials, as parts of eroded sandstone stairs repairs) and strategies (tourism deseasonalization, reservation system and even guard focused on the sensitive places of the Rock City) for combating overtourism and protecting sandstone shapes (Boháč, Vacek 2023). Rock formations are essential for a significant portion of tourists visiting the region (Drápela, Boháč, Böhm, Zágoršek 2021). Irreversible changes in their shape could lead to damage to the protected landscape area, decreased interest in the geosite and, in the final consequence, the owners' profit.

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Souhrn

Článek zkoumá erozi pískovcových hornin optikou geologie a geografie cestovního ruchu. Zaobírá se přirozenou erozí, erozí způsobenou neturistickými lidskými aktivitami a zejména erozí vyvolanou turistickým ruchem. Eroze narušuje pískovcové útvary, a tak snižuje atraktivitu zasažené lokality. Konkrétně se příspěvek zaměřuje na Prachovské skály, jednu z nejnavštěvovanějších oblastí Českého ráje, proslavenou pískovcovými věžemi. Jádrem Prachovských skal, tzv. Skalní město, je přístupné po zaplacení vstupného a navíc se v něm nacházejí informační tabule s upozorněními pro turisty. Toto však nebrání dalším turistům vyvolaným neúmyslným či úmyslným poškozením. Dalším zdrojem eroze jsou neturistické ekonomické aktivity v oblasti. Příspěvek představuje základní teoretický rámec geologie studovaného území a poškození geologicky zajímavých lokalit. Přináší také související inovativní typologie. Autoři se pomocí terénního výzkumu snaží identifikovat nejohroženější formy a tvary ve Skalním městě a vysvětlit mechanismus jejich poškození. Terénní výzkum také zahrnuje měření eroze pískovce a souvisejících posunů. Text je doplněn fotografickými, mapovými a tabelárními přílohami.

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GREEN BUDGET AS A FORM OF SOCIAL ACTIVATION TO IMPROVE THE URBAN ENVIRONMENT – CASE STUDY OF KATOWICE, POLAND

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Abstract

Participatory Budgets as a placemaking tool involve residents in co-deciding on public expenditure. The growing number of applications for pro-environmental projects influences the creation of Green Budgets in many Polish cities. An example is Katowice where such an initiative has been operating since 2020 to support public tasks in the field of ecology and environmental protection. The study is aimed at indicating the development trends of the Katowice Green Budget based on its 4 editions (2020, 2021, 2022, 2023). During this period, residents submitted a total of 715 green projects and 347 of them were selected for implementation. The results show a growing trend in the scope of submitted green projects in the first 3 editions and stabilization in the 4th edition. The number of accepted projects is constantly growing. The largest number of projects is related to the development of greenery (new plantings, green streets, revitalization of green areas), as well as green education important for increasing public awareness of the role of pro-environmental activities in the city. This confirms that the Green Budget fills the gap in activities supporting the development of urban greenery, and is appreciated by both the city authorities and residents.

Keywords: urban green spaces, placemaking, environmental education, sustainable society, sustainable city

Introduction

The involvement and participation of citizens in making decisions about spending public funds intended for shaping urban spaces has been growing significantly in recent years and is one of the key forms of participation in the planning and development of many Polish cities. The Citizens' Budget (CB) has become a popular placemaking tool – a form of grass-roots participation that allows for a better response to local social needs and at the same time improves the potential and experience of citizens in negotiating their interests (Taylor, 2019; Smaniotto Costa et al., 2024). In recent years, more and more cities around the world have set ambitious climate and environmental goals for their activities, and the Citizens' Budget is playing an increasingly important role in the sustainable management of urban space (Sinervo et al. 2024). The share of social 'green' initiatives aimed at pro-environmental activities is growing – increasing the number of green areas and places for outdoor recreation (Maksymiuk, Kimic, 2016), building green infrastructure, increasing biodiversity, supporting retention etc. (van der Jagt et al., 2023). This approach is determined by the need to counteract the negative effects of climate change and improve living conditions in the city, which was directly influenced by, among others, the COVID-19 pandemic (Kimic et al., 2024). It also results from the need to increase access to green areas, in particular for groups at risk of exclusion, such as women (Polko, Kimic, 2022) or seniors (Kimic, Polko, 2022). Green Budgets are being created to enable communities to be involved in the process of creating sustainable and thus livable cities. Katowice is a city located in south-western Poland and the centre of the Silesian Metropolis. This area with a high concentration of industry is currently undergoing transformation towards revitalization and regeneration of the degraded urban environment. Top-down planning is gradually being replaced by dialogue with citizens as the residents of Katowice are increasingly willing to engage in the transformation process (Pudelko, 2015). The Citizens' Budget was initiated here in 2014. However, the growing interest of residents in green projects resulted in the introduction of the Katowice Green Budget in 2020 – a separate placemaking tool for

building the city's natural potential. Thanks to separate public funds, it enables the identification of residents' needs in the field of broadly understood ecology, environmental protection and improvement of the city's aesthetics by increasing the share of greenery. It implements the provisions of the 'Development Strategy of the City of Katowice 2030' (2015) based on the development of Katowice as a city that is: *green* – focused on respecting environmental and spatial resources, *smart* – focused on strengthening and introducing innovations, and *resilient* – focused on adaptability and transformation through participation in the process of preparing actions to mitigate structural changes. Public participation in the Citizens' Budget is currently carried out using online voting systems (Szczepańska et al., 2022). This is a consequence of the growing use of information and communication technologies (ICT) to increase active participation in urban initiatives (Cunha et al., 2011; Polko, Kimic, 2024), including the process of shaping urban spaces (Kimic et al., 2019; Olejniczak, Bednarska-Olejniczak, 2021).

Material and methods

The article focuses on the case study of the of Katowice Green Budget. The aim was to indicate the direction of development of this placemaking tool based on data from the 4 editions carried out so far in 2020, 2021, 2022 and 2023 (Zielony Budżet Miasta Katowice, 2024). The preliminary stage included an analysis of the number of projects submitted by residents in each edition to indicate general quantitative trends. Then, leading project types were identified and assigned to 8 categories. The projects were assessed in order to identify those whose share among the completed projects has increased in the subsequent editions of the Katowice Green Budget. The obtained results made it possible to illustrate changing trends and social needs in the field of pro-environmental initiatives in the city.

Results

In the 4 completed editions of the Katowice Green Budget in 2020, 2021, 2022 and 2023, residents submitted a total of 715 green projects for an amount exceeding PLN 10.5 million. 347 projects were selected for implementation, which constitutes 48.53% of the submitted projects. As many as 306 projects involved local initiatives implemented in 22 districts. Only 41 projects were city-wide – they concerned activities assigned to more than one district (Table 1).

Tab. 1: List of projects submitted and selected in the vote in the first four editions of the Katowice Green Budget (2020-2023).

Green Budget Edition	Number of projects submitted	Number of projects selected in the vote / % of those submitted		Projects selected for implementation	
				Citywide	District
2020 (I)	123	54	43,90%	4	50
2021 (II)	164	89	54,27%	8	81
2022 (III)	227	96	42,29%	14	83
2023 (IV)	201	108	53,73%	15	92
Total	715	347	48,53%	41	306

With regard to the number of submitted projects, an upward trend is visible in the first three editions of GBK, while a slight decline was recorded in 2023. Regardless of these changes, the number of projects selected for implementation is constantly growing, and additionally they constitute between 43.90% and 53.73% of projects submitted in individual editions.

A detailed analysis of the projects selected in the vote allowed them to be assigned to 8 main categories: *new plantings*, *street greenery*, *new green areas*, *revitalization of green spaces*, *maintenance of greenery*, *water retention*, *small animals care*, and *environmental education* (Table 2).

Tab. 2: Projects selected in the vote and assigned to individual categories in the Katowice Green Budget.

Green Budget Edition	New plantings	Street greenery	Maintenance of greenery	Environmental education	New green areas	Revitalization of green spaces	Water retention	Small animals care
2020 (I)	14	12	1	4	8	8	4	3
2021 (II)	34	3	10	7	9	16	4	6
2022 (III)	27	11	8	23	11	11	1	4
2023 (IV)	27	4	12	36	5	13	4	7
Total	102	30	31	70	33	48	13	20

The results obtained show that in the four completed editions of the Katowice Green Budget, the majority of completed projects belonged to the new *plantings* category (102). This group included those related to a more comprehensive introduction of greenery creating extensive structures composed of trees, shrubs and perennials, but also planting several trees in urban space, and introducing greenery in playground and recreation areas, as well as individual elements (flower meadows, flower beds, green stops), plants in pots, or small thematic gardens and community utility gardens. Second in order is the *environmental education* category with 70 projects implemented over four years. They included a series of educational activities for children carried out in schools, as well as ecological workshops (focused on recycling, a sustainable approach in everyday life, environmental protection etc.) and plant cultivation classes for adults. Projects classified into the following categories: *revitalization of green spaces* (48), *new green areas* (33), *maintenance of greenery* (31) and *street greenery* (30) were at an average level. They included social initiatives aimed at increasing the number of green areas in the city (mainly small squares), improving the attractiveness of existing green areas and city streets, and the quality of green areas by intensifying care treatments. The remaining two categories included only a few projects in each Green Budget edition. A total of 20 projects were selected in the *small animal care* category, which included the installation of nesting boxes for birds and insect houses. Only 13 projects were selected in the *water retention* category, included the creation of small rain gardens and the cleaning of water features in green areas.

Within individual categories, certain trends can be noticed regarding the changing share of projects selected for implementation. The number of those in the most popular *new plantings* category remains at a constantly high level – in the last three editions they covered 27 and 34 projects, respectively. The greatest increase takes place in the *environmental education* category, where in 2023 the number of projects selected in the vote was as many as 36 – the highest among all categories in all editions. This proves the social need to raise awareness and expand knowledge to support activities to improve the functioning of the urban environment. At the same time, the small number of projects in the *water retention* category indicates the need to increase education about the possibilities of rational use of water to shape a more sustainable city, even through activities on a local scale.

Discussion and conclusions

The success of the Katowice Green Budget is manifested not only by the increase in the number of projects submitted in the first three editions and the stabilization of their high number in the fourth edition, but above all by a constant increase in the number of projects selected for implementation. This confirms the advisability of separating the Green Budget from the city's basic Citizens' Budget, and at the same time the growing interest of residents in strengthening natural capital and the urban climate resilience (Sobol, 2019). This is consistent with general trends observed in most Polish cities, including voivodeship capitals (Maksymiuk, Kimic, 2016; Bernaciak et al., 2017; Jamontt et al., 2017; Szczepańska et al., 2022). The Green Budget is a valuable supplement to the basic Citizens' Budget of Katowice and fills the gap in existing

activities aimed at developing and maintaining urban greenery, including improving the quality and access to outdoor recreation areas. This is confirmed not only by the growing number of submitted and implemented green projects, but also by their diversity in terms of scale and subject matter. A positive phenomenon is the growing social awareness of the importance of pro-environmental activities for improving living conditions in the city, including the desire and even the need to expand knowledge by organizing and participating in educational campaigns (Bernaciak et al., 2017). It should therefore be recognized that the experience so far related to only a few editions of the Katowice Green Budget is positive and promising. Recognizing the activities carried out using this tool provides knowledge and a better understanding of the current social expectations, allowing to more effectively involve residents in deciding on the sustainable development of Katowice. This knowledge is also the basis for the process of forecasting and planning pro-environmental activities in the city, including decisions to increase funds for subsequent editions of the Green Budget.

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Souhrn

Participativní rozpočty jako nástroj tvorby míst zapojují obyvatele do spolurozhodování o veřejných výdajích. Rostoucí počet žádostí o proenvironmentální projekty ovlivňuje tvorbu zelených rozpočtů v mnoha polských městech. Příkladem jsou Katowice, kde taková iniciativa funguje od roku 2020 a podporuje veřejné úkoly v oblasti ekologie a ochrany životního prostředí. Cílem studie je naznačit vývojové trendy Zeleného rozpočtu Katovic na základě jeho 4 vydání (2020, 2021, 2022, 2023). V tomto období obyvatelé předložili celkem 715 zelených projektů a 347 z nich bylo vybráno k realizaci. Výsledky ukazují rostoucí trend v rozsahu předložených zelených projektů v prvních 3 vydáních a stabilizaci ve 4. vydání. Počet přijatých projektů neustále roste. Největší počet projektů se týká rozvoje zeleně (nové výsadby, zelené ulice, revitalizace zelených ploch) a také zelené osvěty důležité pro zvýšení povědomí veřejnosti o roli proenvironmentálních aktivit ve městě. To potvrzuje, že zelený rozpočet vyplňuje mezeru v aktivitách podporujících rozvoj městské zeleně a je oceňován jak orgány města, tak jeho obyvateli.

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GUERRILLA GARDENING AS A CHALLENGE IN ENVIRONMENTAL EDUCATION?

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Abstract

Currently, in the context with the concept of sustainability, emphasis is placed on ecological education and environmental problems in education, while pupils and students are increasingly separated from nature and from activities connected with a real contact with nature. Therefore, students' ecological ideas often end with sorted waste and reports on current ecological disasters. In this paper are considered the possibilities of using a controversial activity - guerrilla gardening - to increase students' interest in their surroundings, in the study of ecosystems and in their active contact with nature. The paper also discusses the possibilities and limitations of this activity with an emphasis on environmental responsibility.

Keywords: ecology, leisure time activities, motivation, recreation, responsibility

Introduction and the goal

In connection with the ecological crisis and the concept of sustainability, more and more emphasis is placed on ecological and environmental education, but today's students are primarily educated on a theoretical level, and in their free time they are often in the grip of digital technologies and social networks and they are separated from the real contact with nature. One of the ways how motivate young people to environmental activities is the controversial activity - guerrilla gardening, the benefits and risks of which are discussed in this paper.

Materials and methods

This paper is based on the overview of relevant written sources and continues with the SWOT analysis of guerrilla gardening in environmental education.

Theoretical background

"The major challenges of today's society, such as climate change, water and food security, as well as biodiversity loss, involve efforts to protect and save the environment. Coping with these 'wicked' problems requires education and engagement. Historically, environmental education entered school curricula in the 1970s when concerns about environmental degradation were broadly discussed on a global level." (Schönfelder & Bogner, 2020)

According to Khusainov et al. (2015): "Psychological direction of the lessons, its structure during education of nature studying subjects, seeing the interrelation between human and nature are allowing to pupils to be self-aware as a part of the nature. They are beginning to understand the meaning of importance of nature education development and their own possibilities in relishing of nature only by finding themselves to be a part of the nature. That is the first step to the ecological culture. As the result pupils get a habit of environmental friendliness and finally they do everything that is necessary for environmental development of their districts, schools, gymnasiums etc."

Environmental consciousness refers to a state of awakening in one's relationship to the environment, where one is sensitive to the environment and knowledgeable about the environment, and is committed to act in a way that demonstrates enlightened environmental responsibility and care. (Ji, 2011)

The categories of environmental education objectives are according to (Tbilisi Declaration, 1977):

- Awareness - to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.
- Knowledge - to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.

- Attitudes - to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.
- Skills - to help social groups and individuals acquire the skills for identifying and solving environmental problems.
- Participation - to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

One of the effective but controversial method how to attract pupils and students to the interest in nature and environment is guerrilla gardening. The main contribution of guerrilla gardening in environmental education is that it is outside activity, the work with real visible results, that reduction of the stress and the feeling of adventure. Using adventure activities for education were studied in many papers (e.g.: Thomas, 2005; Hanna, 1995; D'Amato & Krasny, 2011; McKenzie, 2000; Shooter & Furman, 2014; Martin, 2004; Dresner & Gill, 1994; Attarian, 2001; Brown & Jones, 2021; Sandell & Öhman, 2013; Karppinen, 2012; Palmberg & Kuru, 2000).

The term 'guerrilla gardening' was introduced in 1973 by Liz Christy, a young oil painter living and working in New York. She noticed tomato plants growing in the mound of trash in her neighbourhood. The plants had clearly sprouted from fruit in the discarded rubbish. Taking inspiration from this, Liz and her friends scattered their own seed in vacant lots and planted empty tree pits. Later they decided to create a community garden recalling the New York of the seventeenth century, in which every house had a garden; they wanted to create a small oasis in densely built district. (Sackey, 2022)

In the 1970s, guerrilla gardening began as a grassroots protest against urban decay and derelict spaces in New York City. (Thornton, 2023)

"Since the 1970s, guerrilla gardening served as a warning to citizens and policymakers on the negative impact of urban decay on urban life, socially, economically, and environmentally... Since the 2000s, guerrilla gardening and other forms of urban agriculture have increased their mainstream appeal, emerging as important urban social movements and participants in new forms of urban governance that seek to reconnect and enhance symbiotic relationships between human and natural ecosystems in the built-up environment." (Thornton, 2023)

Guerrilla gardening is the strife for management and control that causes alienation from nature, despite best intentions. ... motto, "I walk, I see, I do," can contribute to a more just multispecies city. This takes courage but might enable urban residents to truly benefit from nature's benefits for individual and more-than-human community health, of which positive emotions are a central part. (Müürpeal et al., 2023)

Alongside the term guerrilla gardening some authors use the term community gardening or the urban agriculture (Gu et al., 2012) which does have no connotations of transgression and intervention. The urban farming movement is not simply about growing food, but the effects are diverse and widespread. Through the integrated wholistic system of learning, activism, and health urban farming became a catalyst for renewal in communities across the country. (Gu et al., 2012)

Guerrilla gardening is very close to adventure education which can awaken motivation through unusual challenging activities even of less motivated students. Shooter & Furman (2014) mentioned in their study three benefits of adventure education and socio-ecological models: "First, both adventure education and socio-ecological models regard positive behaviour change as a desired outcome. Second, adventure education and socio-ecological models both offer insights to address environmental problems. Third, both models highlight our social and environmental interrelatedness. Adventure education provides a unique opportunity to step away from the complexities and distractions of day-to-day life and learn directly about both human and ecological interrelationships. Adventure education can be an effective way to teach systems thinking and the socio-ecological model provides a useful framework to do so."

There are two categories of guerrilla gardening operation. The first involves undercover work. Often performed at night, when outdoor workers are absent and potential witnesses in bed, the project is executed quickly and quietly. In the other type of the operation you work by day. You do not skulk or hide behind dark hoodies or bandana masks. You wear work clothes and work gloves and a safety vest. - A worker's vest is like backstage pass. (Tracey, 2007)

According to Black (2013): “The overall reaction to the garden from neighbours and passers-by is positive, and people are generally happy that the gardeners are doing something with land that was largely abandoned. People out walking stop to admire the flowers and chat with the gardeners....But a little bit different is the situation when the guerrilla gardeners transform a public space into a place for growing food; it can be perceived as provocative or even disgusting.”

“Guerrilla gardeners often colonise land not only without the permission from authorities, but also with little regard for those who surround the space; transforming areas without consulting with the local communities”. (Adams et al., 2014) From this point of view guerrilla gardening has close to arbitrary actions or anarchy. “But what if anarchy could be beautiful, what if it could bring local communities together planting flowers in the streets?”. One doyenne of guerrilla gardening call it botanarchy. (Gayle, 2023)

“With the lack of arrests and no documented prosecutions, guerrilla gardening is more appropriately conceptualised as an informal act as opposed to an illegal act..” (Adams, Hardman, & Larkham, 2015; Reynolds, 2008 in Hardman et al., 2018)

“Perhaps the most unlawful action of a typical guerrilla gardener is their avoidance of obtaining planning permission or dealing with the bureaucracy of local authorities through avoiding risk assessments, insurance and other such paperwork usually required to establish a formal site.” (Zanetti, 2007 in (Hardman et al., 2018)

It seemed that guerrilla gardening had become normalised law-breaking, a form of urban intervention that was broadly accepted and a welcome part of everyday living in certain neighbourhoods. The police were not thought likely to intervene and in one instance encouraged the planting of a guerrilla garden outside a local police station. Local politicians were happy to pose for photographs with the gardeners and landowners were – in most cases – perceived to be uninterested. (Millie, 2023) Of course, a much more responsible approach is to transform guerrilla gardening into “a less guerrilla form” that is perhaps less adventurous but more respectful of property rights and the law; i.e. seek out the landowners and ask for permission to garden on their land. In the event that the municipality will be the owner, we can expect helpfulness, as the interest of the municipality's management should be to beautify neglected places.

Results

Tab. 1: SWOT analysis: Guerrilla gardening in environmental education

Strengths	Weaknesses
<ul style="list-style-type: none"> ▪ Adventurous and challenging activity ▪ Recreational activity ▪ Reduce stress ▪ Motivation to environmental activity ▪ Requires participants' activity ▪ Very creative ▪ Popular for young people ▪ Quite cheap ▪ Visible results of own work ▪ Critical environmental thinking ▪ Enables to see the environmental changes ▪ Enables to see results of own work ▪ Feedback from others ▪ Enables to see various point of views ▪ Supports the thinking about community ▪ Supports environmental perception and sensitivity ▪ Supports environmental activities ▪ Develops responsibility ▪ Develops environmental responsibility 	<ul style="list-style-type: none"> ▪ Illegal activity ▪ Incitement to criminal activity ▪ Does not respect ownership ▪ Brakes the law ▪ No planning permission ▪ No risk assessments ▪ For the reasons mentioned above it can be hardly a part of school practical education ▪ Requires a lot of time ▪ Suitable mainly for very active participants ▪ Requires to be familiar with botany and biodiversity (at least the leader of the group) ▪ Requires long time active and responsible students (otherwise the plants can die soon or they will be not cultivated) ▪ Requires an experienced and adventurous lecturer
Opportunities	Threats
<ul style="list-style-type: none"> ▪ Can motivate also less motivated students ▪ Included environmental investigative 	<ul style="list-style-type: none"> ▪ Can be destructive without botanical knowledge ▪ The danger of spreading of invasive plants

<ul style="list-style-type: none"> activities ▪ For less motivated students with a motivated lecturer ▪ For children from 10 years ▪ For managers who want to be environmentally friendly and socially responsible ▪ For environmentalists ▪ For activists ▪ For leisure time groups, courses ▪ For self-development ▪ Can be used as relaxation activity ▪ Can be used as a part of teambuilding activities 	<ul style="list-style-type: none"> ▪ Irresponsible gardeners can only start their project without continuing care and interest ▪ Participants of this activity can feel that it is ok to be involved in illegal activity and it can be generalized ▪ The participants can be attracted with the adventure more than with the real environmental goals ▪ Unskilled lecturers can choose wrong plants, wrong place and do not think about the future care about the plants
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Discussion and Conclusion

In this paper was given an overview of literary sources dealing with guerrilla gardening and education, and a SWOT analysis of guerrilla gardening in environmental education was prepared on the basis of the theoretical part of this article. The findings show that, although it is a controversial method, it has many benefits for environmental education, including: real contact with nature, motivation through adventure, development of responsibility to planted plants and to the environment in general; the other benefits are stress reduction and relaxation associated with the stay in nature and with the joy from the results of own work.

Guerrilla gardening can be recommended for students from about 10 years of age under professional guidance; for environmentalists, for leisure groups, or for managers and employees as part of teambuilding activities. The main weaknesses and risks of guerrilla gardening lie in the fact that it is an illegal activity, although as stated in the theoretical overview, it is mostly tolerated by both the police and the city council.

(However, there still remains the danger that the unwanted result of education using guerrilla gardening can be arbitrariness and disrespect for the law). Another risk can be a one-time, irresponsible "hurrah action" that does not take into the account the longer-term care of the plants and the "occupied" land.

Last but not least, the spread of invasive or otherwise unsuitable plants can be a risk, for example due to the lack of knowledge. However, the mentioned negatives can be solved with an experienced lecturer, a responsible attitude of the participants and with a request for permission to "guerrilla gardening" from the owner of the chosen neglected plot.

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Souhrn

Na ekologické a environmentální vzdělávání je v souvislosti s ekologickou krizí a konceptem udržitelnosti kladen stále větší důraz, avšak současní studenti jsou vzdělávání především v rovině teoretické a rovněž ve svém volném čase jsou často v zajetí digitálních technologií a sociálních sítí a odtrženi od reálného kontaktu s přírodou. Jednou z možností, jak motivovat mladé lidi k aktivní environmentální činnosti je kontroverzní aktivita – guerrilla gardening.

V tomto příspěvku je podána v teoretické části rešerše odborných zdrojů zabývajících se guerrilla gardeningem v ekologickém vzdělávání a na podkladě teoretické části příspěvku je přehledně zpracována SWOT analýza guerrilla gardeningu v environmentálním vzdělávání; podstatné body výsledků jsou stručně okomentovány v následné diskusi.

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HARMONIZING NATURE AND TECH: EXPLORING THE FUSION OF MOBILE TECHNOLOGY IN OUTDOOR ADVENTURE

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Abstract

Mobile technology (tablets, smartphones) may provide students with access to educational resources (maps, navigation tools), enriching the outdoor adventure experience and facilitating the learning; therefore, the present study was aimed at exploring the fusion of mobile technology in outdoor adventure (in students). Instrument of survey (3 questions) was carried out 2 months (Jan. - Feb., 2024), through the sampling (purposive) of 1 624 (100%) students: (i) Male (846, 52.10 %); (ii) Female (778, 47.90%). Descriptive (percentage - %, arithmetic mean - \bar{x}) and inferential (chi-square test - χ^2) statistics was used to evaluate the data. 62. 80% (1020) of students use mobile technology in outdoor adventure; in contrast to 30.48% (495) (not using) ($p > .05$). 36.82% (598) of students use additional devices of mobile technology (mobile apps) in outdoor adventure ($p < .01$). 8.78 % (142) of students (only) are aware of apps, aimed at discovering the natural attractions ($p > .05$). Exploring the fusion of mobile technology (apps) in outdoor adventure is students may promote the learning (experiential), engagement and environmental awareness, making it an important aspect of educational and/or outdoor recreation programs.

Keywords: Apps, education, health, students.

Introduction

Exploring the fusion of mobile technology in outdoor adventure is an interesting (exciting) journey at intersection of innovation and nature (Lindel, 2014). Mobile technology is revolutionizing the way we approach outdoor adventure (Crawford et al., 2016; Michalakakis et al., 2020), offering an abundance of tools to enhance learning, navigation, and/or enjoyment. Here are some important ways of fusion of mobile technology in outdoor adventure:

1. **Maps and Navigation** – Apps (mobile); in particular, Google Maps, Gaia Gps, provide detailed maps (real-time navigation), helping adventurers to stay on course and explore terrain (Schöning et al., 2007).
2. **Assurance and assistance** – Apps (Stay Safe, Cairn) allow adventurers to send signals (distress), share location with others (emergency contact) and access resources in case of emergency (Kamarudin, Salam, 2012).
3. **Health and fitness** – Devices (wearable) like smartwatches and trackers together with apps, allow adventurers to monitor heart rate, track activity levels, and analyze performance to optimize training (Shei et al., 2022).
4. **Education and experience** – Apps (Peak Visor, iNaturalist) provide the educational content about the local biology (fauna, flora), history, and/or geography, enhancing the experiences (outdoor) by offering insights into the natural environment (Unger et al., 2020).
5. **Conservation and maintenance** – Apps (Leave No Trace, Trail Karma) promote responsible outdoor recreation (practice) by providing guidelines for minimizing environmental impact and ways to return back to outdoor community (Simon, Alagona, 2009).

Mobile technology (tablets, smartphones) may provide students with access to educational resources (maps, navigation tools), enriching the outdoor adventure experience and facilitating the learning; therefore, the present study was aimed at exploring the fusion of mobile technology in outdoor adventure (in students - 1 624, 100%).

Material and methods

In terms of study aim (see Introduction), the survey group (1 624, 100%) (target population) consisted of 778 (47.90%) adolescent boys and 846 (52.10%) girls, attending the 1st - 2nd years in high schools of Slovakia (Table 1). Adolescent boys (778, 47.90%) and girls (846, 52.10%) consisted of convenience sample, recruited by EduPage (Adamčák et al., 2023). Instrument of survey (3-question) was carried out 2 months (Jan. - Feb., 2024), through the sampling (purposive) of 1 624 (100%) students; regarding gender, year of study. Exploring the fusion of mobile technology (apps) in outdoor adventure (in students; see Introduction) was carried out in accordance with ethical standards as laid down in Declaration of Helsinki (1964) and its later amendments and comparable ethical standards. All subjects (1 624, 100% - students) provided written informed consent (Harriss et al., 2020).

Tab. 1: Demographic data of survey group (1 624, 100%)

Demographic data		
Boys	Age	15.80 ± .20 years
Girls		15.60 ± .20 years
Boys	Gender	778, 47.90%
Girls		846, 52.10%

Developing the instrument of survey (3 questions) made it easier to explore the fusion of mobile technology (apps) in outdoor adventure (in students) consisting of 2 sections:

1. **Demographic data** – Age, gender, year of study (Table 1).
2. **Survey items (3 questions)** – 3-question survey was online (available), collecting the data (Microsoft Forms, Office 365) (Table 2 - 4). 3-question survey was chosen because of its cost effectiveness, ease of access and time saving (Adamčák et al., 2023).

Available data (3-question survey) of 1 624 (100%) of students was tabulated in database design (Table 1 - 5). Each item (3) was analyzed and compared using the Tap3 – Gamo, B. Bystrica (Azor et al., 2023). Descriptive (arithmetic mean - \bar{x} , percentage - %), inferential (chi-square test - χ^2) ($p < .01$, $.05$) statistics was used to evaluate the data; in particular, between 778 (47.90%) adolescent boys and 846 (52.10%) girls (Singhal, Rana, 2015).

Results

In terms of study aim (see Introduction), Table 2 illustrates (shows) whether 778 (47.90%) adolescent boys and 846 (52.10%) girls use apps (mobile) in outdoor adventure. 30.52% of students (1 624, 100%); in particular, 30.18% of boys and 30.84% of girls, do not use the apps (mobile) in outdoor adventure. Regular use of apps in outdoor adventure is reported by 20.96% of students and 41.76% of students report non-regular use of apps. In terms of outdoor adventure, 6.76% of students are “no active”.

Difference between 1 624 (100%) of students; in particular, 778 (47.90%) boys and 846 (52.10%) girls was insignificant (statistically, $p > .05$) ($p = .102$, $\chi^2_{(3)} = 6.20$) (Table 2).

Tab. 2: Use of apps (mobile) in outdoor adventure (1 624, 100%)

Question 1			
	Boys	Girls	Boys + Girls
No use	30.18%	30.84%	30.52%
No active	6.22%	7.30%	6.76%
Regular use	18.70%	23.22%	20.96%
Non-regular use	44.90%	38.64%	41.76%
P = .102; $\chi^2_{(3)} = 6.20$			

Table 3 illustrates the use of devices (smartwatch, tracker) in outdoor adventure in 1 624 (100%) students. 45.96% of students report “no use” of devices (40.50 % of boys, 51.40% of girls); “no active” in terms of outdoor adventure are 17.80 % of students. Non-regular use of devices in outdoor adventure report 21.90% of students and 14.34% of students report regular use of devices.

Difference between 1 624 (100%) of students; in particular, 778 (47.90%) boys and 846 (52.10%) girls was significant (statistically, $p < .01$) ($p = 2.64 \text{ E-}10$, $\chi^2_{(3)} = 46.48$) (Table 3).

Tab. 3: Use of devices in outdoor adventure (1 624, 100%)

Question 2			
	Boys	Girls	Boys + Girls
No use	40.50%	51.40%	45.96%
No active	16.02%	19.58%	17.80%
Regular use	15.58%	13.10%	14.34%
Non-regular use	27.90%	15.92%	21.90%
P = 2.64 E-10; $\chi^2_{(3)} = 46.48^{**}$			

** - $p > .01$.

Table 4 illustrates the awareness of apps in outdoor adventure in 1 624 (100%) students. 8.78% of students (only) are aware of apps, aimed at discovering the natural attractions. 35.16% of students (1 624, 100%) do not know apps (any) in outdoor adventure and 26.28% of students heard of (some) apps; however, are unsure (uncertain) whether apps (some) are aimed at outdoor adventure. 29.78 % of students do not want to use apps (new) aimed at outdoor adventure.

Difference between 1 624 (100%) of students; in particular, 778 (47.90%) boys and 846 (52.10%) girls was insignificant (statistically, $p > .05$) ($p = .08$, $\chi^2_{(3)} = 6.80$) (Table 4).

Tab. 4: Awareness of apps in outdoor adventure (1 624, 100%)

Question 3			
	Boys	Girls	Boys + Girls
No use	33.02%	26.52%	29.78%
Heard of	25.20%	27.36%	26.28%
Aware of	9.08%	8.48%	8.78%
Do not know	32.72%	37.64%	35.16%
P = .08; $\chi^2_{(3)} = 6.80$			

Discussion

Mobile technology (apps in smartphones) may provide students with access to educational resources (maps, navigation tools), enriching the outdoor adventure experience and facilitate the learning (experiential) (Lai et al., 2007); however, concerns arise, regarding overreliance on technology and its potential to detract from essence of outdoor exploration. Mobile technology (apps) enriches outdoor adventures by providing tools and/or resources. Apps (available - free) allow the students to navigate unfamiliar terrains, fostering independence and confidence (Cerino, 2021). Educational apps may offer insights into local fauna, flora, and/ or geological features, transforming hikes into interactive learning experiences (Unger et al., 2020). However, skeptics raise concerns about the encroachment of mobile technology (apps) on outdoor experiences. They argue that excessive screen time detracts from sensory immersion essential to outdoor adventures. Instead of engaging with surrounding, students may become fixated on screens, missing out the beauty and serenity of nature (Larson et al., 2019). Reliance on mobile technology (apps) poses risks; in particular, battery failure and/or loss of signal, compromising safety in remote areas. Maintaining the balance between mobile technology (apps) and nature is important in preserving the authenticity and spirit of outdoor exploration (Lindel, 2014).

Conclusion

Exploring the fusion of mobile technology (apps) in outdoor adventure of 1 624 (100%) students (see Results) may promote learning (experiential), enthusiasm (engagement), and/or environmental awareness (Čipková et al., 2024), making it important aspects of educational and/or outdoor recreation programs.

By integrating mobile technology (apps) in outdoor adventure, adventurers may engage with surroundings, deepening the understanding of ecological principles and fostering senses of stewardship towards environment. Innovative approach empowers educators to adapt curriculum to modern learning styles, catering to digital natives of today, instilling appreciation of nature and outdoor exploration.

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Souhrn

Mobilní technologie (tablety, chytré telefony) mohou studentům poskytnout přístup ke vzdělávacím zdrojům (mapy, navigační nástroje), obohatit zážitek z outdoorového dobrodružství a usnadnit učení; proto byla tato studie zaměřena na zkoumání spojení mobilních technologií v outdoorovém dobrodružství (u studentů). Nástroj průzkumu (4 otázky) byl prováděn 2 měsíce (leden - únor 2024), a to prostřednictvím výběru vzorku (účelového) 1 624 (100 %) studentů: (i) mužů (846, 52,10 %); (ii) žen (778, 47,90 %). K vyhodnocení dat byla použita deskriptivní (procenta - %, aritmetický průměr - \bar{x}) a inferenční (chí-kvadrát test - χ^2) statistika. 62,80 % (1020) studentů používá mobilní technologie při dobrodružství v přírodě; na rozdíl od 30,48 % (495) (nepoužívá) ($p > .05$). Další zařízení mobilních technologií (mobilní aplikace) využívá při outdoorovém dobrodružství 36,82 % (598) studentů ($p < .01$). Mobilní aplikace, zaměřené na zdraví, zná při outdoorovém dobrodružství (pouze) 8,80 % (142) studentů ($p < .01$). Zkoumání spojení mobilních technologií (aplikací) v outdoorovém dobrodružství u studentů může podpořit

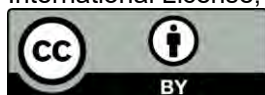
učení (zážitkové), zapojení a environmentální povědomí, což z něj činí důležitý aspekt vzdělávacích a/nebo outdoorových rekreačních programů.

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HOW ARE RECREATIONAL FACILITIES INFLUENCED BY THE NEW BUILDING ACT IN THE CZECH REPUBLIC?

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Abstract

The paper is devoted to the new legislation on public building law and issues related to legislation in this area in relation to recreational facilities. In 2021, a new construction law was approved, which should, among other things, reorganize the public construction administration and should simplify the processes within the framework of building permits, including recreational buildings. This paper focuses on selected issues related to the permitting of buildings for recreation and on the digitalisation of construction processes.

Keywords: Building Act, building authorities, authorities concerned, recreational objects

Introduction

In recent years, there has been a discussion among the professional and lay public in the Czech Republic about the need to improve the legislative environment in the field of building permits, to bring the public building law closer to the standards leading to its streamlining, to remove obstructions, delays or barriers that today limit the construction and development of the Czech Republic. Therefore, all steps taken by the legislator during the recodification should have been aimed at simplifying the processes and rules leading to building permits and ensuring construction in general. The permitting of buildings, and not only buildings for recreation, has long been an area of criticism in the Czech Republic. One of the problems cited is the length of the permitting processes, their complexity (or the difficulty of understanding which specific process is to be applied to a particular building) and, last but not least, the complexity and lack of transparency of the authorities that are supposed to comment on buildings. In 2021, a new Construction Act was approved and published in the Collection of Laws under No. 283/2021 Coll. The new Construction Act came into force gradually. This date was postponed to 1 January 2024 by a major amendment to Building Act 152/2023, but it will not apply to recreational buildings until 1 July 2024. The period between 1.1.2024 and 1.7.2024 is referred to in the Act as the transition period¹. During the transition period, Building Act No. 183/2006 Coll. applies to buildings for recreation.

Recreational buildings and the new Building Act

The new Building Act does not specifically define buildings for recreation. According to the Building Act, buildings for recreation are divided into buildings for individual recreation,

¹ In matters relating to spatial planning, the existing legal regulations shall apply during the transitional period, with the exception of the zoning decision and the binding opinion of the spatial planning authority, which shall not be issued for the purpose of permitting a reserved building listed in Annex 3 to this Act, a building related to it and a building forming a set of buildings with it. For the purposes of the transitional provisions in Part Twelve, Title II, Part 2, the date of entry into force of this Act shall be 1 July 2024.

In matters relating to projects under this Act, the existing legislation shall apply during the transitional period, except in matters relating to the reserved structures listed in Annex 3 to this Act, structures related thereto and structures forming a complex of structures. In matters relating to the reserved buildings listed in Annex 3 to this Act, related buildings and buildings forming a group of buildings with them, this Act shall apply, except for sections 172, 173, 185(3)(c) and Part Seven.

Note: Structures listed in Annex 3 are e.g. motorways, railways, civil aviation structures, renewable energy plants other than hydroelectric works (e.g. photovoltaics with a total installed capacity of more than 5 MW), etc. ...

residential recreation, or buildings of accommodation facilities used to provide accommodation and related services. In order to determine the necessity and form of obtaining a building permit for recreation, the Building Act distinguishes between small buildings, simple buildings and other buildings.

A minor building for recreation is a building, including the foundation structure, up to 55 m² of built-up area and up to 4 m in height on a plot of land that is determined by a decision on the permit of the plan, a zoning plan with elements of a regulatory plan or a regulatory plan for use as a recreation area, which is placed at a distance from the boundaries of the land of at least 2 m and the area of the part of the land capable of absorbing rainwater after its placement will be at least 50% of the total area of the land.



Fig. 1: A simple recreation building is a building for family recreation which has no more than two storeys above ground and one underground storey and an attic or setback storey

In addition, all buildings that meet the purpose of being used for recreational purposes and do not have to be buildings for accommodation, e.g. water reservoirs, buildings for sport or other relaxation, can be considered as buildings for recreation. If we take recreation to mean anything that is used for relaxation, rest or relaxation, we could also consider, for example, spas or amusement parks to be recreational buildings in a broader sense. However, from the point of view of the Building Act, this distinction cannot be made. The Building Act then divides the aforementioned buildings into separate categories, e.g. the aforementioned building for individual recreation, buildings for sport are classified by the Building Act as civic amenities, which are buildings, facilities and land serving to ensure the basic needs of the inhabitants. Water reservoir buildings are then water works, which can be further subdivided according to other criteria under the Water Act, etc.

Due to the variety of buildings for recreation, for the purposes of this article we will focus on the construction of recreational huts (according to the Building Act, this building is referred to as a building for individual recreation). In this article, we will focus on the form and method of permitting construction plans for holiday cottages from the perspective of the new Building Act.

Holiday cottage

The construction of a holiday cottage (from the point of view of the Building Act - a building for individual recreation) will be dealt with. The size of a particular building is essential for a holiday cottage. If the holiday cottage building is up to 55 m² of built-up area and up to 4 m in height and meets the conditions of a small building as described above, it does not require any permission from the building authority. However, this does not mean that such a building can be built anywhere without any further interference from other public authorities. Such a building must always be located in accordance with the zoning plan, and must comply with all conditions

for the protection of any affected interests, e.g. nature protection, conservation, protected areas, etc.

Other holiday cottages already require permission from the building authority. To do this, they must of course meet the requirements of the zoning plan, protection of protected interests or protected areas described above. Compared to the Building Act No. 183/2006 Coll., the new Building Act has abolished the two-stage permitting of buildings. Permitting the location of a building, whether in the form of a decision or in the form of a planning consent, has been abolished. The new Building Act only provides for the authorisation of a construction project in one form. All variants of permitting, whether a notification of intent or a certificate from an authorised inspector, have been abolished. The authorisation of the project under the new Building Act will also resolve the assessment of the suitability of the location of the building and its implementation. It will therefore be similar to the current joint planning and construction procedure.

The application for the commencement of the building permit procedure will be submitted on the prescribed form electronically via the builder's portal or in paper form. The application form should be laid down in the implementing legislation (decree). The building authority should notify the parties to the proceedings, the authorities concerned and the principal designer of the initiation of the proceedings within 7 days of receipt of a defect-free application or of the removal of defects in the application. In the notification, it shall state how the parties to the proceedings may acquaint themselves with the plan and whether and when, if necessary, an oral hearing or a public hearing will be ordered in the case and whether the oral hearing will be combined with an on-site inspection. If the building authority orders an oral hearing, it shall notify the parties to the proceedings and the authorities concerned of the date of the hearing at least 15 days in advance. If no oral hearing is scheduled, the building authority shall specify in the notice of initiation of the proceedings a time limit, which shall not be shorter than 15 days, within which the parties to the proceedings may lodge objections.) In the case of a project in an area where no zoning plan has been issued, the building authority shall always order a public oral hearing. In the case of EIA projects in an area where a zoning plan has been issued, the building authority may order a public hearing. The public hearing shall be announced to the public by public notice and may be scheduled no earlier than 30 days after the date of service of the public notice, during which time the building authority shall allow anyone to inspect the decision documents. After all the actions have been carried out, the building authority shall assess whether the project complies with the requirements laid down in the Building Act² and whether it can be authorised. If all the conditions are met, or if they can be ensured by imposing conditions in the decision to authorise the project, the building authority shall issue the planning permission; otherwise, it shall reject the application for planning permission. The time limits³ for issuing a decision are laid down in the Building Act in such a way that a decision must be taken by:

- a) 30 days from the date of commencement of proceedings in the case of a simile construction,
- b) 60 days from the date of initiation of proceedings in other cases.

These time limits may be extended by resolution before their expiry:

- a) up to 30 days in particularly complex cases or where an oral hearing is ordered, or

² The building authority assesses compliance with

- a) the spatial planning documentation, zoning measures and the definition of the built-up area,
- b) the objectives and tasks of spatial planning, in particular with the character of the territory and with the requirements for the protection of cultural, historical, architectural and urban values in the territory, if the municipality has not issued a zoning plan,
- c) the requirements of this Act and its implementing legislation,
- d) the requirements of other legislation protecting the public interests concerned,
- e) requirements for public transport or technical infrastructure,
- f) the protection of the rights and legally protected interests of the parties to the proceedings, which shall be assessed and measured in relation to each other.

³ Note: The time limit for issuing a decision is interrupted in the event of a suspension of proceedings due to defects in the application and starts again from the beginning once the defects have been rectified.

- b) for up to 60 days in proceedings involving a large number of parties or where service by public notice is to be effected on persons to whom service is demonstrably impossible or where service is to be effected abroad.

A simple building with no more than two storeys above ground and one underground storey and an attic or recessed storey is described above as one of the categories of buildings for recreation. These structures could be permitted under an accelerated procedure, subject to the conditions set out in the Building Act. In such a case, there is no oral hearing, no time limit for lodging objections, but the building permit is issued as the first act of the building authority in the procedure. The conditions are that the builder has applied for a decision in the accelerated procedure and that the construction is located in an area where a zoning plan has been issued, it is not an EIA project, it is not a project requiring an exemption or a derogation procedure under the Act on Nature and Landscape Protection, the construction meets the requirements for the permit and the builder has documented the consents of all parties to the procedure for the project, indicated on the situational drawing of the documentation.

It is clear from the above that the permitting of buildings for individual recreation will be simpler in that it will not be necessary to choose from a large number of variants of permit forms. There will be only one variant, which can be simplified under certain conditions. On the other hand, when comparing the permitting process under the new Building Act with the joint planning and building procedure under the old Building Act, it must be noted that it is a similar procedure with similar time limits.

Digitization

The basis for simplifying the permitting of construction plans under the new Construction Act should be the so-called digitalization of construction law, which should facilitate communication between the builder and individual administrative authorities and between the affected entities such as owners of public technical infrastructure. High-quality digitisation could significantly simplify not only the processes of building permits, but also the protection of protected public interests, where it could contribute to greater awareness. All newly created information portals should be linked to existing information portals and should allow a range of information to be obtained online.

Commenting on the digitisation, the Ministry of Regional Development states that it will allow a developer to submit only one proposal instead of dozens of applications. An intuitive form will guide them through the whole process. The building authorities will have an IT system where all the tasks that are now fragmented in the preparatory phase, the planning decision-making and the building procedure will be under one roof. The state will also have better control thanks to this, it will know exactly where the whole process is stalling, what the average length of the construction procedure is, or how many appeals there are. The builder, planners and other parties will have an immediate overview of the stage of the procedure. The electronic administrative file will contain the complete construction documentation. Moreover, its management will be possible in standardised pdf, dwg and BIM formats. The system will efficiently link land-use planning and infrastructure data with information on buildings and procedures⁴.

The builder's portal should enable digital actions towards the building authority and the affected authority, submitting requests to the owner of public transport or technical infrastructure, providing statements from the owner of public transport or technical infrastructure, etc. This portal should be the basis for simplifying communication between building authorities, authorities concerned, owners of public infrastructure and builders.

In the area of spatial planning, the main objective of digitising spatial planning is to create a new unifying information system, which is the National Geoportal for Spatial Planning. This will serve as a support for spatial planning processes and will also make the outputs of spatial planning in the Czech Republic available to all citizens. It will facilitate the coordination and sharing of

⁴ [Ministerstvo pro místní rozvoj ČR - Digitalizace stavebního řízení v ČR \(gov.cz\)](https://www.mmr.cz/aktualizace-stavebniho-řízení-v-čr)

spatial plans, even at the drafting stage. As the Ministry of Regional Development states, the digitisation of spatial planning is not just a matter of converting paper documents into electronic form, but of changing the entire system of their acquisition and work with them⁵.

Another system should be the register of construction procedures, which should provide for the registration of submissions and other documents, decisions and other actions of the construction authority or the authority concerned, information on the authorised official person or persons, as well as documentation for project authorisation, etc.

Another system - information system of construction proceedings should serve for exercising the competence of construction authorities, concerned authorities, if they take actions according to other legal regulation serving as a basis for issuing a decision in proceedings under this Act, central administrative authorities in exercising control over the competence of state construction administration authorities⁶.

Conclusion

The new Building Act will certainly bring some simplification in relation to the processes of permitting holiday homes. There will be a significant simplification in the area of the forms of building permits, where the so-called two-stage permitting (location permit and implementation permit) will no longer be necessary, but only one permit will suffice. It will also simplify the 'choice' of the form of permit, as there will be only one permit option, namely planning permission. On the other hand, it is necessary to consider whether the planned speeding up will also take place, since the time limits set are similar to those under Building Act No 183/2006 Coll. and most recreational buildings will require a building permit as before, as well as the opinion of the authority concerned. The digitisation of processes can be considered beneficial. If the planned builder's portal is launched, and if it is functional and, as the Ministry of Regional Development states, intuitive and instructive, it will be a great asset that will simplify not only the processes of communication with the authorities, but also information in this area.

Souhrn

Nový stavební zákon přináší řadu faktických změn v procesech povolování staveb pro rekreaci, ale v řadě případů se jedná pouze o změny v názvosloví, o změny spíše technického charakteru. Co přinese nový stavební zákon pro stavby pro rekreaci? Při porovnání stavebního zákona č. 183/2006 Sb. a zákona č. 283/2021 Sb. lze uzavřít, že k výraznějším změnám nedojde. Většina staveb pro rekreaci bude vyžadovat povolení stavby. Ke zjednodušení dochází v oblasti forem povolování staveb, kdy již nebude nutné tzv. dvoustupňové povolování (povolení umístění a povolení realizace), ale postačí pouze jedno povolení. Také se zjednoduší „výběr“ formy povolení, neboť bude pouze jedna možnost povolení, a to povolení záměru. Velké zjednodušení by mohla přinést očekávaná digitalizace stavebních procesů, která by měla být spuštěna k 1. 7. 2024.

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⁵ [Ministerstvo pro místní rozvoj ČR - Digitalizace územního plánování \(gov.cz\)](https://www.mprv.cz/)

⁶ Kliková, A. Nový stavební zákon č. 283/2021 Sb. a jeho změny. In: Exfos XXXI. Mezinárodní vědecká konference soudního inženýrství Brno 2023.

HOW CAN BOTTOM UP ACTIVISM CREATE A PUBLIC PARK: CASE STUDY OF EVOLUTION GARDEN IN ČEBOVCE (SLOVAKIA)

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Abstract

The following case study describes the ongoing process (since 2014) of creating a 1,1 ha public park via bottom-up activism in cooperation with local municipality in Čebovce (Slovakia). Čebovce is a small village with 1021 inhabitants in the south of Slovakia close to the Hungarian border surrounded by oak forests and vineyards. It has a typical valley climate, dry or moderately wet, with an annual average temperature 8.5°C and precipitation of 620 mm. The contribution describes the workflow, activities, fundraising and voluntary work during the period 2014-2024, also identifies the main formal and non-formal groups involved in the process. The selected plot, which was transformed to a public park was an illegal waste dump with a black locust stand in the central part of the village. The data were obtained from project reports of the leading NGO, which was the leader of the activities. The main function of this public park was to create an outside classroom for the local elementary school and place for relax and short-term recreation. The paper describes the strategy which was used to create and maintain this public space via bottom-up activism.

Keywords: Grassroot, low cost, NGO, public space, volunteering

Introduction

Volunteering refers to activities performed through organizations to alleviate needs in society by individuals who receive little to no monetary compensation for their efforts (Wang et al. 2017; Xu 2014). Volunteers and their activities—the latter commonly referred to as volunteering—are central elements in the lively arenas of community involvement, civil labor, and social capital (Stebbins, 2009). In smaller communities bottom-up activism occurs more often as documented by Slobodníková and Tóth (2022) on 3 case studies from western Slovakia.

Volunteer activities have been spurred by Slovakia's low interest in protecting and developing public areas and urban greenery. Certain "politics" frequently take advantage of the low participation rate in the public sphere in an effort to buy public space, altering its fundamental qualities as public areas. Due to the extraordinary sensitivity of this phenomenon, openness in negotiations and public participation in its genesis are required. Whether in an urban, municipal, or rural context, development policies are heavily influenced by the way public areas are used (Faltán, 2010). Many people want to engage in nature or ecotourism, they wish to take part in activities that may have a benefit for their local environment. There is also a rise in communal consciousness and participation in community activities (Bell et al., 2009; Tóth et al. 2014).

Grassroot organisations can have a big impact on the environment especially in smaller towns. They act as ecopreneurs, change agents for a more sustainable society (Pastakia, 1998).

Materials and methods

The subject of the study is an insight into the activity of one civic association, which acts in the design and transformation of public space in Čebovce. Čebovce is a small village with 1021 inhabitants in the south of central Slovakia close to the Hungarian border surrounded by oak forests and vineyards. It has a typical valley climate, dry or moderately wet, with an annual average temperature 8.5°C and precipitation of 620 mm (Tarábek, 1980). The investigated public space can be found in the residential area with a total area of 1,1 ha. Before 2014 the site was abandoned with illegal waste dumps and synanthropic woody and herbal vegetation. The stand consisted of species such as *Robinia pseudoacacia*, *Sambucus nigra*, *Crataegus monogyna*, *Prunus spinosa*, *Prunus domestica*, *Cerasus avium*, *Juglans regia* and *Acer campestre*. The understory is synanthropic, thermophilus vegetation from the alliance *Galio-*

Alliarion (Jarolímek et al. 1997) Information were obtained from the project reports, websites, FB page and by interviewing initiatives. The main player in the processes was the civic association (CA) Jašterica Spoločnosť pre trvalo udržateľný rozvoj (Lizard Society for sustainable development) established in 2003. The long-term goals of the CA are raising of environmental awareness among the village community and preserving of old fruit varieties and landraces. The short-term goals were to engage in small grant schemes to improve biodiversity, plant trees and organize clean ups in the surroundings. The study offers an overview of the mission, objectives, main activities, and the co-design process lead by the CA, the sources of funding and the workflow in the period 2014-2024.

Results

The project of the Evolution Garden started in 2014 with a co-design meeting led by the CA with the presence of village inhabitants and the Mayor's Office. The main idea was to transform the 1,1 ha unused area into a public park with added environmental value. The master plan of the project was created using participatory planning. At the first meeting, there was a larger focus on the needs of locals and the elementary school teaching staff. In spring 2015 the CA and volunteers started to clear the area. 30% of black locust trees were removed and native trees were supported. The CA also received funding from the Grant for Optimists scheme. The Mayor's Office received funding from the Village renewal program for planting trees native trees of the Kurupina Plateau in the cleared area. For the first three years, systemic arboricide with triclopyr was used to control the black locust root suckers. These activities were done by the Mayor's Office, which was also responsible for mowing 3-6 times per year. The Mayor's Office also provided yearly funding from 2015 to 2021 for the CA. In the years 2016-2020, the main goals were: to control the black locust suckers, replant dead trees and plant new ones, installing benches, plant labels, waste bins, and wood-based concrete bird and bat houses. The number of volunteers decreased in the years 2008-2020 gradually from 30 to 7. These were mainly the members of the CA. During the COVID period, there was almost no community activity and the CA worked in an „emergency mode“. In 2022 the Mayor's Office received funding from the Green Villages scheme. With support of this scheme 54 tree specimens were planted. The first event after COVID was in 2023, which was a guided tour for locals to share awareness, of what kind of tree and plant species are growing in the Evolution Garden in cooperation with the Slovak University of Agriculture in Nitra. This event was demanded by locals and the goal was to train volunteers to guide tourists in the future in the Evolution Garden.



Fig. 1: Visit of the local kindergarten in the Evolution garden Source:

<https://skola.easypc.sk/category/338-vychadzka-ms-do-evolucnej-zahrady-2018.html>

In total during the period 2014-2024 234 tree and shrub specimens were planted in the Evolution Garden, the mortality rate of newly planted trees was 34%, caused by drought stress and mechanical damage by grass trimmers. The Mayor's Office received funding for 2 projects and the CA received 3 funded projects. In total 56 volunteers attended the weekend activities during this period counting around 1200 volunteer hours. The local elementary school and the kindergarten is using the Evolution garden for educational purposes as can be seen in **Fig. 1**. The funding altogether was 16931,64 € from which the CA received 3969,31€. The co-financing costs of the Mayor's Office were 761,18€.

All activities in the period 2014 -2024 were coordinated by the CA Lizard in close cooperation with the Mayor's Office. Without the help and support of the Mayor's Office, the project of the Evolution Garden would not have been possible.

Discussion

Our case study showed that the activity of the CA, the help of the volunteers and the support from the Mayor's Office was crucial for the establishment of the Evolution Garden and the post-establishment maintenance. Our findings were similar as the results from the case studies presented by Slobodníková and Tóth (2022). After the establishment there was relatively high tree mortality due to, drought stress and trimmer damage, which is a common problem when establishing urban greenery (Morgenroth et al. 2015). Another stress factor for newly planted trees was drought. This primary stress increased insect damage and the mortality of trees itself. This cascade effect is well described by Dale and Frank (2017). Watering was problematic, because of lack of finances, logistic problems and no water source on site. Public space is a highly socially sensitive phenomenon that requires a wider social discourse, as Falt'an (2010) notes. The most difficult task for volunteer associations wanting to improve public spaces is getting the general public interested and fostering a positive, cooperative relationship with the local municipality! In Slovakia, experts, authorities, and the general public must acquire new techniques and approaches for public space planning. Similar findings very reported by

Slobodníková and Tóth (2022). This case study provides information for further investigation into Slovakia's grass root organizations and bottom-up initiatives and participatory planning itself.

Conclusion

The case study identifies the strategy used to achieve the establishment of a public park with bottom-up activism. This process of establishment deals with many problem, which can be solved only when good cooperation between the main players exist. The CA, volunteers and the Mayor's Office as single players could not achieve such results as together. The sustainability of the project relies on a healthy cooperation of the mentioned subjects.

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Souhrn

Následující případová studie popisuje probíhající proces (od roku 2014) vytváření 1,1 ha veřejného parku prostřednictvím místního aktivismu ve spolupráci s místní samosprávou v obci Čebovce (Slovensko). Čebovce je malá obec s 1021 obyvateli na jihu Slovenska poblíž maďarských hranic obklopená dubovými lesy a vinicemi. Má typické údolní klima, suché nebo mírně vlhké, s roční průměrnou teplotou 8,5 °C a srážkami 620 mm. Příspěvek popisuje workflow, aktivity, fundraising a dobrovolnickou práci v období 2014-2024, také identifikuje hlavní formální a neformální skupiny zapojené do procesu. Vytipovaný pozemek, který byl přeměněn na veřejný park, byla nelegální skládkou odpadu s akátem v centrální části obce.

Údaje byly získány z projektových zpráv vedoucí nevládní organizace, která byla vedoucím aktivit. Hlavní funkcí tohoto veřejného parku bylo vytvořit venkovní učebnu pro místní základní školu a místo pro odpočinek a krátkodobou rekreaci. Článek popisuje strategii, která byla použita k vytvoření a udržení tohoto veřejného prostoru prostřednictvím aktivismu zdola nahoru.

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IMPACT OF AIR TEMPERATURE DEVELOPMENT IN WINTER ON RECREATION

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Abstract

Winter recreation is essentially fully dependent on the course of the air temperature. The occurrence of snow and ice in the landscape is conditioned by air temperatures below zero. However, climate change, typical of global warming, also manifests itself in the winter season. From the analysis of the air temperature databases at the climatological stations of the Czech Hydrometeorological Institute, it follows that for the period 1961 to 2020, despite partial differences, it statistically significantly increases in winter. The increase in air temperature during this period ranges from 1 to 1.6 °C. In the southern parts of our territory, in several places, the average monthly temperature does not drop below zero in winter. This means that if it snows, the snow melts quickly, the natural areas of ice are for a short time, therefore unusable for recreation.

Keywords: global warming, seasons, snow, frosts

Introduction

Air temperature trends over the past year and in the early months of 2024 are evidence of the manifestations of global warming, which is occurring at all times of the year. As reported by Pfister (1992), from the results of a network of stations evenly distributed around the globe, the average air temperature has been increasing since 1850. The initial very slow rise has accelerated in recent decades and the rise is accelerating. While the global average temperature increased by 0.2°C between 1850 and 1950, it increased by 0.7°C over the next 60 years (Brohan et al., 2006).

Generally, the amplification of the greenhouse effect due to the increasing concentration of greenhouse gases in the Earth's atmosphere is the cause of the increase in air temperature (Sun and Wang, 1996). CO₂ is most often mentioned, but other gases from humanity's economic activities are also involved. Given the nature of this process, it is expected that global warming will continue to increase in the future, and it cannot be ruled out that it will increase even faster (Hansen and Sato, 2004).

Various studies show that the rise in air temperature is not the same everywhere, and there are differences even in smaller areas, as the values from our area show. The air temperature rise in different seasons is also different (Střeščík et al., 2014), but it is statistically significant in all these seasons in our territory. Here it is necessary to emphasize that the demonstrable increase in air temperature has impacts on winter recreation, mostly negative. Higher temperatures mean fewer days with natural ice, faster melting of snow cover and reduced skiing opportunities.

It should be noted, here that the climate characteristics presented in the documents used so far no longer correspond to the conditions of the last two decades (Kolektiv 1961, Tolasz et al 2007).

Materials and methods

The results are based on the so-called technical series of monthly average air temperatures at 267 climatological stations in the Czech Republic for the period 1961-2020, i.e. for the third (1961-1990) and fourth (1991-2020) normal periods. A more detailed description of the methods used and their outputs, is given by Štěpánek and Zahradníček (2008).

The assessment of the snow cover is based on daily measured values of its total height (in centimetres) according to the methodology for climatological stations of the Czech Hydrometeorological Institute. From these data, statistical characteristics were calculated, and

maps were drawn. Long-term changes in air temperature and average total snow cover height were expressed using regression lines.

Results

A statistical analysis of air temperatures from the above climatological stations in our area shows that, like the average annual air temperatures, the average air temperatures are also increasing in each season, albeit differently at each station. Our results show that winter air temperatures increase more in Bohemia than in Moravia.

There are also differences in air temperature rise between months in the same season. January is the most noticeable in winter. In this month temperatures rise fastest, almost as fast as in summer. In contrast, the rise is much slower in months of December and February. The faster rise in air temperature in January than in February has one interesting consequence. Usually, January is the coldest month of the year, but sometimes February is colder. December has rarely been colder than January, with no difference between the first and second half of the studied period.

From the conducted analysis of the daily total snow cover with respect to the length of the article, we present the assessment for the station Frenštát pod Radhoštěm (Fig. 1). The beginning of snowfall in this area is in November, which is the month with the lowest snow depth of the months evaluated. The snow cover is very variable in this month, with years with no snow at all or only about 1 centimetre (cm). Such a continuous period was the longest between 2014 and 2020. The maximum height was 15.5 cm in 1985. The continuous period with snow depths above 5 cm was from 1997 to 1999. In November, the trend is for a 1 cm decrease in snow cover height. Conditions for skiing have been consistently unfavourable since 2006.

The first month of winter, December, also does not always have snow for the whole period. If we take a snow depth of 5 cm as suitable for skiing, then two continuous periods were from 1980 to 1983 and 1989 to 1992 to 2020. The maximum height reached 30.6 cm in 1993. However, the downward trend in snow depth for the years 1961 to 2023 is 4 cm, the highest of any month. Unlike November, conditions for skiing have been acceptable in the last two years. January, the coldest month in the long term but also the richest in snow, does not show snow cover above 5 cm in all years. The maximum height was in 2006 with a value of 63 cm. The longest continuous period with snow depths above 5 cm was from 1965 to 1972. Since 2014, the snow depth has not reached 10 cm, only in three years has it exceeded 5 cm.

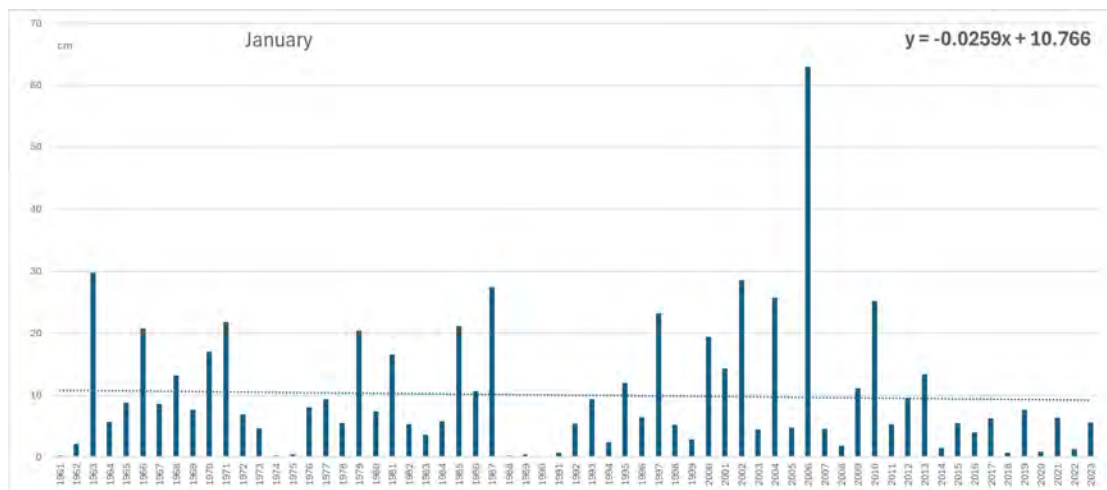
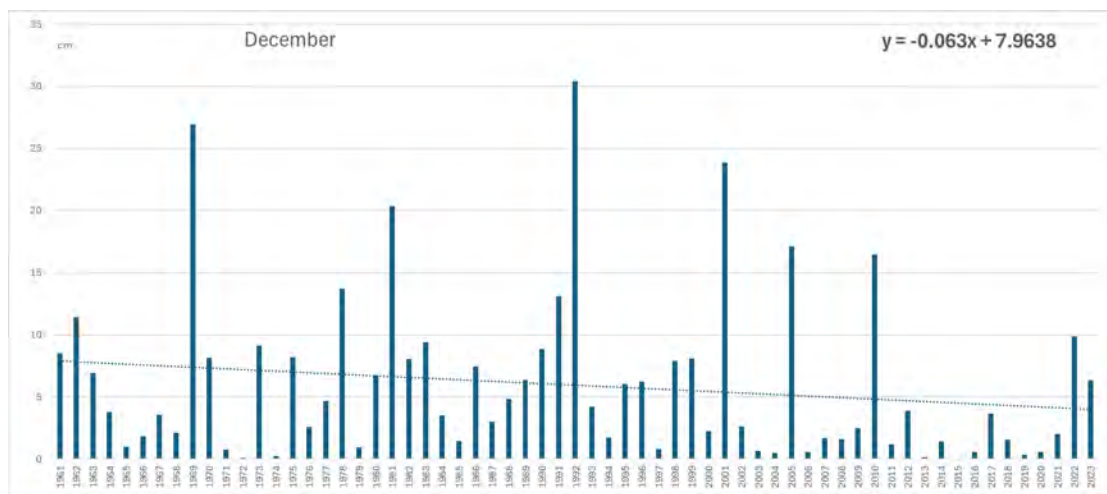
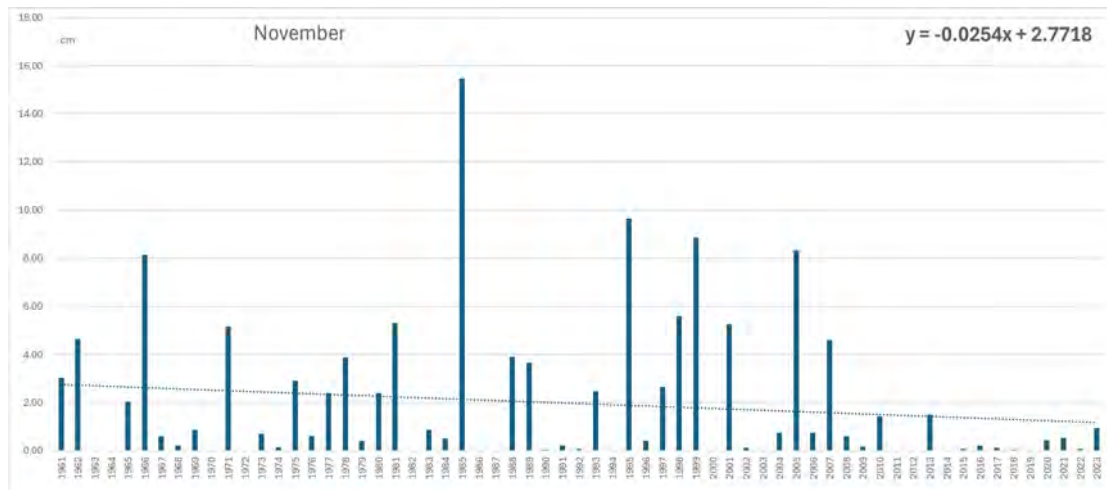
The final winter month of February also has years without snow cover above 5 cm and with higher variability than January. The longest continuous period was from 1983 to 1988. The maximum height was also 63 cm in January and in 1986. In terms of trend, February is identical to January. Since 2016, conditions were favourable for skiing only in 2021.

It is logical that the first spring month, March, will have less favourable conditions for skiing than the winter months. Only 15 years of the assessed period have a snow cover higher than 5 cm. Such a continuous period was from 2004 to 2006. This also had a relatively high maximum height of 36 cm compared to other years. However, since this year, conditions for skiing have not occurred. The downward trend is 2 cm, which, given the snow depth in March, represents unfavourable conditions for skiing.

Discussion

These results show that air temperature increases in winter, in Bohemia more than in Moravia. At the same time, it must be stressed that this is not an even increase, but there is a relatively high dynamics of air temperature, i.e. changes over a short period. Thus, extremely high temperatures are replaced by significant drops within two or three days. These results are consistent with published studies by other authors.

From the point of view of winter recreation, these air temperature dynamics have a negative impact. Higher air temperatures mean that the ice season is shorter, so skating on natural surfaces is shorter. However, higher temperatures also affect the snow cover. Compared to the published climatological evidence from the last century, there is a lower snow cover in winter, especially in the last decade. Although the length of its occurrence has not been assessed, it can be deduced that the favourable conditions for various forms of skiing have been shortening in recent years.



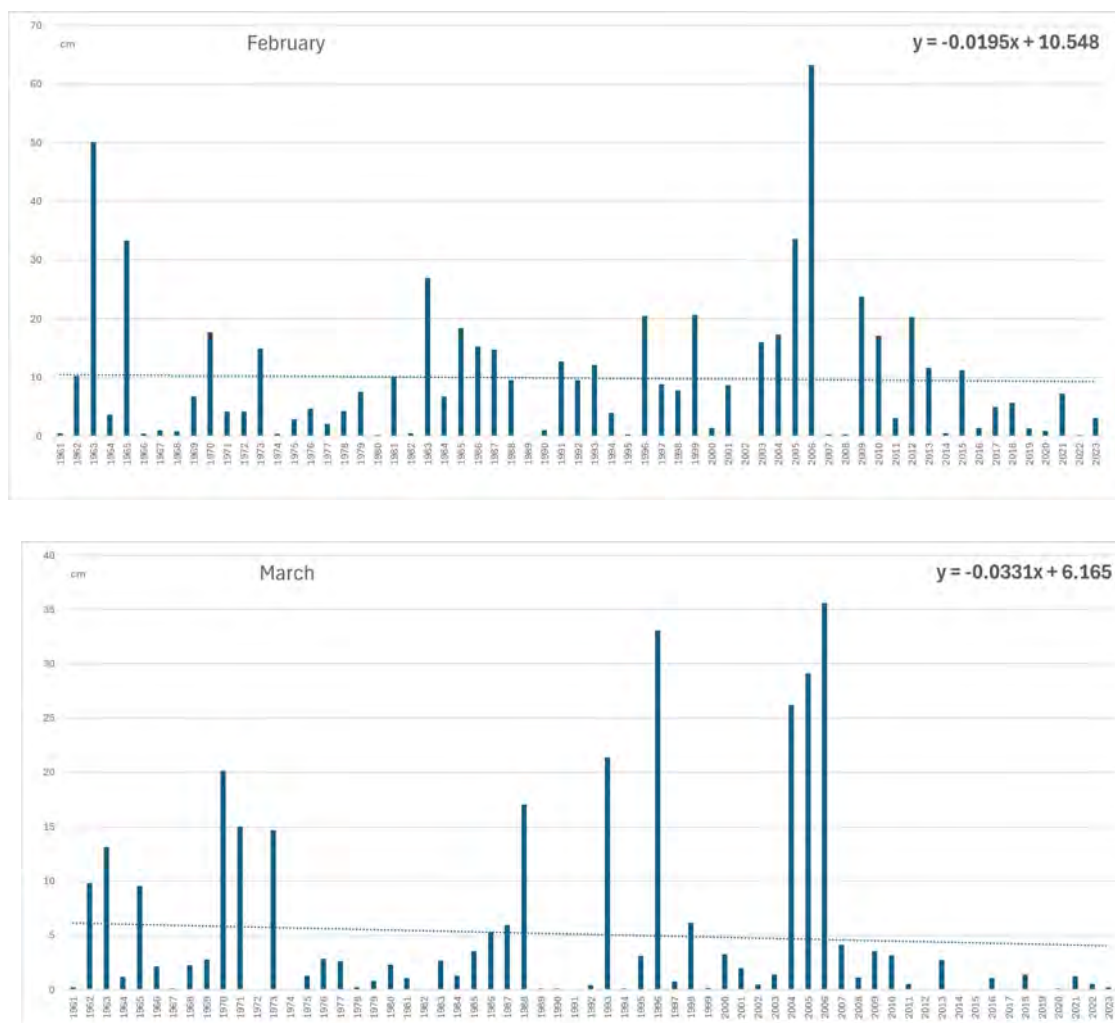


Fig. 1: Snow cover height (cm) and its trend in the months November to March for the period 1961 to 2023 at the climatological station of the Czech Hydrometeorological Institute Frenštát pod Radhoštěm

Conclusion

The air temperature in winter is demonstrably rising. This also affects the conditions for winter recreation. Overall, when we evaluate the snow cover at all stations assessed, we can conclude that it is highly variable between November and March for the years 1961 to 2023. In terms of trend, all months for these years show a decrease in snow cover. With a set threshold of 5 cm of snow as a condition for skiing, the beginning comes later, and the end comes earlier. Thus, the current climate trend also means a shortening of the ski season in our mountains. From the point of view of the outlook for winter sports, it must be stressed that it will be necessary to replace natural conditions with artificial ones to ensure them.

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Souhrn

Změna klimatu je nejvíce vyjadřována globálním oteplováním. Z naší analýzy teploty vzduchu za období 1961 až 2020 naměřené na klimatologických stanicích Českého hydrometeorologického ústavu vyplývá, že zimní teploty statisticky prokazatelně rostou. Tato skutečnost má dopad i na podmínky rekreace v chladném období, které jsme vyjádřili měsíci listopad až březen. Z hodnocení denní celkové výšky sněhové pokrývky na vybraných klimatologických stanicích v pohoří Beskyd, Jizerských hor a Šumavy vyplývá, že výskyt sněhové pokrývky byl za hodnocené období vždy proměnlivý s tím, že trend vyjadřuje její postupný pokles. Na mnoha místech v posledních letech nebyla dostatečně vysoká sněhová pokrývka potřebná pro lyžování. Díky postupnému oteplování se jeví, že přírodní podmínky pro lyžování bude nutné nahrazovat umělým zasněžováním.

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IMPLEMENTING MULTI-TEMPORAL CARTOGRAPHY INTO A GIS FOR ANALYZING RURAL LANDSCAPE AND PROTECTING FOREST HERITAGE

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Abstract

Understanding the profound changes generated by the interaction between human activities and natural components, requires an investigation of rural landscape, that would strongly benefit by the implementation of GIS technology. In this framework, a multi-temporal study may offer significant hints for analyzing landscape evolution on time. This paper presents a spatial analysis methodology, developed to comprehend past dynamics of rural landscape, including its morphology and vegetation, to compare current changes, so envisioning potential future trends for well-planned interventions, aimed to landscape protection. This method was applied on a case study implemented in Southern Italy, where an historical map depicting the Municipality of Ruoti - traditionally devoted to arboreal cultivation or wood-sheep farming - has been retrieved. This map, reports the Town and the surrounding area in the Year 1812, including the Site of Community Importance (SCI) “*Abetina di Ruoti*” woodland, showing main rivers, alternation of olive groves and arable crops, and vineyards layout. The multi-temporal analysis performed implementing into a GIS this historical cartography, joined to more recent maps, enabled a compared examination of this study area, its rural land and forestry heritage, and their deep transformations, showing a great potential for assessing and monitoring landscape diversity and vegetation dynamics.

Keywords: Rural Environment; Land use changes; Historical maps; Spatial analysis; Site of Community Importance.

Introduction

The analysis and the knowledge of the historical landscape development, ought to be a starting point for long-term landscape monitoring. The *landscape* should be understood as a dynamic and open system, where biophysical, social and economic factors interact among themselves, to define the current structure. The environmental changes occurred during the last decades, mainly caused by anthropic activities and changes in land use, have been dynamic, since they “evolved” considering human needs and the socio-economic conditions, also influenced by the natural forces and continuous interactions with the surrounding context. An accurate analysis of the performed variations and the global monitoring of all ecosystems, is necessary to propose suitable environmental protection politics (Statuto et al., 2013). A multitemporal land analysis, with the support of GIS and historical documents, may reveal as an important tool for monitoring landscape diversity, while analyzing changes in vegetation and landscape structure (Statuto et al., 2019a). The results of investigating historical developments primarily consist of quantitative/statistical information about land-use change which can, for instance, be used for the continuous monitoring of landscape transformation, or to assess forest biomass production along time.

This paper presents a local study on the land use evolution using historical and recent maps. It is aimed to analyze, in a specific way, the land use dynamics from 1812 to 2018, by a comparative examination of different historical cartographic supports and more recent maps (Liu et al., 2018). This approach, would enable to obtain conclusions about the rural landscape changes, their connection to human activities - agricultural production, in particular - as well as to natural events, and the consequences on the rural land. This analysis, by proposing a methodology supported in GIS tools to evaluate changes that make comparable maps from different dates and data sources, may enable policy decisions that support sustainable development, acknowledging present and future development trends and their potential economic, social, and ecological impacts. The technical and spatial analysis methodologies applied could so ensure proper land planning and management choices.

Material and methods

Study area

The study area (fig. 1) is represented by the entire Municipality of "Ruoti" (55 km²) located in the central-western part of the Province of Potenza (Basilicata Region - Southern Italy). The territory has a considerable morphological variability, with the presence of soils of different age. This area is characterized by an hilly territory, the elevation being in the range 400 - 1000 m a.s.l.



Fig. 1: Study area

The study area is crossed by the most important rivers present in this territory, i.e.: the "*Fiumara di Avigliano*" stream - which bounds it in the south – and the "*Fiumara di Ruoti*" stream. Both of these two waterways are part of the hydrographic basin of the main river "*Sele*". The geomorphological survey, however, has shown the presence along the slopes of several landslides. The study area is predominantly occupied by agricultural land (37%), forest and semi-natural areas (61%) and artificial surfaces (2%). The high-hilly landscape of the study area is characterized by an arable land, present especially on the hills, while wide pastures and vineyards cover the northern area. The mountains are covered with rich woods, consisting mainly in underwood and fir-wood, with some pieces of "*Abies Alba*" (a biotope surveyed by Italian Botanical Society).

Site of Community Importance (SCI) "Abetina di Ruoti"

The importance of this site is due to the presence of relict populations of white spruce, of considerable importance in terms of germplasm conservation. As early as 1971, the Italian Botanical Society censused the "*Abies Alba*" as a biotope of relevant vegetation and conservation interest, due to the presence in the area of nuclei of native white spruce. The Abetina di Ruoti (fig. 2) is a forest that was described as "an almost pure forest of *Abies alba*, rich in magnificent and colossal specimens" (Basilicata Region, "Rete Natura 2000"). The undergrowth is rich in shrub and herbaceous species, including some rare and endemic species.

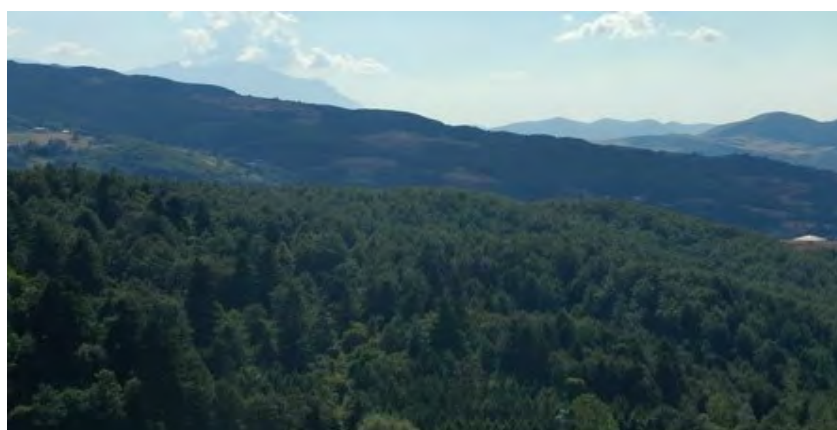


Fig. 2: Abetina di Ruoti

Cartography and data analysis

Land use changes in the study area were examined in two time periods: years 1812 and 2018. The historical information, dated 1812, derived from an historical map (fig. 3) preserved in the "Archivio di Stato" (State Archives) in Potenza.



Fig. 3: Historical cartographic map (year 1812)

The historical map was geo-referenced through a sequence of rectification and referencing procedures, with control points on the map at known locations. Thanks to the different symbology present on the map, it has been possible to identify the various types of land use. The different categories of land use in the study area were calculated for the two analyzed periods.

Results and Discussion

For each considered time period, and taking into account the different base maps above, various categories of land use were identified, considering the symbols present on the historical map and from recent orthophotos, that are able to display the current ground features. For the different categories of land use, using the GIS function, the total area expressed in hectares (ha) and the percentage (%) of the study area have been calculated. Their variation over more than two centuries was also determined.

The results of the territorial analysis are reported in Table 1, that represents, for each data and for each different cartographic support, the landscape use; the comparison has enabled the analysis of land changes from 1812 to present days, covering a time period of more than 200 years, giving information about the historic persistence of soil use typologies, along with their time-driven modifications. Dominant land use typologies of the site have been grouped, in order to better compare the output data, through a more evident highlighting of variations in time (fig. 4).

From the analysis of land-use evolution it can be noticed how, during the investigated time span of more than two centuries, the land use for agricultural production has progressively decreased (from 40.26% to 36.87%), to the benefit of the natural areas, that have in the meantime expanded (from 12.53% to 17.03%), occupying most of the area lost by the former. This phenomenon was probably due to the constant increase of agricultural mechanization and diffusion of chemical products into intensive agriculture. Also forest area surface has increased, with an important impact on the local forest heritage.

Tab. 1: Analysis of land use in the two different years

Land Use Categories	Years		1812		2018	
			ha	%	ha	%
Urban fabric (continuous/discontinuous)			84,66	1,54	90,47	1,64
Agricultural area			2215,83	40,26	2029,22	36,87
Forest			2308,08	41,94	2428,64	44,13
Pastures and natural land			689,74	12,53	937,09	17,03
Fluvial zone			205,18	3,73	18,07	0,33
			5503,49	100	5503,49	100

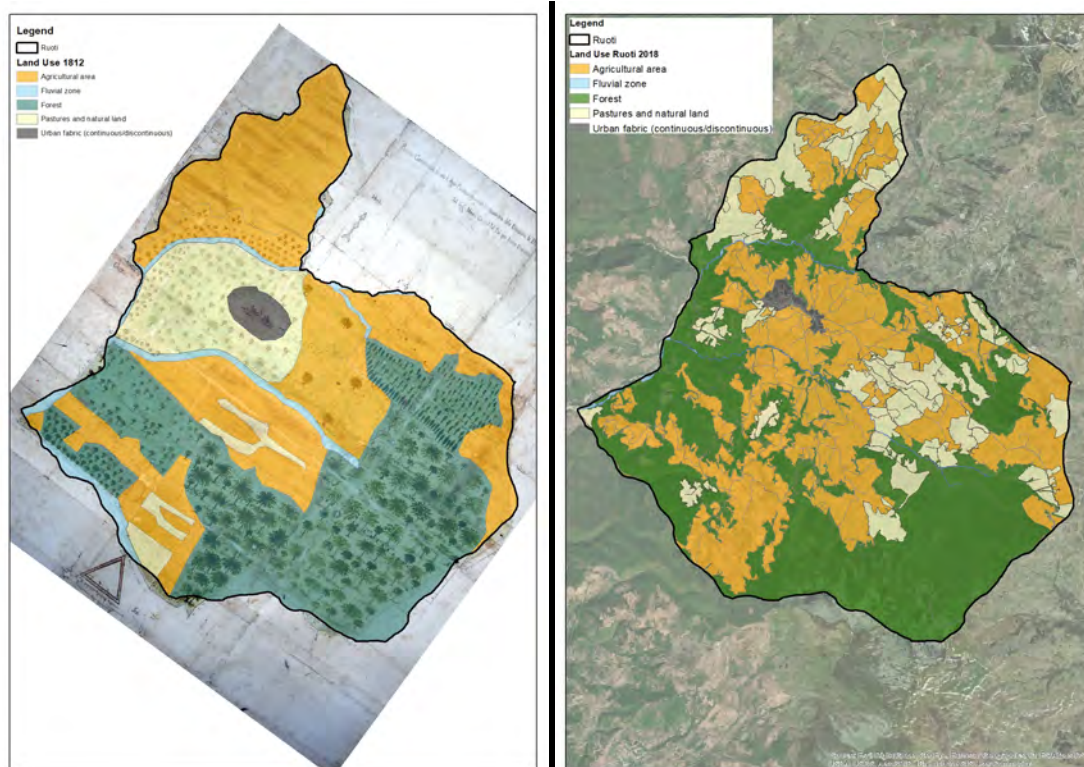


Fig. 4: Land Use categories in different time periods

Conclusion

The role of territorial analysis is extremely important and delicate, to pave the way for proper planning activities. The understanding of the landscape's evolution over the years, both in morphological and vegetation terms, considering the special interest of the local forest heritage, represents a highly valuable database usable by public decision makers in the normal processes of making economic and political choices to govern rural landscape. The spatial analysis that was conducted, enables to assess relationships between forest biomass – with its relevant renewable energy potentials – and rural land, by using GIS technologies. This approach, allows to understand the landscape dynamics of the past, current developments and possible future trends, so as to optimize biomass resources and bridge the gap between energy systems modeling and landscape planning. It results to the concept of "*Energyscape*", as a virtual point for an interdisciplinary analysis, focusing on optimal exploitation of the energy potential and landscape protection (Statuto et al., 2019b). Similar information should be adequately considered to help addressing the need for suitable development policies and appropriate land management planning, aimed to protect forest heritage and rural landscape.

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Souhrn

Lidská činnost vedla ke změnám souvisejícím se změnami ve využívání půdy v zemědělských a lesnických oblastech a na venkově. Změny sociálních a ekonomických podmínek, ke kterým došlo v průběhu minulého století, způsobily významné změny ve venkovské krajině s různými dopady na životní prostředí. Porozumět těmto změnám je nyní snadnější díky novým nástrojům a technologiím. Územní analýza ukazuje s podporou geografického informačního systému (GIS) a historických map dynamiku využití půdy, k níž došlo v průběhu let, aby bylo možné vyhodnotit důsledky proměn půdy na venkovské prostředí a krajinu. Studovaná oblast, která se nachází v regionu Basilicata (jižní Itálie), odráží společnou dynamiku přítomnou v mnoha venkovských oblastech jižní Itálie. Pro správné vyhodnocení je důležité dát dopady do souvislosti s půdou, dynamikou využívání půdy a socioekonomickými podmínkami oblasti. To je možné díky metodikám GIS, které jsou schopny vytvářet specifické modely pro studované oblasti a umožňují implementaci historických modelů pro kvantitativní a kvalitativní studie, což umožňuje pochopit vývoj krajiny a venkovské půdy. Mimořádné vlastnosti zobrazení, které tyto moderní informační technologie nabízejí, zvyšují vnímání studovaných oblastí a zlepšují informační aspekty a možnosti vizuální simulace vývoje využití půdy. Zvláštní pozornost je třeba věnovat managementu využití půdy a zemědělské činnosti, protože mohou ovlivnit některé přírodní cykly ekosystémů a kvalitu lesa.

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INFLUENCE OF UNDERGROUND WATER CHANGES ON STRUCTURE AND QUALITY OF VEGETATION

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Abstract

Among the main ecological factors of soft floodplain forests are regular flooding with surface water lasting several days. Changes in groundwater levels and the transport capabilities of watercourses can cause the decline of soft floodplain forest trees and the gradual transition to communities of hardwood floodplain forest. In the event of changes in water supply occurring over a short period of time, there is a significant increase in the risk of spreading non-native invasive plant species. The aim of the study was to determine the impact of the transport capacity of the Hron River watercourse on the habitats of Willow-Poplar lowland floodplain forests and Oak-Ash-Elm lowland floodplain forests in the study area. Field surveys and data collection were conducted in selected sections of the Hron River near the villages of Pohronský Ruskov and Čata in southern Slovakia. The results indicate that the tree layer consists of individuals of *Salix alba* L. and *Populus* sp. The understory is almost 80 % composed of the invasive species *Negundo aceroides* Moench., which aggressively displaces remnants of original habitats. Considering the age of the oldest individuals, we assume that the changes in habitats began 40-50 years ago. Young individuals of *Salix* sp. and *Populus* sp. are missing in the stand. Similarly, species typical of hardwood floodplain forest communities are absent. It follows that the floodplain forest at the study site is very species-poor, which may have an extremely negative impact on the ecosystem services provided by the forest.

Keywords: invasive plants, forest ecosystem services, river bed, biotope

Introduction

Human beings live in an environment on which they are fully dependent. The concept of ecosystem services as benefits of ecosystems has its roots in efforts to identify the significance of nature for human life and human society (Eliáš, 2010). Knowledge about vegetation, which plays a significant role in maintaining or restoring the 'biological balance of the landscape,' began to be applied in the preparation of landscape biological plans. Forests are among the most significant landscape-ecological stabilization elements. The interest in utilizing all functions of the forest led to their detailed categorization and evaluation, quantification of functions, and development of methodologies for their valuation (Papánek, 1978). Anthropogenic activity is associated with damaging original ecosystems and their colonization by invasive species. Many studies describe the impact of human activity on the alteration of original ecosystems (Vasekova & Stefunkova, 2019; Vasekova, 2019; Rendeková et al., 2019; Pauková, 2019). Invasive plants are characterized by high regenerative potential and negative impact on populations of our native species and habitats. They are often perennial species with vegetative propagation and regenerative ability. The occurrence of these plant taxa in a given locality is not natural, and their presence outside their natural habitat is most commonly caused by anthropogenic activities (Vasekova, 2019). A decrease in groundwater level leads to changes in ecosystems and possible replacement by invasive plants (Ponomareva et al., 2021). Among the main ecological factors of soft floodplain forests are regular flooding by surface, slowly flowing water for several days, or occasionally weeks several times during the growing season, as well as increased groundwater levels (Eliáš, 2010). Regulation of watercourses and drainage prevents regular flooding of the original floodplain forest, thereby weakening its health status and improving conditions for the spread of non-native species. The aim of this study was to determine the impact of the Hron River's transport capacity on floodplain forest habitats in the

study area. The paper also focused on the occurrence of invasive woody plants and their impact on riparian vegetation.

Materials and methods

According to the regional geomorphological classification of Slovakia, the area of interest and its wider surroundings belong to the region of the Danubian Lowland, the Podunajská Hills unit, the Hronská Hills subunit, the Hronská Floodplain, and the Ipeľ Hills (Minár & Machová, 2010). Geographically, the evaluated area is located on the lower course of the Hron River, at river kilometer 23.500, between the municipalities of Čata and Pohronský Ruskov, cadastral area of Čata, district of Levice, Nitra region (47°57'55.3"N 18°39'52.9"E) (Fig. 1). The Hron River is characterized by meanders with the formation of local shoals, deep pools mainly in concave bends, random gravel deposits – locally extensive, which change in response to sudden and steep changes in water flow in the river. The groundwater level fluctuates depending on the state of the Hron River and the intensity of precipitation. In most of the area it is at depths of about 3.5- 4 m. As a result of the modifications of the river in previous periods, which ultimately led to the straightening of the river and its acceleration at higher flows, the Hron River has deepened by 0.5- 1.8 m. As a consequence, the groundwater level in the vicinity of the river has dropped, which has also had an impact on the plant communities occurring in the riparian zone (Pikus, 2011).



Fig. 1: Location of study area in Slovakia (red dot- study area, red line- original bank 50- 70 years ago, green area- assessed area)

The area in question is classified as a first-degree protected area according to Act No. 543/2002 Coll. on Nature and Landscape Protection, as amended (hereinafter referred to as the "Act") (§ 11 and § 12). The area in question is not included in the national list of protected bird areas or in areas of European significance. Field surveys were conducted during the growing season. The boundaries of the area of interest were established and based on the terrain features it was divided into smaller area units. During the assessment, the occurrence of individual species and their abundance in the stand were recorded. Species identification was carried out directly on site using identification keys. Taxon nomenclature followed Marhold (1998). The occurrence of individual species was recorded in tables using Microsoft Excel software. The obtained dataset was further evaluated, and dominant species representation was determined.

Results

The results of the field survey of flora revealed the presence of heterogeneous communities of trees in the vicinity, which are differentiated in terms of age, vertical, and partially horizontal distribution. The age composition of trees in the inner part of the meander clearly indicates the eastward shift of the river. Old tree specimens form linear features in the shape of arcs,

indicating that they formerly constituted riparian stands. With increasing distance from the river, tree specimens are older. Within approximately 100 meters from the current riverbank, the stand is predominantly composed of representatives of the genus *Salix* sp. The tree vegetation is almost exclusively comprised of individuals of *Salix alba* L. Due to the unstable substrate, most trees are unstable, and the angle of their trunks with the terrain plane ranges from 50 to 70°. The understory in this area is predominantly composed of *Negundo aceroides* Moench., constituting about 80 %, along with approximately 28 % of *Sambucus nigra* L., and *Salix* sp., with very few individuals of *Euonymus europaeus* L., *Robinia pseudoacacia* L., and *Prunus avium* L. Occasionally, shoots of *Acer campestre* L. were observed. The lower herbaceous layer is almost continuously covered by *Urtica dioica* L., with a mixture of *Humulus lupulus* L., *Rubus caesius*, *Solidago canadensis*, and the spreading invasive plant *Fallopia japonica* Houtt. Additionally, we observed old specimens of *Populus* sp., which, according to the inclination of their trunks towards the river, evidently formed riparian stands. The estimated age of these poplars is approximately 60- 70 years. From this, it can be inferred that the river shifted in the furthest part of the meander by almost 120 meters eastward during the given period. Furthermore, the area is surrounded by a tree stand almost exclusively comprised of senescent individuals of *Populus* sp. Identifying the species of the *Populus* genus is not straightforward, as they are overaged individuals with reduced vitality and health condition. It is most likely euro-American technical hybrids of poplars, as almost 95 % of floodplain forests in the vicinity of larger rivers have been replaced by these fast-growing individuals since 1950. The fact that the forest stand is species-poor is concerning. Young specimens of *Salix* sp. and *Populus* sp. are found only on unstable gravel bars near the watercourse. However, they are absent in the stand. Similarly, there is a lack of more significant representation of indigenous species characteristic of this habitat, such as *Fraxinus excelsior* L., *Ulmus laevis* Pall., species of the genus *Quercus* sp. and *Alnus glutinosa* L., or *Populus alba* L. and *Populus nigra* L. As a result, the floodplain forest in this area is species-poor. It suffers from the spread of invasive species, which displace indigenous trees typical for this region. Old specimens of dying poplars are mere relics of the original floodplain forests that were once found here, and new shoots of poplars have almost disappeared from the stand. In this area, invasive species *Negundo aceroides* and *Fallopia japonica* are spreading uncontrollably. These invasive species are not native, have few natural pests, and aggressively outcompete indigenous species from their original habitats.

Discussion

Analyses of fauna in Slovakia, in areas influenced by human activity, have recorded a significant occurrence of invasive species taxa (Rendeková, Mičieta & Randáková, 2020; Vaverková et al., 2019). Plants from the genus *Solidago* can have a serious impact on the ecosystems they inhabit. Results have revealed that the invasion of *S. gigantea* has significantly altered several soil properties and is associated with various soil characteristics. Soil acidity has increased, while the content of organic carbon and moisture has decreased (Bobuľská et al., 2019). Vasekova et al. (2019) focused on the riparian occurrence of invasive plants and their negative impact on native ecosystems in Slovakia. The authors recorded the presence of *Fallopia japonica*, leading to a loss of natural vegetation in the vicinity. Rendeková & Mičieta (2017) demonstrated a decline in archaeophytes due to urbanization. Pauková et al. (2018) documented the occurrence of the invasive tree *Negundo aceroides* in floodplain forests in Bratislava (Slovakia). According to Hrivnák et al. (2019), increased invasiveness and the spread of alien species into new habitats can be expected due to climate change and intensified land use. Medvecká et al. (2018) investigated the impact of invasive species on forest ecosystems used for logging. They found that these forests are more sensitive to the occurrence of invasive species compared to forests where logging does not take place. Our survey demonstrated the negative impact of anthropogenic changes in the Hron River watercourse on floodplain forest habitats in the studied area. The aforementioned studies also indicated the negative impact of anthropogenic activities on forest ecosystems, leading to the spread of invasive plants. The spread of invasive species can negatively affect ecosystem services, making it important to pay attention to this issue.

Conclusion

Regulatory interventions on the watercourse of the Hron River have increased the longitudinal slope and the transport capacity of the flow, leading to incision of the riverbed and a decrease in

surface groundwater levels. The decline in groundwater levels results in the decline of floodplain forests and their replacement. Our survey highlighted the fact that the studied forest stand is species-poor. There is also a lack of more significant representation of indigenous species characteristic of this habitat. Furthermore, the habitat suffers from the spread of invasive species, which displaces indigenous trees typical for this region. In the studied area, invasive species such as *Negundo aceroides* and *Fallopia japonica* are spreading uncontrollably. These invasive species are not native, have few natural pests, and aggressively outcompete indigenous species from their original habitats. The presented study can provide information on the impact of regulatory mechanisms on watercourses on native floodplain forests and their replacement by invasive species, which can have an extremely negative impact on forest ecosystem services.

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Souhrn

Mezi hlavní ekologické faktory měkkých lužních lesů patří pravidelné několikadenní záplavy povrchovou vodou. Změny hladiny podzemní vody a transportní schopnosti vodních toků mohou způsobit úbytek dřevin měkkého lužního lesa a postupný přechod ke společenstvům tvrdého lužního lesa. V případě změn v zásobování vodou, ke kterým dochází v krátkém časovém období, se výrazně zvyšuje riziko šíření nepůvodních invazních druhů rostlin. Cílem studie bylo zjistit vliv transportní kapacity vodního toku Hron na stanoviště lužních lesů studovaném území. Terénní průzkum a sběr dat byl proveden na vybraných úsecích řeky Hron u obcí Pohronský Ruskov a Čata na jižním Slovensku. Výsledky ukazují, že stromové patro tvoří jedinci *Salix alba* L. a *Populus* sp. Podrost je téměř z 80 % tvořen invazním druhem *Negundo aceroides* Moench. který agresivně vytlačuje zbytky původních stanovišť. Vzhledem ke stáří nejstarších jedinců předpokládáme, že změny stanovišť začaly před 40- 50 lety. Mladí jedinci *Salix* sp. a *Populus* sp. v porostu chybí. Stejně tak chybí druhy typické pro společenstva tvrdých lužních lesů. Z toho vyplývá, že lužní les na studované lokalitě je druhově velmi chudý, což může mít mimořádně negativní dopad na ekosystémové služby, které les poskytuje. Námi provedený průzkum prokázal negativní vliv antropogenní změny vodního toku řeky Hron na stanoviště lužních lesů ve zkoumané oblasti. Šíření invazních druhů může negativně ovlivnit ekosystémové služby, proto je důležité věnovat této problematice pozornost.

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LANDSCAPE ARCHETYPES – AN OPPORTUNITY FOR SUSTAINABLE RURAL TOURISM

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Abstract

Landscape archetypes represent the historical and current state of the landscape structure, reflecting the socio-economic influences of man in the context of the natural conditions in the territory. The basic feature of archetypes is the dynamics of the formation of the landscape elements spatial arrangement based on the limits of the natural components' properties – georelief, geological structure or hydrological regime of the territory. Archetypes have potential for the development of sustainable forms of tourism – natural and rural tourism (so-called green tourism). Such are also the archetypes in the Nitra self-governing region – 6 rural municipalities representing 3 types of archetypes – the villages of Čajkov and Rybník, Brhlovce and Bory (all Levice district), Vlčany and Neded (Šaľa district). Green tourism mainly focuses learning about local communities, natural and cultural-historical attractions. Its basis is a low number of tourists with an individual program, the locations belong to economically less developed regions with support of traditional local products. Archetypes combine the possibilities of optimal land use and direct improvement of nature protection, biodiversity and landscape through programs and products supporting and increasing environmental awareness.

Keywords: Green tourism. Local communities. Nature and landscape protection

Introduction

According to the World Tourism Organization (UNWTO), sustainable tourism fully considers its current and future economic, social and environmental impacts, solutions to the needs of visitors, economic sectors, the environment and the local population. The result of the infiltration of sustainable principles into the tourism industry is the vision of the so-called sustainable (ST) or responsible tourism. ST represents a new management approach in which all needs (economic, social, cultural and environmental) are fulfilled while maintaining cultural integrity, ecological processes, social and biological diversity. With consistent management, it can be more able than other economic sectors to create a synergistic connection with the economy, country, society and its culture (Dubská 2010). In general, all forms and types of ST are considered green tourism. Its synonym is also ecologically friendly tourism or ecotourism. Rural tourism is probably its most developed form (Závodná 2015).

The essence of the development of tourism in the countryside is the return of man to nature and the deviation from mass tourism to its individual forms. It includes activities related to agrotourism and ecoagrotourism, forest tourism, ecotourism, wine tourism and gastrotourism.

Landscape archetypes are integral, synthetic spatial structures representing territories, which with their physiognomy (texture, regularity of patterns of elements in the structure and their arrangement) reflect a close relationship between the land use and natural conditions. The determining factor for their formation is the georelief and its attributes; it is also a relevant criterion for the categorization of archetypes (its genesis and subsequent landscape-forming processes). The concept of landscape archetypes is a fairly widely understood approach to the landscape regionalization, which prefers horizontal, or horizontal-vertical relations between the elements of the secondary landscape structure with their subsequent interpretation (Hreško, Petluš et al. 2015). Landscape archetypes have potential for the development of sustainable forms of tourism, especially natural and rural tourism (so-called green tourism). 6 municipalities (3 different types of archetypes) in the Nitra self-governing region also have this potential.

The aim of the paper is to evaluate the potential of selected landscape archetypes for the development of rural tourism.

Materials and methods

The model territories belong to the Nitra self-governing region, Čajkov, Rybník, Brhlovce and Bory municipalities belong to the Levice district (Tekovský tourism region), Neded and Vlčany

municipalities belong to the Šaľa district (Nitriansky tourism region). They represent rural villages with an agricultural tradition. As of 1 January 2022, the municipalities had the following population: Čajkov – 936 (area 2394 ha), Rybník – 1404 (area 2469 ha), Brhlovce – 297 (area 1339 ha), Bory – 320 (area 881 ha), Kľačany – 3175 (area 3976 ha) a Neded – 3178 (area 3601 ha) (<https://www.e-obce.sk/okres/levice.html>); <https://www.e-obce.sk/okres/sala.html>).

The spatial definition of landscape archetypes represents a system of regionalization "from above", it is based on the analysis and interpretation of the attributes of the secondary landscape structure (forests, permanent grasslands, fields, rocks and subsoil, water and technical elements) (Hreško, Mišovičová 2018; Ružička, Mišovičová 2013). This method is based on the interpretation of aerial photographs and subsequent processing in a GIS environment (Hreško, Kanásová, Petrovič 2010). Model archetypes are categorized according to landscape types in terms of representative geoecosystems REPGES (Miklós, Izakovičová et al. 2006) and by functional country types. In terms of geomorphological maps (Mazúr, Činčura, Kvitkovič 2000), they are defined as follows, based on the types of erosion-denudation relief of Slovakia: Čajkov and Rybník – archetype of undulated plains and uplands Brhlovce and Bory – archetype of lowland hill lands, Vlčany a Neded – the archetype of the fluvial lowlands.

To assess the spatial structure, identify natural and cultural attractions, an analysis of the secondary landscape structure was used in the sense of the LANDEP methodology (Ružička, Miklós 1982) based on an orthophoto map from 2017 (© EUROSENSE, Ltd. and GEODIS SLOVAKIA, Ltd.), which was interpreted and subsequently processed in the GIS environment using QGIS and ArcGIS programs.

The development factors of sustainable forms of tourism were used to determine the potential of archetypes for the development of rural tourism (Tab. 1), adjusted and modified for our model archetypes. The factors were classified into 4 categories – natural, cultural-historical, socioeconomic and infrastructural.

For the assessment of the current use of the potential for tourism, a point assessment in the range of 0 to 3 (0 – no indicator, 3 – high value) was used for rural tourism activities (Tab. 2) according to a simple key: 0 – absence of activity, 1 – potential occurrence without realization; 2 – occasional occurrence of activity per year; 3 – regular occurrence of activities per year. After adding up the points, the municipalities were ranked from the most to the least utilized potential at the present. The overview of activities in the municipalities was obtained mainly from their strategic development documents and websites. For forms of rural tourism (Tab. 3), their occurrence (+) or absence (-) was recorded in the table.

Results

The villages of Čajkov and Rybník represent the archetype of the vineyard landscape at the southern foot of the Štiavnické hills (declared a protected landscape area), with a rich wine-growing tradition, they belong to the civic association Tekov – Hont. They have a precisely prepared Program of Economic and Social Development for the years 2023–2029 (Vargová, Seneši 2023; Višňová, Smadišová, Šrámek 2023) with an emphasis on sustainable development. These archetypes belong to "čilejkár's" villages where the traditional Tekov folk costume is still worn, and the soft Central Slovak dialect is spoken (Vargová, Nichtová et al. 2014). In these villages, various events related to viticulture are regularly organized throughout the year (e.g. wine-harvesting festivals, regional wine tastings, carnival celebrations, Open Cellars Day), traditions are preserved, and services related to rural tourism are provided. In the Čajkov village there are active 9 associations (382 members in total) (Vargová, Seneši, 2023). To this day, the women of Čajkov village master the art of complex production of richly decorated folk costumes and make folk costumed dolls (<https://www.obeccajkov.sk>). In the Rybník village, there are actively working 9 organizations and associations (428 members in total) and to support the development of rural tourism, they are planning to create a wine route and a farmer's market (Višňová, Smadišová, Šrámek 2023).

The villages of Brhlovce and Bory are also vineyards, they represent an archetype with a dendritic pattern of landscape layout, they also belong to the civic association Tekov – Hont. They have elaborated Development Programs – Bory for the period 2016–2024 (Kolektív 2015) and Brhlovce for the period 2015–2024 (Kolektív 2014) oriented towards the support of rural tourism. In these villages there operate the associations, and various events are organized throughout the year. In terms of development activities, the municipality of Brhlovce has planned the restoration of an educational trail, the construction of bicycle and horse trails, the

implementation of local markets and the construction of local quality brands with the support of sales from the yard (Kolektív 2014). Since 2018, a lavender farm has been operating in the village (<https://levandulabrhlovce.eu/>). The municipality of Bory states in its Document that it has great potential for the tourism development, but this potential is not sufficiently utilized due to the absence of a material and technical base for the development of rural tourism and agrotourism (Kolektív 2015).

Tab. 1: Development Factors of Sustainable Rural Tourism

Development Factors of Rural Tourism	
Natural	
1.	Natural conditions and suitable climatic natural environment
2.	Landscape and soil with a predominance of agriculture, food production and forestry
3.	Without losing the characteristic atmosphere, calmness, silence, peace
4.	The presence of natural elements and phenomena
Cultural – historical	
5.	Getting to know local communities, culture - customs, traditions, gastronomic activities, events
6.	Cultural, religious, historical monuments
Socioeconomic	
7.	An economically backward region, or self-government
8.	Traditional social structure and lifestyle
9.	Support of traditional local products
10.	Part of the income is intended for the nature protection and cultural resources
11.	Creation of development strategies – in general, tourism development
12.	Increasing cultural and ecological awareness
13.	Support for the preservation of natural and cultural values
14.	Nature protection
Infrastructural	
15.	Services are provided by the local community
16.	Without a permanent ecological footprint
17.	Low population density, without mass participation of tourists

Processed by: <https://prirodnaturizmus.sk/#1556010322520-aab92f02-b00b>

The municipalities of Vičany and Neded represent the specific landscape archetype of fluvial lowlands with minimal forest cover. Even after the Váh flow was straightened, the process of urbanization continued along the outer perimeter of the junction of the river branches, respecting the historical function of the river branch. At present, both villages form one urbanized unit, they belong to the local action group Dolné Považie. They have prepared the documents Program of Economic and Social Development – Vičany for the years 2024–2030 with a view to 2035 (Kolektív 2023) and Neded for the years 2016–2020 (Jancsó et al. 2015), extended until 31.12.2022. The development activities of the villages are oriented towards the support of tourism and are located on the Váh River and its oxbow, e.g. construction of cycle paths and routes, recreation area by the Váh River and at the oxbow with accommodation, revitalization of the oxbow, construction of a thermal swimming pool, or wellness centre (Kolektív 2023). Both municipalities belong to a linguistically mixed territory with common history of the two nations of Slovaks and Hungarians, which is reflected in the cultural area, customs and traditions (Jancsó et al. 2016). Activities in the villages are implemented mainly through the local branches of Matica slovenská and Csemadok.

By the activities assessment in the municipalities, Rybník and Čajkov are currently the most active in rural tourism, while Bory uses its potential for rural tourism the least (Tab. 2).

Forms of rural tourism (Tab. 3) as cultural, cycling and gastrotourism are represented at the same level in the municipalities, only rural tourism is represented in green tourism (due to the absence of a private accommodation offer). There is a complete lack of farming and eco-agrotourism, Scandinavian and cottage tourism.

Discussion and conclusion

Based on the natural conditions, the selected villages represent different locations for the development of rural tourism activities – foothill forested and lowland without forests which are also attractive for rural tourism. In all villages, the possibility of agritourism and therefore spending active rest on a farm is absent, horse riding is only available in one village. Also, the quality and nature of our streams do not allow their use for wading and sailing, with the exception of the Váh River in the villages of Neded and Vlčany.

The European Commission has issued an Agenda for sustainable and competitive European tourism. UNWTO promotes sustainable principles in the document Global Code of Ethics for Tourism (Dubská 2010).

All model villages state in their development documents that the main reasons for their lack of development (and therefore rural tourism) is economic caused mainly by the trend of population aging and population decline, number of job opportunities that do not cover the capacities of the economically active population, the lack of funds for the economy development, and the low level of support for cities and municipalities from the state, or transfer of state competences to municipalities without financial coverage. This is accompanied by insufficient infrastructure and support from local governments and the region.

Tab. 2: Activities of rural tourism

Activity of Rural Tourism	A	B	C	D	E	F
Rural hiking	3	3	3	2	3	2
Bicycle tourism	3	3	3	2	3	3
Horse riding, carriage transport	3	0	0	0	0	0
Hunting	2	2	2	0	3	3
Fishing	2	2	2	0	3	3
Cruising on rivers, wading in streams and torrents	0	2	0	0	3	3
Crafts, customs, folklore – learning about rural life and participating in events and fairs	3	3	3	3	3	3
Gastrotourism, visiting local markets and fairs	3	3	3	2	2	3
Outdoor picnics	3	3	3	2	3	3
Collecting wild berries, mushrooms and medicinal herbs	3	3	3	3	0	0
Agrotourism – on the farm – active rest, participation in typical farm work	1	1	1	1	0	0
Walk in the vineyards and wine tasting	3	3	3	0	0	2
Eco-agrotourism – on eco-farms, farms with alternative agriculture	0	0	0	0	0	0
Apiculture	0	3	2	0	0	0
Cottagers – living and working in cottages, log cabins	5	0	0	0	0	0
Relaxation in natural thermal and mineral waters	0	2	0	0	1	0
Getting to know folk architecture, historical monuments (UNESCO)	0	2	3	2	0	0
Visiting sacred objects	2	2	2	2	2	3
Total	36	37	33	19	26	28

Processed by: (<https://prirodnaturizmus.sk/#1556015920535-c0dc937b-7cfc>)

A – Čajkov B – Rybník C – Brhlovce D – Bory E – Vlčany F – Neded

Tab. 3: Forms of Rural Tourism in Model Archetypes

Form of Rural Tourism	A	B	C	D	E	F
green (low-capacity accommodation in the region, rural tourism)	+	+	+	+	+	+
ecological (nature, protected areas)	+	+	+	+	+	+
farm (agrotourism)	-	-	-	-	-	-
eco-agrotourism (farms with alternative agriculture)	-	-	-	-	-	-
gourmet and gastronomic	+	+	+	+	+	+
bicycle hiking	+	+	+	+	+	+
hippo tourism	+	-	-	-	-	-
Scandinavian (accommodation rental without additional services)	-	-	-	-	-	-
second residence in the countryside (cottage)	+	-	-	-	-	-
cultural (learning about history, culture, traditions, customs)	+	+	+	+	+	+

Source: Jarábková et al. 2021

A – Čajkov B – Rybník C – Brhlovce D – Bory E – Vlčany F – Neded

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Souhrn

Pronikání principů udržitelného rozvoje do cestovního ruchu vyústilo ve vizi udržitelného (ST) nebo odpovědného cestovního ruchu. Venkovský cestovní ruch je pravděpodobně jeho nejrozvinutější formou (Závodná 2015). Zahrnuje aktivity spojené s agroturistikou a ekoturistikou, lesní turistikou, ekoturistikou, vinařskou turistikou a gastroturistikou. Krajinné archetypy jsou ucelené, syntetické prostorové struktury představující území, které svou fyziognomií (strukturou, pravidelností vzorců prvků ve struktuře a jejich uspořádáním) odrážejí úzký vztah mezi způsobem využití území a přírodními podmínkami. Krajinné archetypy mají potenciál pro rozvoj udržitelných forem cestovního ruchu, zejména přírodního a venkovského cestovního ruchu (zelený cestovní ruch). Takové jsou i archetypy v Nitranském samosprávném kraji - 6 obcí reprezentujících 3 typy archetypů - Čajkov a Rybník, Brhlovce a Bory, Vlčany a Neděd. Pro určení potenciálu archetypů pro rozvoj venkovského cestovního ruchu byly využity faktory rozvoje udržitelných forem cestovního ruchu (rozdělené do 4 kategorií - přírodní, kulturně-historické, socioekonomické a infrastrukturní). Míra současného využití potenciálu pro cestovní ruch byla hodnocena formou bodového hodnocení v rozmezí 0 až 3 (0 - žádný

ukazatel, 3 - vysoká hodnota). Pro každou formu venkovského cestovního ruchu byla do tabulky zaznamenána jejich přítomnost (+) nebo nepřítomnost (-). Z hodnocení obcí podle aktivit vyplývá, že v současné době jsou ve venkovském cestovním ruchu nejaktivnější obce Rybník a Čajkov, nejméně využívá svůj potenciál obec Bory. Z hodnocení forem venkovského cestovního ruchu vyplývá, že kulturní, cykloturistika a gastronomický cestovní ruch jsou v obcích zastoupeny na stejné úrovni, zatímco v zeleném cestovním ruchu je zastoupen pouze venkovský cestovní ruch, neboť obce přímo nenabízejí ubytování v soukromí. Zcela chybí agroturistika (agroturistika) a ekoturistika, skandinávská turistika, chataření a chalupaření. Lze konstatovat, že všechny obce nevyužívají dostatečně svůj potenciál, a to především z důvodu chybějící infrastruktury a podpory ze strany státu, obcí a kraje.

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LANDSCAPE-ARCHITECTURAL DESIGN IN THE RECREATION AREA NOVÁ DUCHONKA

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Abstract

The recreation area Nová Duchonka represents a significant tourist potential. The large area of 17 hectares is located in the birch-pine forest with open area around the water reservoir. In the socialist era, Nová Duchonka was one of the most popular locations for recreation in Czechoslovakia with quite wide range of visitors. The goal of the landscape-architectural solutions was to adapt the natural potential to current needs and use, as well as to trends that will contribute to the regional development of the territory. Landscaping includes various measures that aim to preserve and improve the natural environment with the support of biodiversity and at the same time create an attractive and functional environment for visitors. The article deals with various landscape solutions, attitudes and design work with an emphasis on recreation, created by students at the Institute of Landscape Architecture from SPU in Nitra. From the point of view of the research by design approach, the paper defines key principles of design that students applied in their design solutions.

Keywords: recreation, landscape architecture, environmental education, biodiversity

Introduction

Man adds the face of a cultural landscape to natural conditions. In historical development, he left a different legacy of his influence, depending on social and cultural development in the context of the boundaries of knowledge, technical maturity and the organization of life (Otahel' et al., 2008, Tóth, Feriancová, 2019). First of all, we need to know the recreation landscape as a natural wealth and cultural heritage well so that we can continue to use and develop it for the next generations (Fornal-Pienak; Bihuňová, 2022, Bechera et al., 2022). In this sense, the concept of sustainability is based mainly on the harmonious use of natural resources and the development of the country. The forest, as the most important part of natural ecosystems, provides a wide range of possibilities and offers for recreational use within ecosystem services (Hrdoušek et al., 2014, Tóth et al., 2018, Supuka et al., 2019, Čibik et al., 2022). Many parts of the forest landscape were anthropogenically modified for the needs of recreation, which improved the availability and performance of recreational activities, but also the complex of information, accommodation, refreshment, cultural and experiential services (Pichlerová, 2007, Bell et al., 2009, Fialová, 2010, Čibik et al., 2022). Dominant elements in the recreational landscape are also water bodies. Modifying their surroundings and making them technically accessible for recreation, and at the same time protecting them in terms of rare locations and biotopes without damaging them, are among the great challenges in landscape design (Supuka, 2013, Čakovská et al., 2019, Kuczman et al., 2022). The spectrum of all recreational activities and services used, especially of a social nature, fundamentally affects and shapes the landscape's resilience (Bihuňová et al., 2021, Kuczman et al., 2024.).

Materials and methods

The development of the concept of a landscape-architectural solution in the Nová Duchonka recreation area was a practical assignment for students of the Landscape Design Studio course at the Institute of Landscape Architecture FZKI, Slovak Agricultural University in Nitra. The request for the revitalization of the area in question was a mandate from the management of the Nová Duchonka recreation area administrators, the Nitra tourism organization and representatives of the municipality of Prašice, to which the recreation area belongs. The village of Prašice is located in the Topoľčian district, which is part of the Nitra region. The favorable climatic conditions of the Považské Inovec mountain range and the water reservoir itself in the birch-pine grove make the Duchonka recreation area attractive for summer holidays by the water, with a rich offer of hiking and cycling. for mushrooms, fishing, water sports and summer fun. rich sports and cultural activities (PHSR, 2022). The dominant feature of the recreation area

and the main attraction for vacationers is the water reservoir, which is located in the northwestern edge of the village. Its volume depends on the inflow of surface water, mainly from the Železnica stream, which maintains its level (Prašice, 2023). The origin of the name Duchonka probably dates back to the Middle Ages and is related to the iron processing metallurgy that was discovered. At least four blast furnaces for iron smelting were built here in the 9th century, along with a system of water reservoirs, cascades and supply channels. The first earthworks began in 1961, when they built an asphalt road from Topoľčany through Prašice to Duchonka. The recreation area belonged to one of the largest autocampings in Czechoslovakia with an area of 20 ha (Camping Nová Duchonka, 2021).



Fig 1: Localization of the addressed territory within the Slovak Republic and the addressed territory within the c.ú. Prašice.

Two years in a row, the Duchonka recreation area won the "Golden Rose" award as the best car camp in Slovakia in 1986-1987. After the fall of the communist regime, subsidies from the state and about Duchonka stopped. The hotel also burned down, the ruins of which still stand in one of the most beautiful locations near the reservoir. These historical statistics and facts confirm the attractiveness and importance of space in the country, on which it is necessary to build and further develop them for the current needs and trends in agritourism. In 2020, a group of enthusiasts wanted to contribute to the "rebirth" of travel and tourism with their activities (Camping Nová Duchonka, 2021). A dendrological survey of the entrance part of the Nová Duchonka area was carried out, according to the arborist standard (Paganová et al., 2018 a.), which shows the predominance of the taxon *Pinus sylvestris* L., with an admixture of the following taxa: *Junglas regia* L., *Prunus avium* L. and *Betula pendula* Roth.. Other extensive areas of stands, with a total area of 6660 m², were mapped according to the methodology intended for mapping non-forest woody vegetation Supuka et al. (2013), where the greatest representation of the taxa *Swida alba* L. and *Salix alba* L. was found, the admixture consisted of the taxa *Crataegus laevigata* (Poir.) DC., *Populus alba* L., *Prunus spinosa* L. and *Rosa canina* L. Existing woods, which have been identified in terms of security threats need to be treated by an arborist for their preservation and further perspective in the space. From the point of view of the research by design approach, the aim of the paper is to define the key principles of design that students apply in their design solutions. The method consisted of two main parts: 1) analysis (broader relationships, historical, functional, spatial, landscape analysis, as well as woody vegetation mapping. 2) design (students worked in design groups, from which various design concepts arose, divided into functional zones of the recreation area Nová Duchonka (Kuczman et al., 2023).

Results

The result of the design process is various design concepts divided into functional zones, full of many creative ideas and solutions. Students presented design concepts in the recreation area Nová Duchonka with innovative but at the same time close to nature solutions. The proposals support the preservation of biodiversity and natural infiltration of water in the landscape. One of the main tasks was the design of a new, representative main entrance to the Nová Duchonka recreation area, which was selected at the opposite end of the area, with the aim of building a retaining parking lot for caravans 'Stehlplatz' for a higher capacity than it is currently, see Fig 2, marked functional zone number 1. The basic element of the new, proposed entrance is a massive wooden gate, which will serve as the main entrance to the recreation area, visualized in Fig. 3. The entrance gate will be supplemented with the logo of the recreation area Nová

Duchonka, with a supplemental orientation map of the area with additional information in the form of a QR code. Part of the entrance are proposed storage areas for bicycles and charging stations. Right next to the main entrance, a new, modern and ecological parking lot with trees has been built. The parking lot has two entrances. One is intended for caravans and buses. The second entrance to the parking lot is used primarily for passenger cars, parking for disabled people and motorcycles. The new parking lot offers 201 parking spaces for cars, 9 parking spaces for disabled people, 16 parking spaces for motorcycles and 18 parking spaces for caravans and buses. The newly built area is completed by the trees *Acer campestre*, *Pyrus calleryana* 'Chanticleer', *Pinus sylvestris*, *Pinus nigra*, a total of 66 trees. Trees in parking lots fulfill an important ecological and aesthetic function, at the same time they optically connect the newly built space to the landscape. Areas of flowering meadows on an area of 1700 m² and flower beds with various types of perennials on an area of 850 m², spring bulbs on an area of more than 520 m² and renovated grass areas on an area of 3180 m² take on a representative function, see Fig. 3 Beds of undergrowth support the biodiversity of the space, attract insects and other animals that are important for the ecosystem. In addition to aesthetic and ecological benefits, plants will also have a significant recreational and psychological effect.



Fig. 2: and Fig. 3: Visualization of the proposed new entrance area and visualization of the proposed parking area in front of 'Stehlplatz' (Kuczman, G., et al. 2023).

Other functional zones (Fig. 4) sensitively complete the existing spaces of the recreation area. Exceptional views are highlighted by an architectural element in functional zone 3 in the form of a view through a 'French window'. The completion of the space around the cabins with a view of the dominant water surface is marked in zone 4. The atmosphere of camping and fire pits is characterized by zone 5. In zone number 6 there are original species of orchids, which are designed in the project to protect against unwanted trampling by tourists in the form of an extended wooden walkway, which guides visitors through this exceptional natural space. In a more remote part of the area, in zone number 7, there are proposed cabins in the crowns of trees, supporting direct contact with nature. The Duchonka water reservoir is the biggest attraction of the space (zone no. 8), around which a number of interesting elements of small architecture are proposed, supporting relaxation as well as sports enjoyment in the space.



Fig 4: Situational plan of the proposed functional zones (Kuczman, G., et al. 2023) 1) new entrance 2) Stellplatz-areas 3) 'French window' 4) cabins with a view of the water, 5) fireplaces in the camping area, 6) orchids - educational trail, 7) cabin in the treetops, 8) joint activities.

An important part of the project is the tree protection plan against construction activity, which applies to revitalization and construction in the entire area. The protection zone of woody plants represents an intact zone, from which activities that potentially disrupt the integrity of wood as a living organism, namely its above-ground and underground organs and vital functions, are excluded. (Paganová et al., 2018 b.).

Conclusion

The presented landscape-architectural solutions point to the possibilities of restoring the recreational landscape space through solutions close to nature. The proposed elements in the individual functional zones offer various opportunities for recreation, with the aim of making the important space more attractive from the point of view of its long-term tradition. At the same time, however, it draws attention to the preservation of natural and cultural wealth in the region. The final landscape-architectural solutions were presented at a public meeting in the presence of the task assigner and concerned authorities as well as those interested and enthusiasts for the improvement of this important biotope in the country.

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Souhrn

Příspěvek představuje krajinně-architektonická řešení, která poukazují na možnosti obnovy významného rekreačního krajinného prostoru Nová Duchonka, které se nachází v Západoslovenském kraji. Požadavkem na revitalizaci pověřilo Slovenskou univerzitu v Nitre (ÚKA) samospráva obce Prašice, s vedením správců rekreačního areálu Nová Duchonka a Nitranskou organizací cestovního ruchu. Navrhované prostory areálu jsou členěny do

tematických funkčních zón, do kterého jsou dotvořeny prvky, za účelem zvýšení atraktivit rekreace. Použita jsou přírodě blízká řešení, s důrazem se zachováním původní bioty prostoru. Navrhované vegetační úpravy přispívají ke zvýšení biologické rozmanitosti a anfiltraci dešťové vody v krajině. Závěrečná krajinně-architektonická řešení se prezentovala na veřejném zasedání za přítomnosti zadavatele role a zájemců o zvelebení tohoto významného rekreačního stanoviště v zemi.

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LANDSCAPE-ARCHITECTURAL DESIGN OF THE BUKOVINKA FOREST PARK IN ZVOLEN

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Abstract

Leisure time is defined as a time after fulfilling all duties connected with work, study, family, sleep and personal life. There are reasons for exploring and visiting nature, forests and open landscape: physical exercise, mental refreshment, getting closer to the nature, enjoy the nature, learn something. Outdoor recreation and nature based recreation is very popular among the society of the big cities. In Slovakia, we can consider that cities of 50 000 and more inhabitants are big cities. In the 80ties of 20.century, the forest parks was established by the almost every big city. Recreation is often blend of physical, mental and emotional activity. Leisure activities can lead to personal development, increasing skills and getting known ourself better. The Paper describes the landscape architectural proposal of the educational trail in Bukovinka forest park in Zvolen city. There were proposed several types of mobiliar, interactive elements and educational boards with various topics.

Keywords: recreation, leisure time, landscape potential, educational boards, outdoor activities

Introduction

Recreation as an activity is usually a blend of physical, mental, emotional and spiritual components (Broadhurst, 2001). Rossman and Elwood Schlatter (2008) described concept of leisure as a multi-phase experience with minimum of three phases: anticipation, participation and reflection. The specious present – the moment of participation, preceded by mental images of anticipation and succeeded by experienced reflections. Bell (1997) listed trends in demands for outdoor recreation as follow: demography, households, polarization, specialized tastes, commercialization, environmental concerns.

Recreation in the natural environment has the high positive effect on the human mental and physical health. The most valued ecosystem is forest, which can fulfill its recreational functions only when there isn't excessive exploitation and exceeding the carrying capacity through uncontrolled/unreasonable mining, construction and increased number of visitors concentrating on small space (Pichlerová, 2019).

Green infrastructure in all its scales support ecosystem services of the area (Šterbová, 2017; Tóth, 2022)) and increase recreational potential of the rural and agricultural landscape (Čibík et al., 2022); forests (Bell, 1997; Supuka, Bihuňová, 2018; Pichlerová, 2019), residential spaces and suburb zones (Simion, et al. 2020), even also brownfield zones (Hlavinková, Vařešchová, 2023). Positive influence of nature on human health knows as well-being, is studied since the 90s of 20. century. It is believed that long-term benefits can gain from repeated and regular stay in nature and from different types of natural areas (Pichlerová, 2019).

Materials and methods

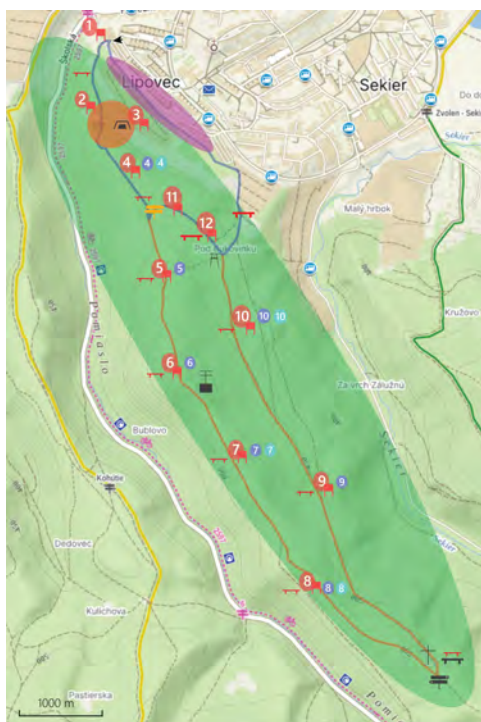
Zvolen is one of the oldest towns in Slovakia, it has about 39 453 inhabitants and 9 873 hectares. The proposed path is located near highly populated housing estate Sekier. Access to the recreational path is from several points by walk, by bike, by car and also by public transports. It has great location and potential for short term recreation in different types of forest ecosystems. Existing paths and roads have various width and length, what creates potential for walkways and cyclo roads. The forest is rich source of mushrooms, herbs.

As negative elements of the locality we consider: not well maintained paths and overgrowth alongside greenery, the presence of a high voltage line and its protection zone, the tourist paths passes through a active hunting area.

Results

The aim of the proposed recreational and educational trail in Lesopark Bukovinka is to create safe environment for short-term recreation for residents and tourists of all age categories. The proposed solution offers interaction of the visitors with nature and supports outdoor activities, which contribute to the regeneration of mental and physical health.

There were designed 12 educational boards, with different topics covered ecological awareness, history of the side and information about the hunter's life. Some of the stops are supplemented by interactive elements, designed for children, for better understanding of main topic of the stand. Forest path has several land art decorations, which are sensitively placed in the forest.



Legend:

Red numbers mark the stands and topics of the educational boards: 1- General information about locality, 2 – Safety instructions and recommendation, 3 – Information about the military object, 4 – Autochthonic tree species, 5 – Fruits of the trees, 6 – Insect, 7 – Mushrooms, 8 – Mycorrhize, 9 – Herbs, 10 – Hunting animals, 11 – What hunters bring to society, 12 – Hunting dog breeds

Blue numbers mark stands and topics of interactive elements: 4 – Leaf puzzle, 5 – Fruit puzzle, 6 – Insect hotels, 7 – Edible mushrooms, 8 – Mycorrhize puzzle, 9 – Herb puzzle, 10 – Animal foot puzzle

Fig. 1: Design of the educational path, with several stops and interactive activities.

The proposal focuses on creating an environment, which will allow visitors actively relax in their free time and provide opportunities for spending great time in the forest ecosystem by themselves, with friend or family. At the same time, the aim of the project is to improve and aesthetically modify chosen stands.

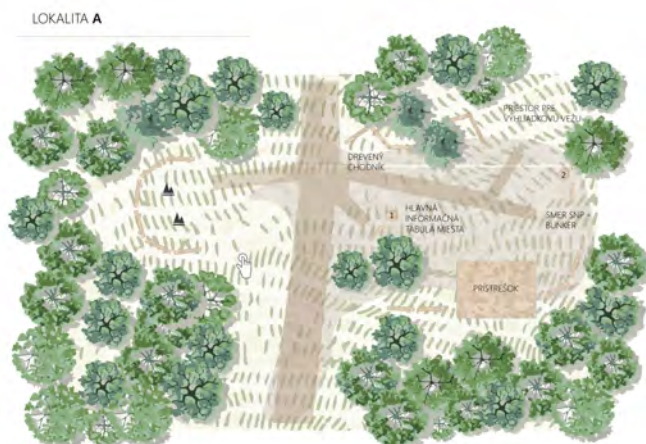


Fig. 2: Detail of the open space with rest zone, fire places and shelter

Conclusion

Leisure is a basic to the self-fulfillment and life enrichment of the individuals. How people use their leisure time is an important social question. Leisure and recreation are recognized as effective ways to enhance life satisfaction (Rossman, Schlatter, 2000).

Nature and its accessibility should definitely not be considered as luxury, but should form an inseparable and a daily part of the life of every age group (Pichlerova. 2019).

Urban environment consist mostly of the built up areas, with lack of green infrastructure elements. The potential for everyday recreational activities in the suburb zone increases with the present of forest areas. Zvolen is located in the hilly part of Slovakia with great connection to the nature and forests. Proposal of the educational trail in the forest park Bukovinka, associate recreational activities with educational and interactive elements, which could fulfill the basic demands of the society for outdoor recreation. On the other hand it also contribute to the better health and well-being of local residents.

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Souhrn

Volný čas je definován jako čas po splnění všech povinností spojených s prací, studiem, rodinou, spánkem a osobním životem. Důvody pro poznávání a návštěvu přírody, lesů a volné krajiny jsou různé: fyzické cvičení, duševní osvěžení, sblížení s přírodou, potěšení z přírody, naučit se něco nového. Rekreace v přírodě a rekreace v přírodě je ve společnosti velkých měst velmi oblíbená. Na Slovensku můžeme za velkoměsta považovat města s 50 000 a více obyvateli. V 80. letech 20. století byly téměř u každého velkého města založeny lesoparky.

Rekreace je často směsí fyzické, duševní a emocionální aktivity. Volnočasové aktivity mohou vést k osobnímu rozvoji, zvyšování kvalifikace a lepšímu poznávání sebe sama. Příspěvek popisuje krajinářsko-architektonický návrh naučné stezky v lesoparku Bukovinka ve městě Zvolen. Bylo navrženo několik typů mobiliáře, interaktivních prvků a naučných tabulí s různými tématy.

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LANDSCAPE-ARCHITECTURAL DESIGN OF THE OLD ORCHARD IN LOCATION PRESEĽANY FOR RECREATION AND WELL BEING

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Abstract

The current lifestyle is characterized by the limited contact of people with nature. The reasons are related to the decrease of outdoor human activities and the limited accessibility to natural environments. The subject of study is an old fruit orchard on the location Preseľany (Slovakia). Over the years it has become a semi-natural biotope with outcrops to arable land. There are present at least three generations of the fruit trees and species of the indigenous flora which inhabited stand within succession. The site is a biodiversity hotspot harboring plant and animal species. The aim of the landscape-architectural design is to provide access to this space for relax and recreation in contact with the open landscape. The design aims to preserve the intact zone over most of the area and works with the narrative of nature return to the intensively used agricultural landscape. Three functional zones for visitors are proposed in the design - a movement zone, a rest zone and a children's zone. The expected benefits of the proposal are to provide contact with nature and opportunity for environmental education.

Keywords: biodiversity, fruit trees, functional zones, habitat, preservation

Introduction

The contact with nature and the natural environment has a positive effect on people's mental health and well-being, as documented by long-term research in public health and health economics (Van den Berg, 2017; Hartig, & Kahn 2016; Bosch & Depledge, 2015). The attention is paid to the evaluation of the size, structure and species diversity of landscape vegetation, as well as the time and frequency of people's contact with the nature. The experience and interaction are particular topics in assessing the impact of nature on people's mental health and well-being. The experience of people's contact with nature mediates sensory perception, mainly sight, but also hearing, touch and smell (Bratman et al., 2019). Interactions are related to different types of human contact with nature (walks, learning and different forms of physical activity). The design, structure and program of a park or other space for relaxation can therefore have a significant impact on the way users or visitors interact with the natural space (Frumkin et al., 2017).

The area of interest is located in the cadastral territory of the village Preseľany, in the middle of arable land. The fruit orchard of cherries, plums and pears was probably established here in the 1930s. Near the orchard there was a farmstead with a well and equipment for livestock production. In the second half of the 20th century, the location was abandoned and the orchard was no longer systematically maintained. The tree stand consists of several generations of fruit trees, but also a number of plants and trees of the potential natural vegetation. The species structure is a result of the natural rejuvenation of the fruit trees, as well as result of the colonization by plant species within the succession.

The local community is interested in the revitalization and inclusion of the vegetation element in the local system of agro-tourism and recreational destinations. However, the area is a semi-natural habitat for numerous plant and animal species. Thus preservation of the biotic functions of the site was one of the priorities in the landscape design proposal. The aim of the landscape-architectural design is to provide access to this space for relax and recreation in contact with the open landscape and preserve the intact core of the biotope for plant and animal species.

Material and methods

The village of Preseľany is located near Tribeč mountain on the floodplain of Nitra river. The nearest towns are Topoľčany (14,4 km) and Nitra (18,6 km), they are connected with village Preseľany by roads and railway line. The area of interest is a part of the Danubian hills. According to the morphology and the terrain relief, it is slightly and medium fragmented upland

at an altitude of 150-224 m. According to the climatic characteristics (Lapin et al., 2002) the studied area belongs to warm and moderately warm region with moderate winter season with the annual sum of precipitation 610 mm.

The main soil types are Cutani-Haplic Luvisols and Calcic Luvisols, locally eroded and Calcaric Regosols; from loess and Calcaric Fluvisols, associated with Calcari-Gleyic Fluvisols and Areni-Calcaric Fluvisols; from carbonate alluvial sediments. In terms of the soil structure, there are present mainly medium, (loam and clay-loam) soils (Atlas krajiny, 2002). The landscape scenery is made up of fields, vineyards and fragments of forest stands. The agricultural land represents 85% of cadastral area. Non-agricultural land consists of forests 9%, water bodies 16.2%, built-up areas 26.7% and other areas 48.1%.

According to the Map of potential natural vegetation (Maglocký, 2002), the reconstructed natural vegetation in the studied area is represented by the following communities: Ash-elm-oak forests in the basins of large rivers (Hardwood floodplain forests) - *Ulmenion*, Peripannonian oak-hornbeam forests - *Polygonato latifoliae - Carpinetum*, Sessile oak and Turkey oak forests - *Quercetum petraeae – cerris*.

In the analytical part of the research inquiry, the wider relationships, historical, functional-spatial, traffic, visual and landscape analyses were addressed. The dendrological survey was carried out in accordance with arboricultural standards for assessing the condition of trees (Paganová et al., 2019). The species composition and biological age of woody plants, including trees that may present a higher risk on the site, were determined. Within the field survey, the potential of the site for various types of activities and visitor interactions of with nature were evaluated *in situ*.

Results

The analysis of the historical development of the landscape near village Preseľany (local name Mancickov) shows, that in the 18th century there was a



Fig. 1: A view on the former orchard on location Mancickov near village Preseľany with a dense tree cover and enclave of the arable land (left), drone image.

forest and later some farm for livestock production. The mapping documents from 1914 do not record the existence of any orchard. The presence of farm and fruit trees in a regular

arrangement is recorded on the picture from the 1950s. However, several individuals were already missing from the original planting. Currently, area of the former orchard is covered by high closed stand with an enclave of the arable land reserved as a field for wild game (Figure.1). The aim of the landscape-architectural design is to provide access to this space for relax and recreation in contact with the open landscape. The design aims to preserve the intact zone over most of the area and works with the narrative of nature return to the intensively used agricultural landscape.

In the orchard, the activities and space available for visitors were concentrated in the peripheral parts of the orchard. The central zone of the orchard will remain intact with a wooden fence. The movement of visitors in the space along the revitalized pathway with vegetation cover (low grass and moss) is indicated by the red line (Figure 2). Visitors will be able to observe the area of the intact zone (biodiversity zone) from the pathway (Figure 2, 4). It is an opportunity to become familiar with the natural processes - alternation of generations and changes of species composition. People can see the decay of senescent trees (Figures 5 and 6) and understand the importance of their shade and biomass for the restoration of plant communities, perceive the peace of this place which is developing according to rules of the nature.



Fig. 2: Distribution of the functional zones in orchard. 1 – entertainment zone, 2 - natural amphitheater, 3 – meadow, 4 – balance wheels, 5 – learning zone, 6 – moss pathway, 7 – biodiversity conservation zone, 8 – rest zone, 9 - sightseeing tower (Authors: Štofíková V., Bilkoová K., Ptačinová S., teacher / head of the design studio: Paganová V., Kuczman G.)

There were proposed three functional zones for visitors - learning zone, rest and entertainment zone. The learning zone is placed along the pathway (Figure 4) and includes the natural amphitheater with seating and view of old trees (Figure 2). The rest and entertainment zones are situated on the western edge of the orchard (Figure 3). Two floral meadows and a picnic place are designed in the relaxation zone (Figure 3). On the opposite side of the floral meadow there is space for children and entertainment. There are playground elements for children's play and entertainment as well as the observation tower for views of the surrounding countryside.

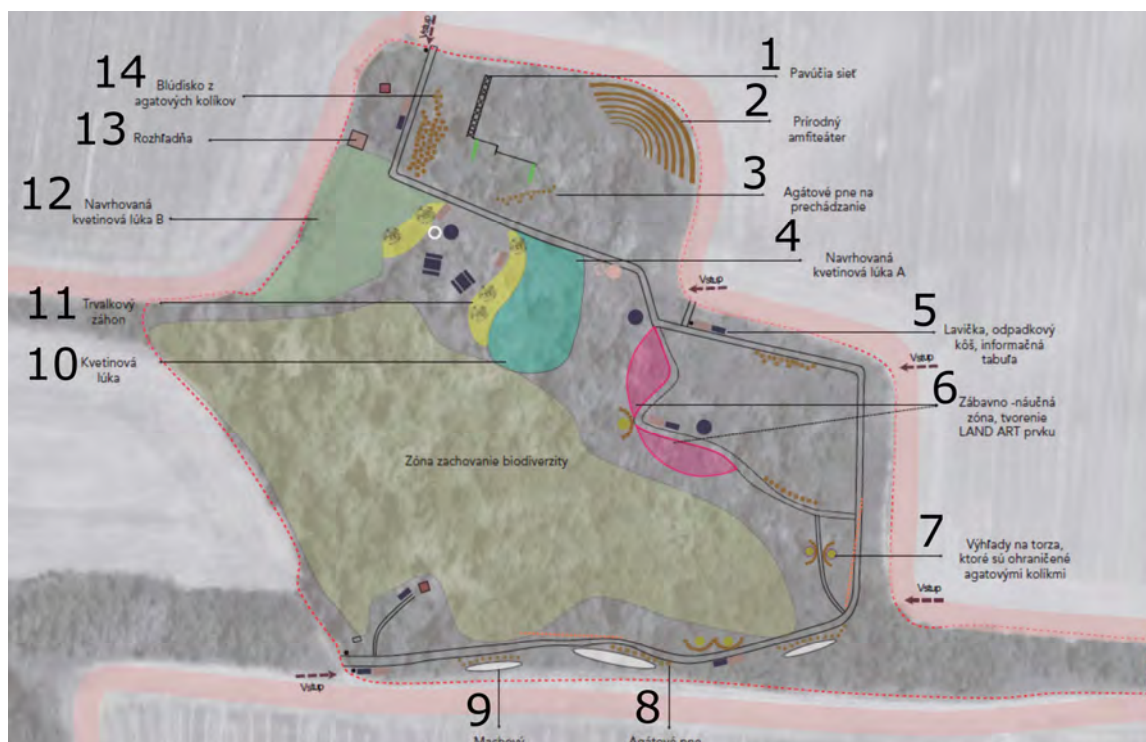


Fig. 3: Landscape design proposal for the old orchard Mancickov. Entertainment zone with playground elements for children 1 – spider net, 3 – balance element, 13 – observation tower, 14 – labyrinth made from black locust stokes, Rest zone with floral meadows – 4, 10 and perennials 11, space for Land art – 6, Learning zone with moss pathway – 9, black locust wheels - 8, view of old senescent fruit trees – 7. (Authors: Štofíková V., Bilkoová K., Ptačinová S., teacher / head of the design studio: Paganová V., Kuczman G.)

Discussion

The new space concept was inspired by the idea of people's contact with nature through various forms of sensory perception - sight, touch, taste and smell. The mental health benefits from nature experiences may occur through multiple psychological causal mechanisms and pathways, including reduced stress, increased social cohesion or physical activity, or enhanced cognitive capacities (Bratman et al., 2019). Visitors can observe natural processes in the old orchard, perceive the "sounds of the forest", the „smell“ of plants and decomposed wood, relax in the meadows, or have fun in the entertainment zone. They can touch and work with natural materials (rods, branches, shells, pebbles, fruit stones) in the space for land art creation. However, the effects of the nature experience will also depend on the age, gender, current mood and other personal characteristics (e.g. nature preferences) of the visitors (Astell-Burt et al., 2014; Tóth et. al., 2018; Čakovská et al. 2019; Čibík et al., 2022).

Conclusion

The intention of the landscape-architectural design was to sensitively use the potential of this semi-natural biotope for people's contact with nature and mediation of various interactions for visitors. The new elements of the entertainment-relaxation zone (meadows, picnic area, observation tower and playground elements for children) are located on small area in order to minimize the impact on the habitat.



Fig. 4: Visualization of the walkway for visitors around the educational zone and in contact with the open landscape (Authors: Štofíková V., Bilková K., Ptačinová S., teacher / head of the design studio: Paganová V., Kuczman G.)



Fig. 5 and 6: The internal part of the orchard in early spring aspect (February 2023). These are senescent trees of the original planting, approximately 70-year-old individuals with different vitality. The skeletal branches gradually die (left) and tree renews the assimilation area from adventitious shoots (Paganová V.)

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Souhrn

Současný životní styl je charakteristický omezeným kontaktem lidí s přírodou. Důvody souvisí s úbytkem venkovních lidských aktivit a omezenou dostupností přírodního prostředí. Předmětem studia je starý ovocný sad v lokalitě Preseľany (Slovensko). V průběhu let se stal polopřirozeným biotopem v kontaktu s ornou půdou. Rostou tu nejméně tři generace ovocných

stromů a druhů původní flóry, které kolonizovali porost v sukcesi. Tato lokalita je ostrovem biologické rozmanitosti, kde se vyskytují mnohé rostlinné a živočišné druhy. Cílem krajinářsko-architektonického návrhu je zpřístupnění tohoto prostoru pro relaxaci a rekreaci v kontaktu s volnou krajinou. Návrh si klade za cíl zachovat neporušenou zónu na většině území a pracuje s narativem návratu přírody do intenzivně využívané zemědělské krajiny. V návrhu jsou navrženy tři funkční zóny pro návštěvníky – vzdělávací zóna, klidová zóna a herní zóna. Očekávaným přínosem návrhu je poskytnutí kontaktu s přírodou a možnost environmentální výchovy.

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LIVESTOCK BREEDING AND MILK PROCESSING AS KEY FACTORS FOR THE PROMOTION OF AGRITOURISM ACTIVITIES IN BASILICATA

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Abstract

Basilicata is a small Italian region with a high percentage of marginal agricultural land, characterized by difficult environmental conditions that pose a challenge for agriculture and livestock farming, but which can become a productive, valuable and profitable resource for local communities and the environment. In a sustainable management approach, considering the potential and limitations of the area, the most appropriate choice is to focus on hardy breeds, which are more resistant and can effectively use fodder resources even if not of excellent quality. Dairy products related to these herds in marginal lands have better nutritional qualities, higher market value and contribute to the achievement of environmental, cultural, recreational, tourism and social benefits. This paper shows some considerations on both dairy farming and processing activities in Basilicata (Southern Italy), and points out their importance in terms of the development of agritourism activities and land promotion, an aspect that has been little investigated so far in this territorial context. The paper focuses on some experiences and case studies carried out in recent years, and on the prospects for further development in terms of safeguarding marginal areas and maintaining agritourism economic activity, as well as land conservation and protection.

Keywords: Rustic breeds, cow's milk, typical cheeses, sustainable systems, rural tourism

Introduction

Marginal lands refer to generally irregular areas characterized by limited soil fertility, high slope, and unproductivity and therefore more at risk of abandonment. In Italy, 39% of agricultural land is classified as marginal and Basilicata, despite its small territorial size, is one of the Italian regions with more than 50% of marginal land (Sallustio et al., 2018). Livestock breeding in marginal areas further enhances the territory and links it to unique, genuine and high-quality livestock production; it also optimizes the use of the natural resources available in marginal land, prevents forest fires and improves climate change mitigation strategies (Hoffmann 2011; Sturaro et al., 2013). In Basilicata, the Caciocavallo Podolico cheese is an example of the valorization of livestock production linked to farms located in marginal territories. This cheese is obtained exclusively from raw milk of Podolica cows (Fig.1) and the various factors that make it unique are: extensive farming system, pasture composition, cheese-making and equipment process (Di Trana et al., 2023). In Italy, approximately 130.000 heads of Podolica cattle are raised, of which 37.000 are registered in the genealogical herd book. Basilicata and Campania (both regions of Southern Italy) have the highest number of farms and animals reared (ANABIC, 2023). This cattle breed, local and rustic, is mainly raised in wild or extensive breeding systems with shelter. Furthermore, it has a very strong link with the territory from a cultural and tourist point of view: "transumanza" is still practiced to date. Transumanza, an Intangible Cultural Heritage of Humanity (UNESCO, 2019) consists in the movement of herds from plain pastures to mountain pastures in the summer season, following old "tratturi", grassy or stony paths originating from the passage and trampling of the herds. The Podolica cattle breed has maintained a marked reproductive seasonality, births are concentrated in spring and summer period, precisely when the quantitative-qualitative characteristics of the pasture are optimal and able to guarantee satisfactory weight increases of the calves. Milking, usually manual, takes place in the morning after the calf's first lactation to stimulate the flow of milk and the lactation period (5-10 liters per day) lasts 6-7 months (Cosentino et al., 2018).



Fig. 1: Podolica cows in typical pastures of the Basilicata Region (on the right spring pasture; on the left summer pasture).

However, these marginal areas, which have low productivity and are often difficult to manage, can be transformed into economic opportunities through sustainable agricultural practices and agritourism projects. Agritourism should not be restricted to just agricultural production; instead, it should incorporate hospitality and cultural experiences to make these areas both productive and appealing to tourists. Therefore, agritourism becomes an "intelligent and sustainable opportunity", promotes the development of rural communities, generates additional income for farmers (Ciolac et al., 2020) and contributes to landscape conservation and local traditions.

This paper presents some preliminary results of experimental activities developed in Basilicata (Southern Italy), aimed at developing a new technological approach for local dairy production, to be integrated into the agritourism context and experience.

Material and methods

Often in rural areas, livestock activity alone is not enough, breeders have to resort to the multifunctionality of their companies by carrying out agritourism activities, especially for small farms with few animals (Fratini et al., 2014). The breeders, also called custodians farmers, raise the Podolica breed both for protection and breed safeguard for conservation purposes, and because they enhance it through agritourism activities and marketing of livestock production (meat and dairy products) (Natrella et al., 2023).

Due to the breed seasonality and limited milk production, Podolica breeders only produce cheese at certain times of the year. Therefore, for an agritourism business that organizes events, such as workshops and cheese-making demonstrations, not having milk available all year could represent a limitation. Thus, experimental tests were conducted at the experimental dairy of the University of Basilicata with the aim of studying new technological approaches to the production of cheeses starting from frozen curds. This could give small local farms and agritourism businesses the chance to transform frozen curds into cheeses in real-time during attractive events and practical demonstrations to customers and tourists.

This work focused on optimizing the management of semi-finished products for the production of stretched curd cheese. The technological properties of mozzarella obtained from curds produced with raw milk and pasteurized milk, frozen and stored in controlled atmospheres such as air, nitrogen and vacuum packaged in MAP (Modified Atmosphere Packaging), were studied and analyzed.

The cow's milk came from farms located in Basilicata and raw (Fig. 2a) and pasteurized (Fig. 2b) milk curds were produced. For each production, 100 liters of milk were processed.

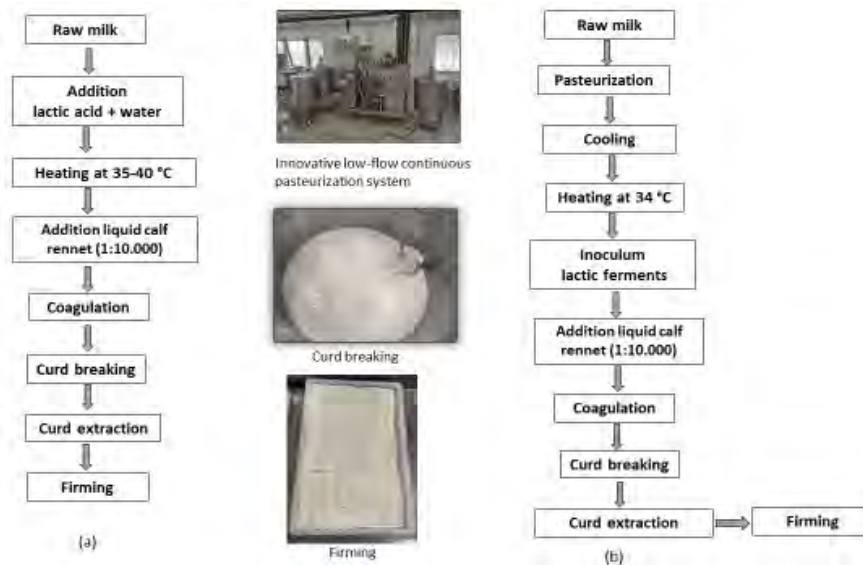


Fig. 2: Production process with raw milk (a) and pasteurized milk (b).

The curd obtained, both from raw and pasteurized milk, was portioned into 1 kg "ingots" and placed in a blast chiller (core temperature of -18 °C in approximately 4 hours). The curd was subsequently packaged inside polyethylene bags (80 micron thick) in a modified atmosphere (vacuum, 100% CO₂, 100% N₂), these were stored at -18 °C.

The curd stretching process was carried out after curd production (day 0) and after 30,60 and 90 days of storage. Considering the milk used and the different packaging systems, the yields obtained from the different curds were analysed.

Results and Discussion

Different ways of processing cow's milk were compared for the preparation of curds, frozen for different times and reworked to produce fresh dairy products.

The yields and cheese characteristics varied mainly depending on the coagulation and packaging method used. The results showed that the treatment of milk has a significant effect on yield: the curd obtained from pasteurized milk has a higher yield than the curd obtained from raw milk (Fig. 3). Furthermore, considering the milk used and packaging system, both for raw and pasteurized milk, the amount of water absorbed during spinning for mozzarella production was increasingly greater with the vacuum preservation method (Fig. 4).

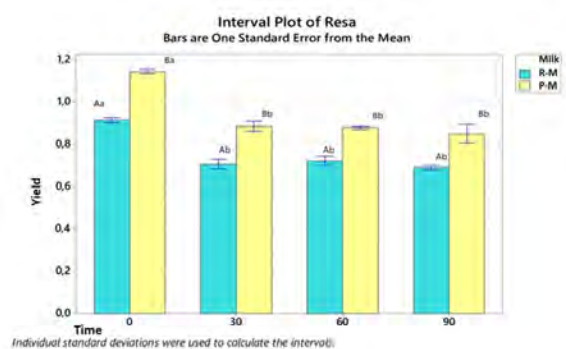


Fig. 3: Evaluation of yield according to milk treatment and storage time. R-M: Raw milk; P-M: Pasteurized milk.

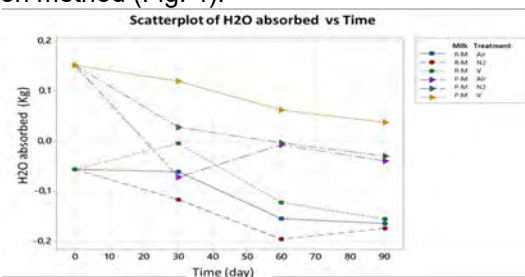


Fig. 4: Scatterplot of the relationship between the retained water and storage time, according to milk treatment and packaging system. R-M: Raw milk; P-M: Pasteurized milk; Treatment: Air, N₂: nitrogen; V: vacuum.

Further studies and experimental tests on other types of cheeses starting from frozen curds will be necessary. However, the results are in line with the bibliography. Pasteurization treatment has a positive influence on yield, increasing the yield of cheese obtained (Lau, et al., 1990; Salwa et Galal 2002; San Martín-González et al., 2007). This phenomenon is probably linked to the increase in the moisture content of cheese (Tadjine et al., 2019), moreover pasteurization determines the heat denaturation of whey proteins resulting in an increase in yield of about 0.1-0.4 kg (Lau et al., 1990). Nevertheless, further studies are needed to study microbiological quality and assess whether heat treatment affects other components of milk or changes in protein structures.

The processing of frozen curd will make it possible to overcome logistical problems and to have the possibility of producing cheese even in periods in which there is no milk available. This could be an opportunity for breeders as the marked seasonality of the Podolica cattle breed concentrates lactation in a few months. Obviously, depending on the equipment present in the farm and the cheese typology, the farmer can decide whether to subject the milk to heat treatment before producing the curd to be frozen. Our results suggest that pasteurization increases yield but the best cheese characteristics are obtained with raw milk curd. Anyway, having frozen curd available could give agritourism activities the opportunity to offer cheese-making demonstrations throughout the year.

Conclusion

The objective of this study was therefore to evaluate livestock farming best suited to marginal lands and to characterize and scientifically understand new technological approaches for local dairy production. The multifunctionality of farms should be encouraged because they provide educational, natural and hiking services and allow the integration of the farmer's income. The company can diversify offering additional services such as agritourism activities, offering tourist services such as picnic areas, agri-campsites, walking tours, guided tastings. Introducing educational and environmental projects, promoting "school farms" means raising awareness among young people and bringing them closer to the world of agriculture and food, with workshops and demonstrations activities. These educational opportunities should not be underestimated because they strengthen the link between consumer and farmer while promoting sustainable agriculture and rural tourism. In addition to increasing economic and commercial opportunities for rural communities, the development of short supply chains and the valuation of landscape resources would be encouraged. The Podolica cattle breed, if correctly managed, can represent a heritage for livestock breeding, both for marginal areas's recovery, for difficult pastures, and for superior quality livestock production. In conclusion, breeding local breeds, dairy production and the agritourism activity related to them, play an important role in protecting marginal areas, using available resources, maintaining economic activity, conservation and land management and promoting recreational use of the landscape.

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Souhrn

Chov hospodářských zvířat a zpracování mléka na marginální půdě zhodnocují půdu, kde by bylo obtížné provozovat zemědělství, a představují základní prvky pro místní komunity, životní prostředí a cestovní ruch. Byly porovnávány různé způsoby zpracování kravského mléka pro přípravu tvarohu, který byl různě dlouho zmrazován a znovu zpracováván na čerstvý sýr. Výsledky jsou významné a mohou pomoci zachovat okrajové oblasti a podpořit ekonomickou aktivitu agroturistiky tím, že nabídnou turistům atraktivní zážitky, například ukázky výroby sýra v reálném čase po celý rok.

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MAPPING THE IN-BETWEEN – APPROACHES AND METHODS OF RESEARCHING URBAN VOIDS

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Abstract

Losses of urban matter in town residential areas represent obstacles in the efficient use of built-up territory. At the same time, they carry a certain value — they are a territorial reserve with the potential for reuse. To ensure increased care, their functional restoration and reintegration into the urban fabric in the form of high-quality public spaces, it is necessary to apply several scientific and research methods. White space research is a long-term process accompanied by a wide range of analyses and different approaches. This quantitative and qualitative research is characterised by a certain sequence of steps and stages that follow each other chronologically and overlap in time. Due to the scope of the issue, it was therefore necessary to develop a work methodology in the initial stages of the research, and later a methodology for mapping and analysing white spaces. The presented article describes these practically proven methods of historical research, data collection, selection into the working database, evaluation, and application of a set of recommendations. Through specific examples from the environment of the regional capital cities of Nitra, Trnava and the district city of Banská Štiavnica, the contribution presents various forms of analytical tools and possibilities for researching white spaces.

Keywords: white spaces, urban voids, urban gaps, inner periphery, urban tourism

Introduction

The urban structure of today's city is intertwined with vagueness. Suburbanisation is on the decline again, and a growing trend of urbanisation and densification of city centres can be observed more and more often. The result is a rising value of empty urban land — gaps in urban matter, spaces without a function, so-called white spaces. Despite this, they are given minimal care and interest. Lost places began to appear on the mental urban maps of Central and Eastern European cities mainly in the 1950s and 1960s. The reason for their emergence is political and socioeconomic changes, an unintended consequence of the organization of the city and the cycle of urban development (Marišová & Lichnerová, 2010). These places surround our everyday life, and we pass by them daily without much notice. They are the subject of various discussions and mostly owned by private individuals and companies. Even though in the territorial plans they are intended for construction, this situation ties the hands of city governments (Marišová et al., 2023). They are often inactive and practically powerless in this regard. Nevertheless, they have a huge potential to be an accelerator of change in model cities for restoration and further urban development (Bihuňová et al., 2020). By implementing appropriate scenarios and strategies for their transformation and renewal, they can become full-fledged living public spaces reintegrated into the urban fabric (Čibík et al., 2019).

Typology of white spaces

White spaces have different size, shape, form, and character. They vary depending on location, ownership, and function (original or temporary). As part of the research, a categorisation of white spaces was created from the point of view of space typology and based on their location in the city, various scenarios were developed through graphically interpreted schemes:

- the centrum (compact urban structure, historic city centre, dense built-up area)
- the inner city (settlement inner spaces, campuses and larger units, residential complexes, the territory between the periphery and the city centre)
- the outer city and peripheral areas (industrial areas, brownfields, open free land)

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 objects, 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. Scenario number five describes an empty space at the corner of an ending build-up area, for example, when a street or sidewalk crosses it. 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 (Fig. 1).

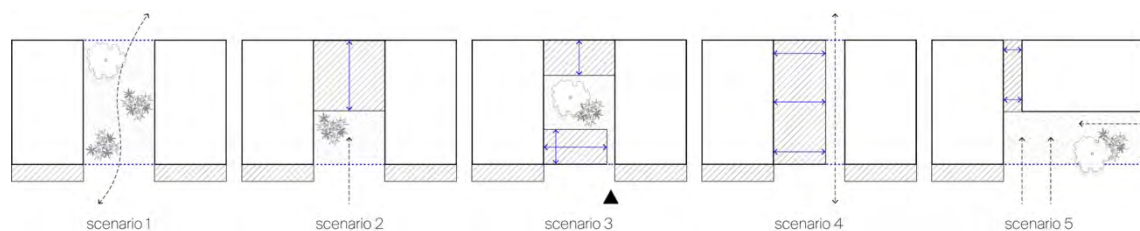


Fig. 1: Different scenarios of white spaces. Case study: city centrum. Source: author.

Scenario number one presents the space between two objects with a transition function. This case is characterised by the division of an already small open area into two or more even smaller units, which makes it quite impossible to create a comprehensive design here. Fragmented areas mostly provide space only for non-conceptual greenery. The tracing is purposeful, formed by the use of space and not designed in advance. Scenario number two is a typical example of a settlement inner space that has no been built. Space is impassable but provides a background and intimacy for various activities with a residential and recreational function. Scenario number three presents a typical gap between two objects, 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. Scenario number four interprets the development between two objects. It is mostly one-story and impassable building, or the first floor is elevated, and the ground floor are transitional. The area reserved for the building can be used for vertical layers. The last scenario creates the most generous space for various activities with a residential and recreational function. It is partially passable, but the tracing does not divide the open area and the path runs along the building (Fig. 2).

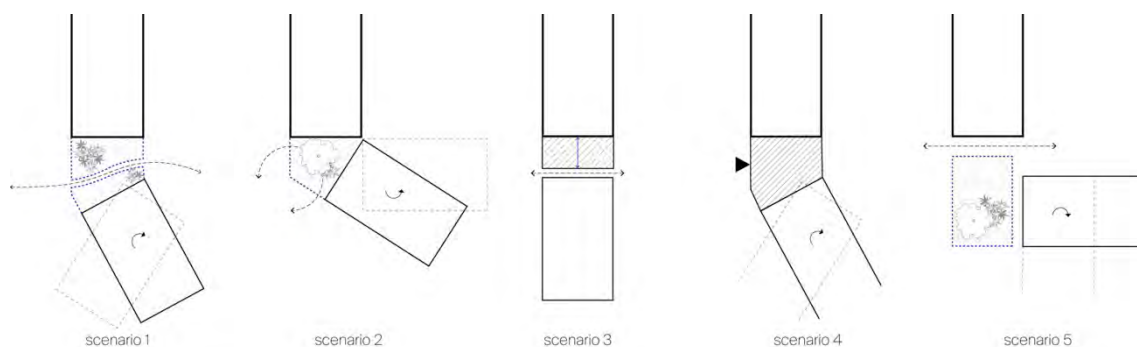


Fig. 2: Different scenarios of white spaces. Case study: inner city. Source: author.

Approaches and methods of white space mapping

White spaces research is a complex project. For the purposes of this contribution, a sequence of steps has been compiled, the observance of which is necessary to map white spaces and subsequently to create the necessary documents for possible work with such spaces. Based on long-term research and practical experience from the environment of several cities, the next steps and four parallel activities were defined:

- 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). 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 also investigated (Fig. 3,4).



Fig. 3: Pixel grid method. All white spaces were marked on the first map. On the second, inner blocks and urban gaps, and on the third map property relations. Source: author

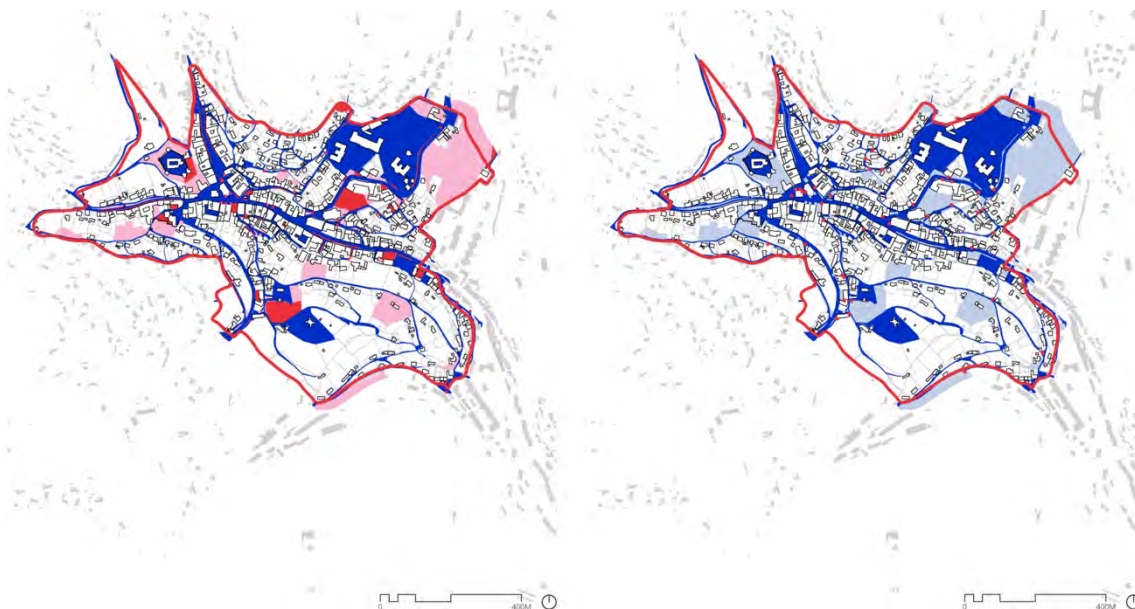


Fig. 4: Analyses of white places and public spaces. Inverse urbanism. Source: author

The method of selecting white spaces for the working database consists in the selection of all places within a pre-defined area where there is lack of urban mass. The boundaries of the territory can be defined based on several aspects (city districts, according to housing typology, according to transport infrastructure, based on spatial dominants and the urban morphology, or according to following areas – centrum, the inner city, the outer city, and peripheral areas). As part of the field trips to the selected locations, the final working database of white spaces with information on the exact location, type of

scenario, ownership, origin, and current function is later processed (Fig. 5). The result is a material containing dozens of spaces, which serves as a basis for future research (Fig. 6). The database and the information in it must be regularly updated as necessary.



Fig. 5: BM_03_MICHALSKÁ STREET. Sample of the fact sheet within the work database. Description: 1. orthophoto map, 2. actual photo, 3. work name, 4. basic data. Source: author



Fig. 6: Working database of all analysed white spaces. Source: author

Conclusion

Based on long-term multilevel research, the presented article describes the possibilities of data collection and introductory methods of mapping and analysing white spaces in the city environment. It follows procedures proven in practice and brings its own ways of looking at the issue. Using various schemes, the article also presents different scenarios within the typology of white places in relation to their location in the city. The contribution is the basis for the processing of a complex methodology for mapping white spaces.

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Souhrn

Cílem tohoto příspěvku bylo přiblížit přístupy a metody mapování bílých míst i samotnou problematiku těchto dostatečně nevyužívaných městských prostorů. Článek odkrývá jednotlivé kroky v procesu přípravy podkladů a sběru dat. Prezentované možnosti obsahového a formálního zpracování úvodních metod víceúrovňového výzkumu mohou posloužit jako základ pro komplexnější práci s těmito prostory. Výsledkem by měla být integrace bílých míst do struktury města v podobě plnohodnotných živých veřejných prostorů.

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NEW ELEMENTS IN THE LANDSCAPE OF THE PAVLOVSKÉ VRCHY HILLS

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Abstract

The benefits of land consolidations for improving the ecological stability and recreational potential of agricultural landscapes are now well known. In this process, space for the design and implementation of soil, water and environment conservation measures (e.g., grassing, strip cropping, balks, tree belts, water reservoirs, ...) is created. Land consolidation plans supported by the government can provide conditions for improving quality of life in rural areas.

Protected area Pálava (Pavlovské vrchy hills) is sought after by tourists from the Czech Republic and abroad. The habitats of rare ecosystems on the slopes of hills with beautiful limestone rock formations are the subject of protection. The elements of plan of common facilities designed as a part of the simple land consolidation in Perná have potential to contribute to an increase the recreational attraction of this area.

Keywords: Rural countryside, land consolidation, nature close measures, landscape non-production functions, recreation potential

Introduction

The Pálava protected landscape area (PLA) is located in southern Moravia, near the town of Mikulov. It covers an area of 85 km². Its heart is the Pavlovské vrchy hills, but the PLA also includes their agriculturally used slopes, and in the foothills banks of the Dyje river and several ponds. The altitude varies from 163 to 550 m. The characteristic appearance of the hills was imprinted by the white limestone rising in the highest positions.

People have lived here for thousands of years, which is evidenced by archaeological finds of artifacts from the Stone Age, the remains of Roman military camps and castle ruins. Remains of original forests and steppes are subject to strict protection. Due to the unique natural conditions, very rare species of plants and animals are found here. Thousands of tourists, pedestrians and cyclists visit Pálava every year, for which a dense network of roads and trails is marked and maintained. In addition to tourism, people also practice other recreational activities here, such as swimming, fishing, rock climbing, etc. The recreational potential of Pálava is supported by a wide range of accommodation, catering, wine tasting options and a number of cultural events.

The slopes and foothills of the Pavlovské vrchy hills are covered by very fertile soil, which is intensively used for plant production, vineyards and orchards. At present, tendencies towards greening of farming gaining ground more and more. The administration of the Pálava PLA communicates with farmers and, in their common interest, they introduce, for example, grassy strips, hedges, planting fruit trees and avenues, etc. One example of cooperation between farmers, the PLA and the State Land Office under the Pavlovské vrchy hills is land consolidation in cadastre of the municipality of Perná, the results of which the paper presents.

Material and methods

A simple land consolidation in the cadastral territory of Perná was initiated by the State Land Office in 2023 and applies to the locations U studny and Bergrus (Fig. 1). Both localities are strongly at risk of erosion, even with the risk of landslides. During heavy rainfall episodes, widespread erosion occurs. This leads to degradation of fertile agricultural land and surface runoff, which is concentrated due to the high slope and ruggedness of the terrain. As an affect of the concentrated runoff, rills and gullies are created on the slopes and the surface of the field roads is eroded. Resulting flooding with transport of eroded soil can potentially cause damage in the built up area. The area of the entire area of interest is 6.9 ha and includes 4.5 ha of orchard, 2.4 ha of other area. The following objectives of simple land management were established:

- improving the environment and increasing the ecol. stability of the landscape,
- creation of conditions for rational farming, incl. accessibility of land,

- creation of conditions to protect the agricultural land,
- improvement of the environment and enhancement of the landscape,
- creation of prerequisites for the possibility of using the support from the funds of the European Union.

The analysis of the current state of the territory was based on background maps and data (CENIA, RISWC, Czech Geological Survey, ...), processed spatial planning documents, project documentation and studies related to the interested area. On the basis of the collected documents, the owners' claims, the results of the survey, the survey of the actual state, the analysis of erosion and runoff conditions, a draft plan of common facilities (PCF) was drawn up. The plan of common facilities was prepared in accordance with applicable legal regulations and methodological guidelines. It also takes into account comments from state administration bodies and the concerned organizations. Proposed elements are based on the results of an expert engineering-geological survey of the area. The PCF includes:

- reconstruction of four field roads including objects interrupting and diverting concentrated surface runoff,
- stabilization of ravine with the check dams,
- drainage elements for draining water from field roads,
- small water pool.

Results and discussion

The importance of land consolidations in the process of soil, water and landscape conservation was emphasized, for example, by Podhrázká et al. (2021) or Kupidura et al. (2014). Within the framework of simple land consolidation, measures were proposed in the cadastre of the municipality of Perná to improve accessibility of plots and limit very intense water erosion, which is locally manifested by landslides (e.g., Bíl et al. 2020).

The proposed road network is essentially based on the original road network, which it amends and supplements with the aim of improving the patency of the landscape and the transport services of the land. In addition to its basic function, the transport network creates an important landscape-forming element with an ecological function, as accompanying greenery is planted (Szturc et al. 2023). Sections of reconstructed field roads can be seen in Fig. 2 and 3, their lengths are 610 m (VC 1), 25 m (VC 2), 190 m (VC 3) and 325 m (VC 4). In all cases, the roads are designed as single-lane roads with a width of 3 m (plus 2 x 0.25 m reinforced roadside). Directionally, the roads are designed in such a way as to make the extravillan of the Perná village optimally accessible, thereby enabling local residents and tourists to connect with the surrounding nature. Field roads consist of arches and straight sections. Longitudinal slopes of the sections follow the natural terrain as much as possible. Transverse slope is one-sided 3 % and guarantees the drainage of the plain as well as the safe drainage of surface runoff to drainage objects along the roads. Surface of the field roads will be made of mechanically reinforced aggregates, which guarantees good resistance to the movement of agricultural machinery and simultaneously it allows partial seepage of water into the subsoil.

A water pool with an earth dam (Fig. 2) with a flood area of 480 m² was designed in the Bergrus location. This dam (length 59 m, height 1.10 m) holds up to 192 m³ of water. A lowered place is designed in the crown of the dam for the drainage of possible higher flows. The surface of the embankment will be covered with humus and sown with a grass mixture. It will therefore be an element close to nature, which in the locality will contribute to the increase of water retention in the landscape. Its implementation, together with the subsequent planting of the banks with trees, can realistically be expected to increase ecological stability and biodiversity. There will be an improvement in the subsidization of underground water supplies and the conditions for the development of fauna and flora linked to the wetland community will be improved. The positive effect of small water reservoirs on water retention in the landscape and the transformation of flood waves was described, for example, by Tlapák et al. (2015).

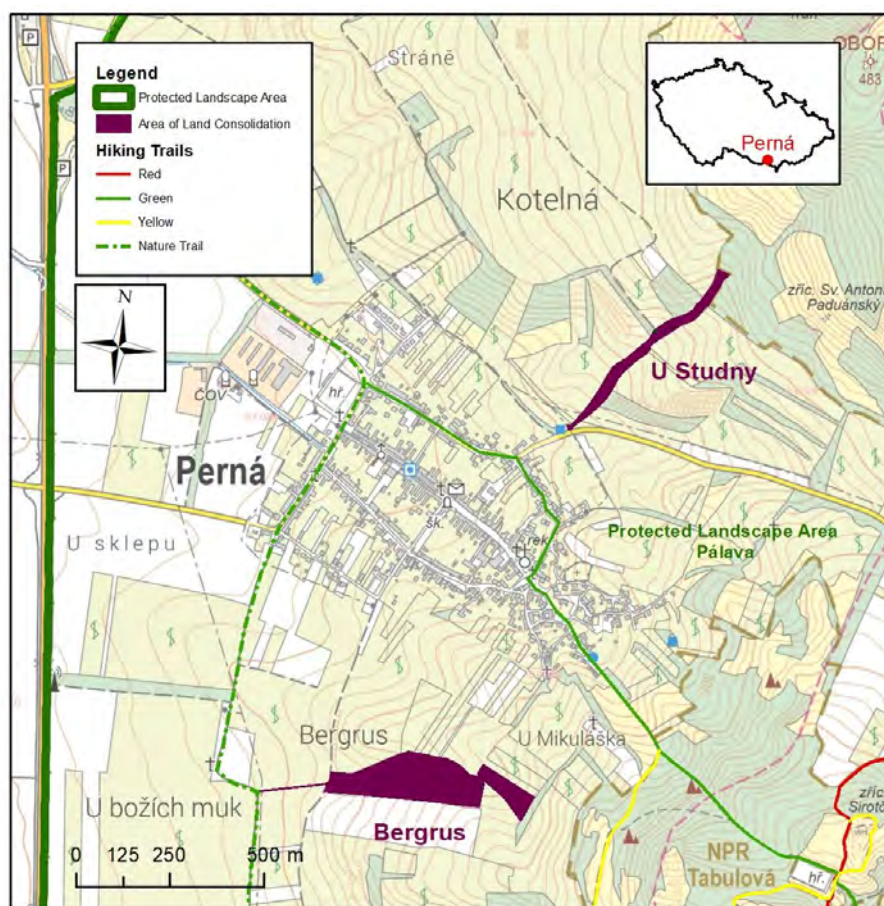


Fig. 1: Area of interest

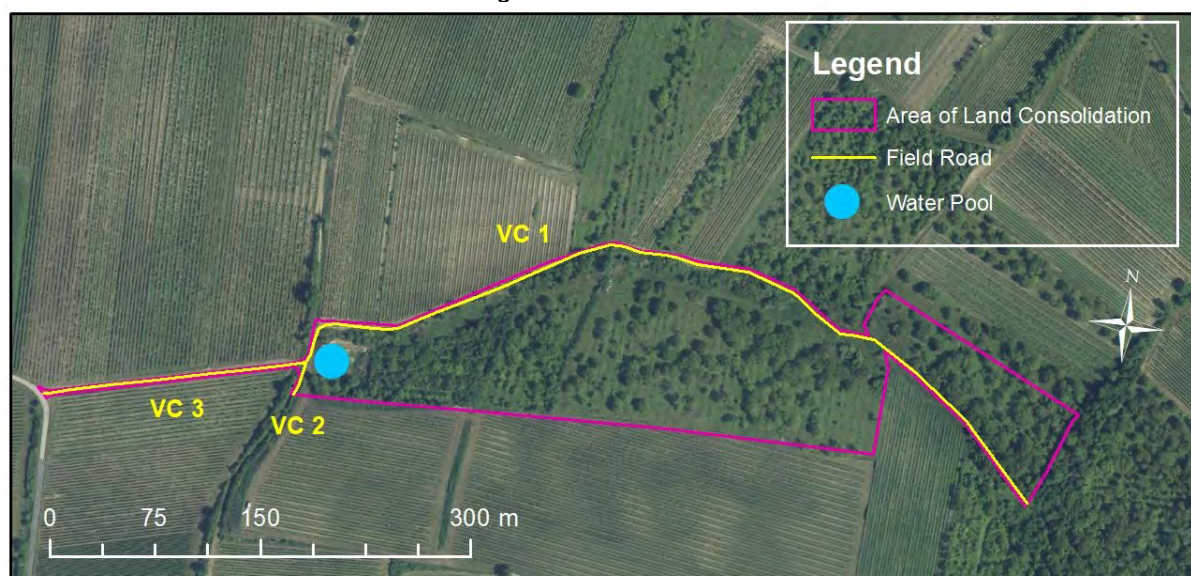


Fig. 2: Design of water pool (loc. Bergrus)

The U studny location (Fig. 3) is characterized by a strong soil erosion risk. Original VC 4 field road acted as a culvert and surface runoff posed a flood risk to the built up area. On the other hand, the field road had to be preserved due to the accessibility of field and vineyard tracks. That is why the strengthening of the field road surface was designed. The surface runoff on the field road will be interrupted by accompanying transverse drainage elements, which divert water from the road into ditches and then the water is led into the local ravine. A system of ten dams of four different types was designed in the ravine (Fig. 3): 3 wooden, 2 stone, 2 gabion and 3 log dams (Tab. 1). Wooden and log check dams will be constructed from horizontal and vertical system of logs and stakes. Gabion dams will be made of gabion baskets filled with gravel placed on compacted gravel bed. Also the stone

dams will be placed on a compacted gravel subgrade. All dams include safety overflows and stilling basins.

Tab. 1: Basic parameters of the designed check dams

Check dam	Type	Dam length (m)	Dam high (m)	Max. contain (m ³)
PR1	wooden	15	0.76	35
PR2	stone	17	2.86	511
PR3	gabion	11	1.68	175
PR4	log	12	0.76	93
PR5	wooden	8	0.78	12
PR6	wooden	9	0.55	9
PR7	log	10	1.44	41
PR8	gabion	14	2.83	392
PR9	log	14	1.98	204
PR10	stone	14	2.04	326

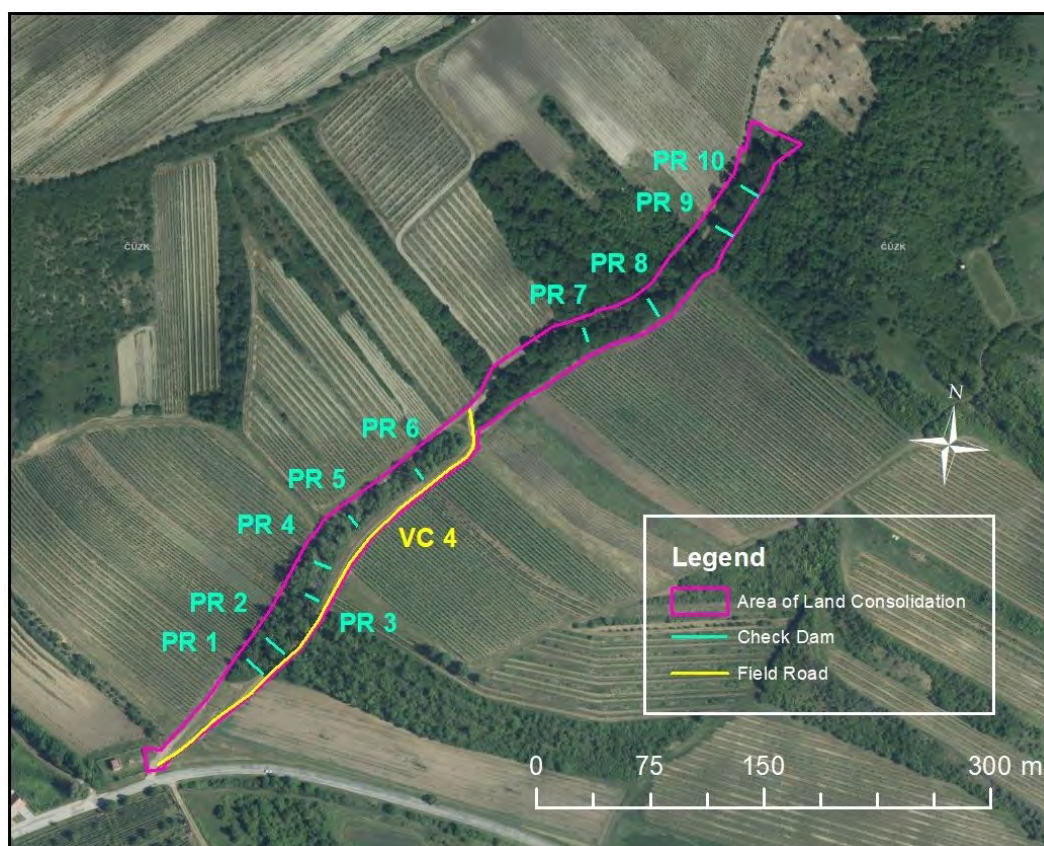


Fig. 3: Design of stabilization of ravine (loc. U Studny)

Both the water pool and the ravine stabilised with dams will be well accessible to tourists and, once completed, are expected to be a destination for recreational and sightseeing walks. The unique system of check dams will be especially interesting for tourists. The barriers will be conceived in four different construction methods using different materials. Descriptive boards, which will be installed near the realized elements of the PCF, will provide visitors with detailed information of both technical and ecological characteristics.

Conclusion

The elements of the PCF designed and implemented in the Perná cadastre are an illustrative example of the potential of the land development process for the protection of soil, water and the environment. These are elements close to nature, which, in addition to increasing water retention and erosion control, will contribute to increasing biodiversity and further making the area passable. Their recreational potential lies in connecting the village with the countryside and creating new attractive points (Fig. 4). There will be achieved the access to locations of tourist interest, locations suitable for

relaxation will be created with the opportunity to gain new knowledge about the landscape, its functions and conservation.



Fig. 4: Lookout over the ravine (view of the Perná village)

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Souhrn

Přínosy pozemkových úprav pro zlepšení ekologické stability a rekreačního potenciálu zemědělské krajiny jsou dnes dobře známy. V rámci jejich procesu se vytváří prostor pro návrh a realizaci opatření na ochranu půdy, vody a životního prostředí (např. zatravnění, pásové střídání plodin, meze, pásy dřevin, vodní nádrže, ...).

Chráněná oblast Pálava (Pavlovské vrchy) je vyhledávána turisty z České republiky i ze zahraničí. Předmětem ochrany jsou biotopy vzácných ekosystémů na svazích kopců s překrásnými vápencovými skalními útvary. V území se uplatňuje aktivní spolupráce CHKO s farmáři i obyvateli. Jednoduchá pozemková úprava, která probíhá v k.ú. Perná, je příkladem takové spolupráce, zejména CHKO a SPÚ. Prvky plánu společných zařízení navržené v Perné mají potenciál přispět ke zvýšení rekreační atraktivita této oblasti. Konkrétně se jedná o čtyři polní cesty, stabilizaci strže unikátním systémem přehrážek a jednu tůň. Jejich realizace povede ke zvýšení průchodnosti krajiny, zlepšení retence vody

v krajině, zvýšení ekologické stability a biodiverzity. V dotčených lokalitách vzniknou nové turisticky velmi zajímavé cíle s krajinotvornou a edukační funkcí, které rozšíří rekreační potenciál Pálavy.

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OPPORTUNITIES TO IDENTIFY SUITABLE SITES FOR THE IMPLEMENTATION OF SMALL WATER BODIES ON DRAINED AREAS

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Abstract

The main purpose of drainage, as one of the traditional amelioration measures, was to adjust the water and air regime of agricultural soils, i.e. to optimise the moisture and aeration of soils in terms of plant needs, soil workability and its carrying capacity for agricultural machinery. Due to changes in the economic conditions, progressive erosion of the land, unprofessional or rather neglected maintenance, ageing of structural elements, etc., quantitative and qualitative changes in the water regime of entire river basins have been occurring for a long time. The possible existence of drainage structures enters into the design of virtually all types of water management measures on small watercourses and in agricultural catchment areas and should be taken into account and used appropriately in these measures. Drainage water can subsidise small reservoirs, pools and wetlands, but only if the applicable standards are met, the technical design is appropriate, and the required water quality is maintained.

The selection of the area for the implementation of small water bodies must be carefully considered with regard to the hydrological, morphological and soil conditions of the environment, the limits and possibilities of the area, especially with regard to the downstream processes in the area (management of the surrounding land, connection to the hydrographic network, etc.). In the present study, a procedure for the design and construction of small water bodies on drained land is presented using the outputs of a multi-criteria analysis based on the search for an optimal solution through the selected factors.

Keywords: drainage, pools, wetlands, agriculture, multicriteria analysis

Introduction

Wetlands and pools are biotopes specific to organisms that require a permanent surface water or at least a very high water table to exist and thrive. They form a transition between terrestrial and aquatic ecosystems. They represent a natural water reservoir in the landscape and have a significant retention capacity in the event of excessive rainfall. They provide suitable conditions for the existence of specific wetland organisms and are the natural habitat of a wide range of plants and animals adapted to life in wetlands. By wetland we can imagine a permanently, or only for a certain period of the year, flooded area or an area with soil that is permanently saturated with groundwater. These are areas that form a kind of transition between terrestrial and aquatic ecosystems. These ecosystems take many forms that are always different from the others. For example, there are marshes, pools, peat bogs, floodplains and forests. Unlike a pond, a wetland may be completely waterless for a temporary period during a drought, but once the water comes, life will resume. In the context of water management revitalisation, a wetland can be described as a waterlogged area of land, often with irregular shapes and an unclear interface between water and land, where water depths of about 0.6 m prevail. Parts of the wetland have developed open water and are partially covered with emergent plants. An artificial wetland can be created by shallow flooding of the terrain by excavation, or a combination of both. Pools and wetlands are of great ecological importance in the landscape as they are very rich and diverse and have a large biomass production. Their water and climate importance is mainly due to the fact that they hold significant amounts of surface and shallow groundwater. These water reserves are predominantly active within the catchment, as they are able to help balance conditions in times of drought.

Materials and methods

The aim of the study was to identify, through a multi-criteria analysis, locations suitable for the implementation of small water areas in the selected area. Multicriteria analysis is a method used when deciding between several alternatives, whereby multiple resulting alternatives are not allowed simultaneously and only one alternative should always be the conclusion of the analysis. A

prerequisite for using multicriteria analysis is a larger number of quantifiable criteria to include in the decision-making process. In practice, multicriteria analysis is implemented through GIS tools as a so-called raster analysis of suitability, in our case the suitability of implementing the MVP in a given area. The layers entered into the multicriteria analysis were the floodplain soils layer, hydrological soil groups, critical point watersheds, concentrated runoff pathways, trans-regional UES, remote sensing, historic ponds, and slope. After editing and converting to raster data, map algebra was used to obtain a weighted average of all layers in the form of a final raster map.

To test the applicability of MKA in a specific environment, the 4th order watershed No. 2-01-01-0810-0-00 in the foothill area of the Jeseníky Mountains, including the selected cadastral area of Větrkovice, was selected (Fig. 1).

The area falls within the geomorphological unit of the Low Jeseník, geomorphological subunit Vítkovská vrchovina. The central part of the Vítkovská vrchovina (Vítkovská vrchovina) is the Heřmanická vrchovina (Heřmanická vrchovina), its relief is very rugged, with large plateaus of an aligned character and valleys of watercourses sunken to varying degrees. For this catchment area, a section of the MKA layers was selected for the analysis of sites potentially suitable for the implementation of water bodies. The analysis of the identified sites in the area was further focused on the survey of the presence of drainage structures, their possible presence and the condition of the land indicating the limited functionality of the possible drainage and thus the suitability of the land for change of use.

Results

Based on the analysis of the area according to the MKA outputs, areas suitable for the implementation of small water areas were identified. The colour range of the legend is divided into 6 categories, according to the same interval. The higher the value of the interval (maximum value of the interval = 1), the more suitable the site is evaluated for the implementation of SSSIs. In the area of interest Větrkovice, the MKA reaches a maximum value of 0.39 and an average value of 0.12. (Fig.1)

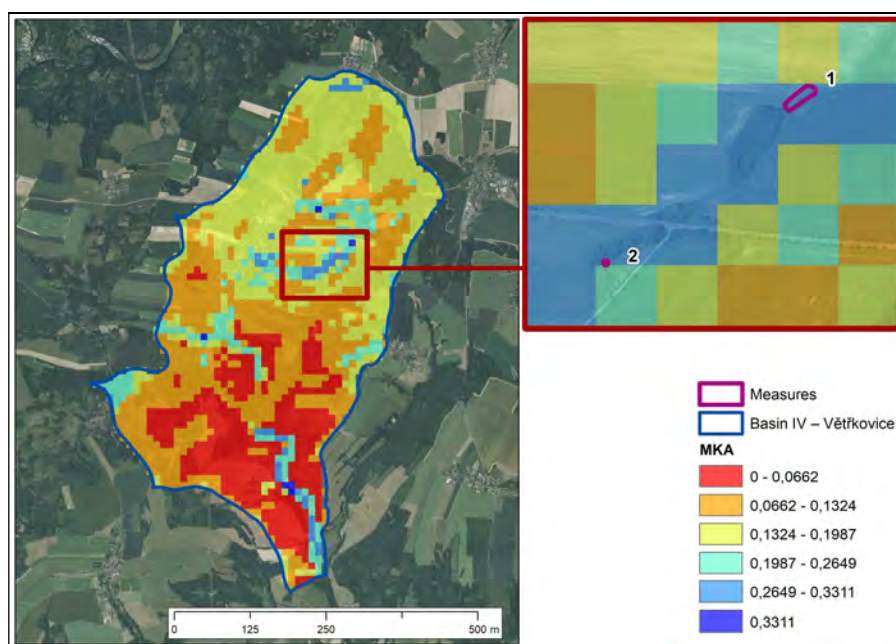


Fig.1: Area of interest

For the analysis of the existence of drainage structures, the LPIS <https://eagri.cz/public/portal/mze/puda/aplikace-mapove-podklady/uzitecne-aplikace> database was used in the first phase. From many experiences it can be concluded that the digitized polygons of drainage structures may not fully correspond to the project documentation of the implemented structures. Moreover, they do not contain information on the location of detailed drainage facilities (drains).

Based on a detailed survey of the area and an analysis of the limits and possibilities for the implementation of the structures regarding the ownership relations in the area, in consultation with the landowners, land owned by the municipality in the immediate vicinity of the watercourse was selected.

These lands have not been used by the municipality for a long time due to their unfavourable hydrological regime. They were also not used by ZD Slezská Dubina because the waterlogged area could not be managed. The MKA value in the selected site is 0.29. In cooperation with ZD Slezská Dubina, project documentation for the selected site was subsequently traced. Figure 2 presents the proposed location of the water reservoirs on the basis of the drainage construction project.



Fig. 2: Proposal for the location of water reservoirs on the basis of the drainage construction project.

Subsequently, project documentation was prepared for the construction of two pools in site 1 (measures 1) and a wetland in site 2 (measure 2) (Vysoudil, J., 2022). The construction of the pools (measure 1) was started in June 2023. During the excavation works, a drain running along the stream was uncovered. this drain was therefore discharged into the pools, its outlet part was blinded in order not to drain the pools under construction. In the case of the wetland construction (measure 2), the drainage drain was uncovered during construction, a new manhole was constructed, and the drainage was connected to the wetland. The pre-construction situation and the current status are documented in Figures 3 and 4.

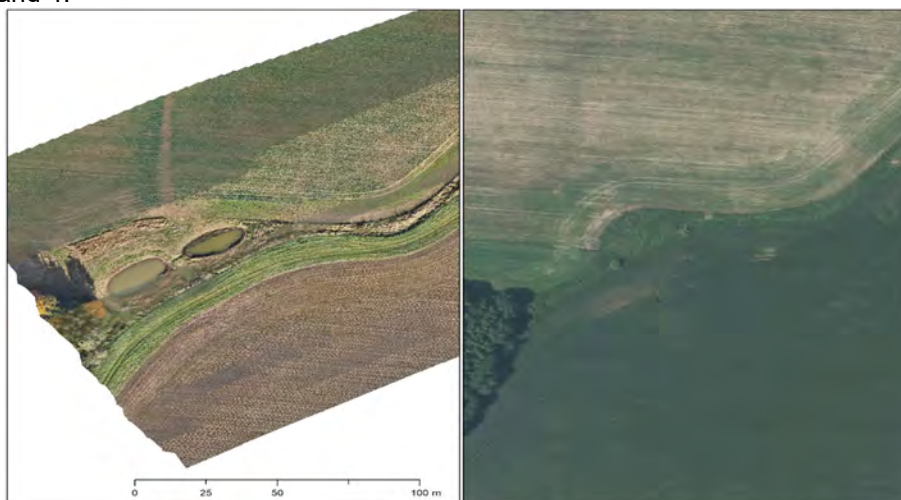


Fig. 3: Site of interest before and after implementation of the pools



Fig. 4: Site of interest before and after implementation of the wetland

Conclusion

The proposed measures can be characterised as measures to improve water conditions in the area, which will have a positive effect on optimising the water conditions in the area. The proposed buildings are designed to improve the water conditions in the area. (GEON, Ltd, 2022) The pools create another element of ecological stability, the primary purpose will be to create a wetland and aquatic environment for the preservation and restoration of aquatic habitat. The facilities have been complemented by the planting of landscape greenery.

The possible existence of drainage structures enters the design of virtually all types of water management measures on small watercourses and in agricultural catchments and should be considered and appropriately used in these measures (Kulhavy, Z. et al. 2013).

It is suggested to differentiate the management of drained areas to the original drainage function where it is necessary to farm and ensure agricultural production. Or, on the contrary, to direct the drained areas to the non-productive function by implementing appropriate water management measures on drainage structures (e.g. creation and restoration of water features in the landscape with eco-stabilisation function such as pools, wetlands, blind arms and small water reservoirs, revitalisation, and renaturation of drainage water recipients, etc.). Of course, in such a way as to avoid undesirable degradation of the drained land. (Tlapáková, L. et al., 2021).

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Souhrn

Hlavním účelem odvodnění jako jednoho z tradičních melioračních opatření bylo upravit vodní a vzdušný režim zemědělských půd, tj. optimalizovat vlhkost a provzdušnění půd z hlediska potřeb rostlin, zpracovatelnosti půdy a její únosnosti pro zemědělské stroje. V důsledku změn hospodářských podmínek, postupující eroze půdy, neodborné nebo spíše zanedbané údržby, stárnutí stavebních prvků apod. dochází již delší dobu ke kvantitativním i kvalitativním změnám vodního režimu celých

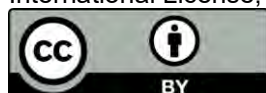
povodí. Drenážní vody mohou dotovat malé vodní nádrže, tůně a mokřady, ale pouze za předpokladu, že jsou dodrženy platné normy, technické řešení je vhodné a je zachována požadovaná kvalita vody. Na základě výsledků multikriteriální analýzy vybraného území byly vytipovány lokality vhodné k realizaci malých vodních ploch. Byl následně proveden podrobný terenní průzkum, konzultace s vlastníky pozemků a hospodařícím subjektem a na těchto podkladech lokalizovány plochy pro výstavbu tůní a mokřadu na pozemcích se stávkami odvodnění, které již omezeně plnily svoji funkci. Následně byla vypracována projektová dokumentace a provedeny stavby tůní a mokřadu. Tyto objekty jsou dotovány drenážními vodami. Došlo k odkrytí drénů, jejich zaústěním do vodního útvaru a zaslepením výtokových drénů tak aby byla zachována funkce odvodnění pod stávkami. Výběr území pro realizaci malých vodních nádrží je třeba pečlivě zvážit s ohledem na hydrologické, morfologické a půdní podmínky prostředí, limity a možnosti území, zejména s ohledem na navazující procesy v území (obhospodařování okolních pozemků, napojení na hydrografickou síť apod.). V předkládané studii je uveden postup návrhu a výstavby malých vodních nádrží na odvodněných pozemcích s využitím výstupů multikriteriální analýzy založené na hledání optimálního řešení prostřednictvím vybraných faktorů.

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PARK OF CHOCOLATE: DESIGN IDEAS FOR A HISTORICAL VILLAGE PARK AT A CHOCOLATE FACTORY

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Abstract

Ivanka pri Nitre is a small rural municipality situated close to the regional capital city Nitra in western Slovakia. The core of its green infrastructure consists in a historical park located in the centre of the village. In recent years, a chocolate factory was built in the northeastern part of the park and the factory alongside with the municipality aim at redesigning the park to meet the needs of users and visitors. The Institute of Landscape Architecture integrated this assignment in the Public Green Space Design Studio to develop design ideas in a research-led teaching process, using research by design. The studio generated seven different design scenarios that vary in philosophy and design morphology - 'the Park of Happiness and Joy', 'The Path to Chocolate', 'Green Island', 'Colourful Park', 'Park of Senses', 'Park of Chocolate', and 'Park of Fantasy'. All scenarios work in different forms and ways with the theme of chocolate and aim at enhancing the open space quality through colours, plants, programme, equipment, and furniture. Representatives of both the municipality and the factory were involved in the design process. Now they are seeking opportunities and schemes to implement the outcomes of the process.

Keywords: design teaching, green infrastructure, landscape architecture, research by design, research-led teaching

Introduction

Parks are core components of local green infrastructure and important open spaces for everyday recreation and social interaction (Biľušová et al., 2020). They are hotspots of local biodiversity in built-up areas and thanks to a high concentration of trees and woody plants, they significantly improve microclimate and provide a wide range of ecosystem services to inhabitants and visitors (Biľušová et al., 2021; Bechera et al., 2022). Public parks in rural areas enhance the local biodiversity through the species composition of trees, which often includes non-traditional and rare species (Bakay, 2015; Hus et al., 2021). Re-designing and revitalising parks in rural municipalities is one of the main tasks of landscape architects (Čibík et al., 2020; Tóth, 2022; Tóth, 2023). This task includes the reconstruction, restoration, or redesign of historical parks and gardens, which have a high concentration in rural municipalities in Slovakia (Tóth and Feriancová, 2016; Van den Toorn et al., 2019). The municipality of the rural settlement Ivanka pri Nitre along with the Lyra company have commissioned the Institute of Landscape Architecture at the Slovak University of Agriculture to develop design ideas for the public park located in the village centre, where recently a new chocolate factory was built in its peripheral part. The assignment was elaborated in 2021-2022 within the Public Green Space Design Studio and results were processed in a booklet in 2023 (Tóth et al., 2023).

Material and methods

Ivanka pri Nitre is a small rural municipality situated close to the regional capital city Nitra in western Slovakia. The core of its green infrastructure consists in a historical park located in the centre of the village. In recent years, a chocolate factory was built in the northeastern part of the park and the factory alongside with the municipality aim at redesigning the park to meet the needs of users and visitors. The Institute of Landscape Architecture integrated this assignment in the Public Green Space Design Studio to develop design ideas in a research-led teaching process, using research by design as the main design-teaching method. The Institute of Landscape Architecture was commissioned to develop a landscape architectural study of the public park located in the centre of the municipality. The first design phase started with field works and mapping and continued with the analysis of wider spatial relations, historical development, landscape context, urban structure and transportation, functional and spatial characteristics, built structures and technical infrastructure, and vegetation. The main methodological approach applied was research by design, while developing seven possible scenarios. The process was communicated with representatives of the chocolate factory and the municipality and final outcomes were presented to the municipality in 2023.

The 3-hectare park was established in English landscape style, but the original composition of the park has not been preserved, see figure 1.



Fig. 1: The public park in the centre of the municipality – historical situation in the early 20th century (left) and situation before the construction of the chocolate factory in 2021-2022 (right) (source: ZB GIS Slovakia).

Building the new chocolate factory in 2021-2022 has significantly changed the character of the park, yet it has generated a new local identity and development potential. Therefore, authors of the design concepts have worked with the chocolate theme in their design ideas and inspirations, see figure 2.



Fig. 2: Chocolate was the main inspiration or theme in most of the design concepts. Some authors were inspired by chocolate flow, its diverse forms or the branching style and colours (authors of sketches and diagrams: A.Kulperová, D.Smutniková, A.Varga, supervisor: A.Tóth, 2021-2023).

Results

The studio generated seven different design scenarios that vary in philosophy and design morphology - 'the Park of Happiness and Joy', 'The Path to Chocolate', 'Green Island', 'Colourful Park', 'Park of Senses', 'Park of Chocolate', and 'Park of Fantasy'. All scenarios work in different forms and ways with the theme of chocolate and aim at enhancing the open space quality through colours, plants, programme, equipment, and furniture. Representatives of both the municipality and the factory were involved in the design process. Now they are seeking opportunities and schemes to implement the outcomes of the process.





Fig. 5: The design concept Colourful Park enhances the park with a wide range of vivid colours inspired by the visual branding of the chocolate produced in the park (author: D.Smutniková, supervisor: A.Tóth, 2021-2023).

Discussion

Design studio as a method of project-based and research-led teaching has proved to be an efficient way to address current challenges of open spaces through design teaching and learning (Čakovská et al., 2019). The studio has generated seven different redesign scenarios (Tóth et al., 2023), which were presented to representatives of the municipal board. Thanks to the diversity of solutions, a vivid discussion was enabled, which shall lead to a prospective reconstruction of the park in the future. It has a great potential to become the most important public open green space in the village, providing a wide range of ecosystem services and benefits to inhabitants and visitors (Bihuňová et al., 2020).

Conclusion

Solutions generated within the design studio include a set of analyses and design ideas for the centrally situated park in the municipality of Ivanka pri Nitre. The outcomes of the design studio are currently being used as a basis and starting point for a long-term process of a comprehensive redesign, that has already started through an intensive exchange between the municipality and the chocolate factory. The municipality of Ivanka pri Nitre is currently seeking for opportunities to apply for fundings for the reconstruction of the park, with Lyra company as the main partner.

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Souhrn

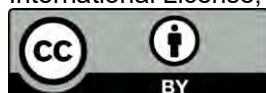
Ivanka pri Nitre je malá venkovská obec ležící v blízkosti krajského města Nitra na západním Slovensku. Jádro její zelené infrastruktury tvoří historický park, který se nachází v centru obce. V posledních letech byla v severovýchodní části parku vybudována továrna na čokoládu, která se spolu s obcí snaží park upravit tak, aby vyhovoval potřebám uživatelů a návštěvníků. Ústav krajinářské architektury začlenil tento úkol do Ateliéru navrhování veřejné zeleně, aby rozvíjel návrhové myšlenky v rámci výuky vedené výzkumem s využitím výzkumu prostřednictvím návrhu. V ateliéru vzniklo sedm různých scénářů návrhu, které se liší filozofií a morfologií návrhu - 'Park štěstí a radosti', 'Cesta k čokoládě', 'Zelený ostrov', 'Barevný park', 'Park smyslů', 'Park čokolády' a 'Park fantazie'. Všechny scénáře různými formami a způsoby pracují s tématem čokolády a jejich cílem je zvýšit kvalitu volného prostoru prostřednictvím barev, rostlin, programu, vybavení a mobiliáře. Do procesu navrhování byli zapojeni zástupci obce i továrny. Nyní hledají možnosti a schémata, jak výstupy procesu realizovat.

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POTENTIAL FOR CROWDSOURCED HYDROLOGIC DATA ON THE MFF KŘTINY AS A SIDE PRODUCT OF LOCAL RECREATIONAL ACTIVITIES

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Abstract

Citizen science can be simply defined as the practice of engaging the public in the observation and production of reliable data and information usable by scientists. Citizen science is a growing phenomenon with many good results in various fields of science. To this day, there are already a number of examples of crowdsourced hydrological monitoring experiments that can be used as inspiration. One of the big challenges in streamflow measurements in small forest streams are the many potential sources of wrong readings (branches and leaves clogging the weir, animals interfering, ice and snowmelt, etc.) which cause high uncertainty in the measured data. The best way to combat this is to frequently monitor the state of the measuring device, which in remote forest areas can be rather complicated. Using a citizen science approach and allowing people to collect hydrometric data during their leisure activities can be a great way to increase the number of in situ readings and potentially greatly improving the quality of the available hydrological data. In this article we look at the possibilities and technological restrictions for crowdsourced hydrological data as well as their potential benefits at some areas on the Training forest Enterprise Masaryk Forest Křtiny.

Keywords: Citizen science, Streamflow, Small forest streams, Headwater catchments

Introduction

Citizen science can be simply defined as the practice of engaging the public in the observation and production of reliable data and information usable by scientists. A citizen scientist is a volunteer who collects and/or processes data as part of a scientific enquiry (Silvertown, 2009). Citizen science is nothing new it is rather connected to the very roots of scientific endeavors. Science as a paid profession is quite young phenomenon, dating from the later part of the 19th century. With regards to current usage of citizen science we can therefore talk about its rediscovery with new purposes and goals. The information technology revolution and the advent of the Internet and location-aware mobile technologies equipped with cameras and other sensors (Zerger et al., 2010) have greatly increased the capacity of what citizen scientists can do. Citizen science can help to address major conservation challenges simply by identifying and naming current and future utilization of studied areas since citizens are one of the important stakeholders in the landscape (Brus et al., 2020). Citizen science can help namely by (1) enabling science that might not otherwise be feasible because of scale or for other practical reasons, and (2) better engaging the public in helping to make decisions (McKinley et al., 2017). So the goals can be either acquiring scientific knowledge by letting people (citizen scientists "CS") do the observations or stimulate public input and engagement in environmental management and policy making.

In Hydrological monitoring, it is essential to guide evidence-based decision making necessary for sustainable water resource management and governance. Limited hydrometric datasets and the pressure on long-term hydrological monitoring networks make it paramount to explore alternative methods for data collection. Citizen science in hydrological research has recently gained popularity and crowdsourced monitoring is a promising cost-effective approach for data collection (Njue et al., 2019).

In this paper, we used a suburban forest experimental catchment as a potential hotspot for trying and incorporating citizen science to enable a better and denser measurement network for monitoring and understand hydrological processes. Taking inspiration in current literature and information of similar projects, we aim to design a citizen science operating framework in the study area and estimate its potential.

Material and methods

The study area is the headwater catchment of a small forest stream Melatín located on the property of the Training forest Enterprise Masaryk forest Křtiny. It can be described as a suburban forest area with a dense network of tourist paths and high recreational potential and utilization. The idea is that there are a lot of forest visitors in areas like this, which makes it a perfect representative area of similar suburban forests. The total area of the catchment reaches 2.7 square km, mean altitude around 400 m a. s. l. (Figure 1).

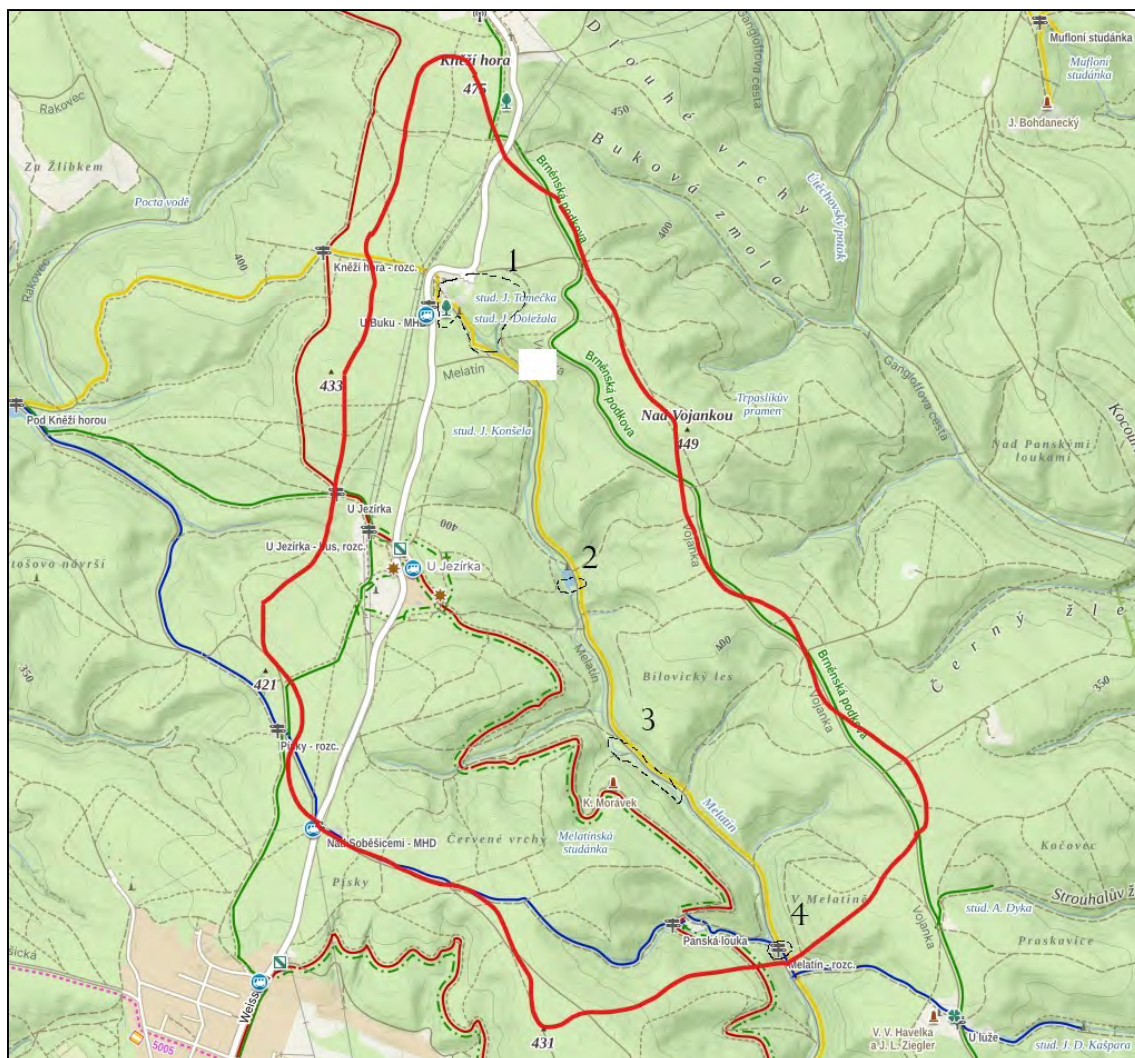


Fig. 1: Localisation of the Melatín experimental catchment

Inside this catchment we designed a network of measurement stations which relies on untrained observers sending measured and observed data via mobile phone text messages to a server (Lowry, 2013). Here, we concentrate on the easily observed or measured variables and processes connected to the water balance of the area (Table 1).

Tab. 1: Description of citizen science measurement stations

Observed variable or process	Measuring process and equipment	Expected results
Water level	Water height gauge	number in centimeters
Ecohydrology	Visual observations	water in ponds yes/no
Ecohydrology	Visual observations	tributaries on water yes/no
Phenology	Visual observations	phenology phase

Here is the description of the designed measuring stations:

1. Phenology observations

This is a forest clearing with solitaire trees of different tree species. Here, the CS would be informed about the different phenology phases by a sign near individual trees (some conifers and some broadleaved) and encouraged to observe and text the phase and date at which it was observed. This will serve as an indicator of the growing season and expected evapotranspiration to the scientist while simultaneously educating public.

2. Water level in the reservoir

There would be a water height gauge with appropriate scale on the spillway of the dam. This would enable the CS to take a reading from the gauge and text it to the scientist. This would serve as an indicator of the streamflow and baseflow related hydrological processes.

3. Ecohydrology

Along the stream, there are a number of small ponds on the banks and a number of tributaries. In the middle of these ponds, there would be a water height gauge with appropriate scale indicating the water level of these ponds. This would enable the CS to take a reading from the gauge and text it to the scientist. On the tributaries, the CS would only indicate if there is water in the streams or not. This would serve as an indicator of the wetness conditions in the catchment. There is a possibility that these ponds and streams will be intermittent which would be an interesting factor to observe. These observations can be extended to include the observations of frogs and other wildlife in the ponds.

4. Water level in the discharge profile

At the discharge outlet of the catchment a Thomson weir will be installed for continuous water level measurements via ultrasound sensors. There would be a water height gauge with appropriate scale on the spillway. This would enable the CS to take a reading from the gauge and text it to the scientist. This would serve as an indicator of the streamflow needed for proper calibration of the sensors.

Results

On the area of the experimental Melatín catchment, a number of four measurement stations were designed. They are aimed both at obtaining ecohydrological data sets via crowdsourced citizen science as well as increasing awareness of the forest visitors towards environmental studies and nature as a whole. Both of these goals exploit the fact that the area is frequently visited suburban forest and it is effectively using its recreational potential for scientific and educational purposes.

Discussion

The data obtained by the CS will have to be validated against our own measured datasets. This is possible on the 4th site, where the water level measurements will be performed by an ultrasound sensor. The expected accuracy is quite high (Figure 2). At the same time, field measurements of water level are subject to a number of uncertainties. Most commonly bed material load as well as wood, that gets clogged in the spillway during stormflow events, stream freezing and thawing during winter, falling leave and twigs under windy autumn days (Deutscher et al., 2021). All these sources require timely repairs of the measuring device or the recalibration of the sensors. This cannot be done without in situ water level data. Here, citizen science could be a great source of correct information.

The success of any CrowdHydrology station location is based on both traffic passing by the station and the potential citizen scientist's motivation to send a text message (Lowry, 2013). The motivation of people to send the messages and take their time during recreational walk or other leisure activities needs to be cultivated if this approach aims to be successful. Therefore future communication with local environmental and educational authorities has to be promoted to inform people about citizen science and its benefits and goals.

At the same time, specific efforts should be made to connect our results to other citizen science endeavors, such as the CANDHY working group which is the Citizens and Hydrology Working Group established in July 2017 by the International Association of Hydrological Sciences (IAHS). The principal aim of the CANDHY WG is to support the use of citizen science in hydrology and harmonize research in this context, promoting the value of citizen science for advancing the hydrological sciences and finding answers to the most pressing open scientific, technical, and societal challenges in this field of expertise (Nardiu et al., 2022). Internationalization is the best way forward.



Fig. 2: An illustrative figure taken from Lowry (2013) documenting expected accuracy of crowd data readings compared to instrumental measurements.

Conclusion

In this article we looked at the possibilities of incorporating citizen science to an experimental catchment. We designed a number of measurements sites equipped to enable data readings and observations by citizen scientists who would be willing to take their time to do it. We believe that including citizen science can be a great asset to current hydrological monitoring in the field and can be used as a stepping stone for other research activities on the Training forest Enterprise Masaryk Forest Křtiny and other similar suburban forest areas in the broader scale.

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Souhrn

Občanskou vědu lze jednoduše definovat jako zapojení veřejnosti do pozorování a získávání spolehlivých dat a informací využitelných vědci. Občanská věda je rostoucím fenoménem s mnoha dobrými výsledky v různých oblastech vědy. K dnešnímu dni již existuje řada příkladů crowdsourcingových hydrologických monitorovacích experimentů, které lze použít jako inspiraci, jedním z nich je i pracovní skupina CANDHY, což je pracovní skupina Citizens and Hydrology, kterou v červenci 2017 založila Mezinárodní asociace hydrologických věd (IAHS). Na území

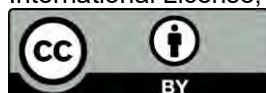
experimentálního povodí Melatína byla navržena řada čtyř měřicích stanic. Jejich cílem je jak získání souborů ekohydrologických dat prostřednictvím crowdsourcingu občanské vědy, tak i zvýšení povědomí návštěvníků lesa o ekologických studiích a přírodě jako celku. Oba tyto cíle využívají skutečnosti, že oblast je hojně navštěvovaným příměstským lesem a efektivně využívá svůj rekreační potenciál pro vědecké a vzdělávací účely. Věříme, že zapojení občanské vědy může být velkým přínosem pro současný hydrologický monitoring v terénu a může být využito jako odrazový můstek pro další výzkumné aktivity na Školním lesním podniku Masarykův les Křtiny a dalších podobných příměstských lesních oblastech v širším měřítku.

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PRECIPITATION AND AIR TEMPERATURE TREND INVESTIGATION OF THE KOSICE BY TRADITIONAL APPROACHES

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Abstract

Trend investigation of the hydrometeorological variables is a critical component of the adaptation to global climate change. Accurate determination of the ongoing hydrometeorological trends will help to make more reliable plans for a sustainable future. This study examined 50 years of monthly and annual data belonging to Kosice station using Mann-Kendall, Spearman's rho, and Sen's slope approaches. Trends of the precipitation and maximum and minimum air temperature were analyzed by applying the traditional methods mentioned. The Kosice station records start in 1972 and end in 2022, the same as for all three parameters. While trends were not identified for the precipitation as statistically meaningful, significantly increasing trends were found for minimum and maximum air temperature.

Keywords: Climatological Trend, Mann-Kendall Test, Spearman's Rho Test, Sen's Slope, Trend Magnitude

Introduction

Precipitation and air temperature change on a regional scale over the last decades have been important issues for water managers, hydrologists, irrigation engineers, etc. Detection of the past variabilities in the precipitation and the air temperature may help planners to develop their strategies or completely revise them. As recent reports about global warming say, the average air temperature has increased, and it keeps increasing, causing changes in the hydrological cycle. Due to the importance of the phenomenon, much recent research about climatological changes has been published on regional scales.

Gocic, M., & Trajkovic, S., 2013 used Mann-Kendall and Sen's Slope statistics to analyze the meteorological trends in Serbia. They recommended that Mann Kendall and Sen's Slope approach be very useful and reliable in the case of hydrometeorological trend investigations. Soltani, M., et al., 2013 performed statistical analysis for the long-term precipitation trend of the Gorgan Weather Station. They used a monthly data set of precipitation from 1956 to 2015. According to the time series analysis, they did not obtain any significant trends. Kocsis T. et al., 2017 conducted research for detecting the signs of climate change based on long-term precipitation trends. They used both parametric and non-parametric evaluations for the detection of trends. Longobardi, A., & Villani, P., 2010 published an annual and seasonal study about the trends of rainfall. They used 211 station records located in Italy for analysis and underlined that Italian territory has already started to suffer from the decreasing rainfall trends. Salami, A. et al., 2016 conducted research on the trends of the hydrometeorological parameters2 trend and the significance of the trends. They used the Mann-Kendall test and standard anomaly index to detect the nature of the trends. According to their outputs for the Lagos coastal area, they found that rainfall, humidity, wind speed, and sea level rise have tended to increase while the air temperature has a tendency to decrease. Yadav, R. et al., 2014 also applied the Mann-Kendall test to detect the trends of the precipitation and air temperature in Uttarakhand. They used a monthly data set for analysis, and they evaluated the magnitude by using Sen's Slope. Ahmad, I., 2015 performed a study for Swat Basin, Pakistan, using Spearman's rho and Mann Kendall's tau tests. They found both increasing and decreasing trends mixed for seasonal and monthly detection. Mahato, L. L., 2021 investigated the long-term climatic trends of the Jharkhand from 1901 to 2002. They found some significant trends for climatic variables and suggested the study outputs will benefit policymakers and water managers. More previous studies about the usage of the Mann-Kendall test and Spearman's Rho test can be found in Krishnan, M. N., et al., (2019); Abghari, H., et al., (2013); Malarvizhi, R., & Ravikumar, G. (2021); Huang, Y. F., et al., (2015); Ceribasi, G., et al., (2014); Zhang, Y., et al., (2022).

In this study, the authors focused on the maximum and minimum air temperature and precipitation changes in Kosice, Slovakia, for a 50-year period. Non-parametric Mann-Kendall and Spearman's Rho

tests were used for the calculations. Also, the significance of the trends was investigated by using Sen's slope.

Methodology

In this study, air temperature and precipitation trends of Kosice, Slovakia, were investigated by using traditional Mann-Kendall and Spearman's rho tests. The magnificence of the trends was evaluated by calculating Sen's slope values. Records belonging to the Kosice range from 1972 to 2022, according to the hydrological year. The beginning of the hydrological year is November, according to the Slovak arrangements. Therefore, the results of each approach were shared in Tables by using November as the starting month. Precipitation and maximum and minimum air temperature were analyzed monthly and annually.

Mann Kendall and Spearman's rho test are both non-parametric tests. The decision of the trends for Mann-Kendall and Spearman's rho tests was made based on the null hypothesis. In this case, while the null hypothesis (H_0) indicates no trends, the alternative hypothesis (H_1) indicates a trend. All calculations were done by accepting the confidence interval of 95 percent, while alpha was taken as 0.05.

Mann-Kendall Test

The Mann-Kendall test is one of the most popular traditional tests in use for climatologic trend investigation. As it is mentioned before, this test is a non-parametric test. It is mainly developed by Mann, 1945 and Kendall, 1975. Calculation steps of the Mann-Kendall is given below;

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^n \text{sgn}(x_j - x_k) \quad (1)$$

In eq.1. "S" is the Mann Kendall stat and the calculation of the $\text{sgn}(x_j - x_k)$ is given in eq 2.

$$\text{sgn}(x_j - x_k) = \begin{cases} +1; & \text{if } (x_j - x_k) > 0 \\ 0; & \text{if } (x_j - x_k) = 0 \\ -1; & \text{if } (x_j - x_k) < 0 \end{cases} \quad (2)$$

For the purpose of the acceptance or rejection of the null hypothesis the Z stat based on the obtained "S" value must be calculated. The calculation of it is shared in equation 3.

$$Z = \begin{cases} \frac{S-1}{\sigma} & \text{if } S > 0 \\ 0 & \text{if } S = 0 \\ \frac{S+1}{\sigma} & \text{if } S < 0 \end{cases} \quad (3)$$

In equation 3. "σ" is the variance of the slope value. The calculated value must be compared to the critical Z value of the two-tailed normal distribution.

Spearman's Rho Test

The Spearman's rho test is also a non-parametric test, and it is based on the rank of each value of the time series. Spearman's rho calculation steps are as follows;

$$D = 1 - \frac{6 \sum_{i=1}^n (R_i - i)^2}{n(n^2 - 1)} \quad (4)$$

$$Z_{SR} = D \sqrt{\frac{(n-2)}{(1-D^2)}} \quad (5)$$

In equation 4, „n" is the time series length, and „R_i" is the ith rank of each monthly record. In equation 5, ZSR is the Z stat calculated according to Spearman's rho value, and it will be used to accept or reject the null hypothesis.

Sen's Slope

This approach is generally used to evaluate the significance of the trends. The larger the slope value, the more important the trend is. Sen's slope formula is given in equation 6.

$$\beta = \text{median} \left\{ \frac{x_j - x_i}{j - i} \right\} \quad (6)$$

Equation 6 x_j and x_i shows the records of the time series in the jth and ith time steps (Sen, 1968).

Results and Discussions

Kosice meteorological station precipitation and air temperature records for last 50 years were analyzed by using traditional trend investigation methods. Results of the precipitation and maximum and minimum air temperature were shared in separate tables. Sen's slope values were calculated and added to the Mann-Kendall results tables to show the significance level of the detected trends. Mann-Kendall test results of the precipitation are given in Table 1.

Tab. 1: Mann-Kendall test and Sen's Slope results for precipitation

Hydrologic Time Scale	Alpha	MK Stat.	Critical Z Value	Z Stat.	Trend	Sen's Slope
November	0.05	149.00	1.96	1.24	-	0.19
December		-94.00		-0.78	-	-0.13
January		-129.00		-1.07	-	-0.28
February		-25.00		-0.20	-	-0.07
March		-73.00		-0.60	-	-0.25
April		38.00		0.31	-	0.11
May		-32.00		-0.26	-	-0.13
June		35.00		0.28	-	0.11
July		-12.00		-0.09	-	-0.05
August		3.00		0.02	-	0.00
September		46.00		0.38	-	0.08
October		139.00		1.15	-	0.17
Annual		-33.00		-0.27	-	-0.35

When Table 1 is examined, it will be seen that no trends were detected within the given confidence interval. Even if any trends were not detected for precipitation by using the Mann-Kendall test, a significantly negative slope was calculated by Sen's slope in the annual evaluation. Spearman's rho precipitation results are shared in Table 2. Same as the Mann-Kendall test, alpha was considered as 0.05. The two-tailed test was used for the decision of the null hypothesis within the 95 percent confidence interval.

Tab. 2: Spearman's rho test precipitation results

Hydrologic Time Scale	Alpha	Sr Value	Critical Z Value	ZSr	Trend
November	0.05	0.17	1.96	1.22	-
December		-0.10		-0.67	-
January		-0.17		-1.17	-
February		-0.01		-0.10	-
March		-0.09		-0.62	-
April		0.09		0.59	-
May		-0.05		-0.34	-
June		0.02		0.14	-
July		0.01		0.06	-
August		0.00		0.01	-
September		0.06		0.39	-
October		0.16		1.12	-
Annual		-0.03		-0.22	-

Spearman's rho test results were similar to the Mann-Kendall test for the precipitation. No trends were found for this approach too.

Mann-Kendall and Sen's slope test minimum temperature results are shared in Table 3.

Tab. 3: Mann-Kendall test and Sen's Slope results for minimum air temperature

Hydrologic Time Scale	Alpha	MK Stat.	Critical Z Value	Z Stat.	Trend	Sen's Slope
November		145.00		1.21	-	0.04
December		168.00		1.40	-	0.05
January		18.00		0.14	-	0.00
February		82.00		0.68	-	0.03
March		-27.00		-0.22	-	0.00
April		21.00		0.17	-	0.00
May	0.05	215.00	1.96	1.79	-	0.05
June		433.00		3.61	Positive	0.08
July		354.00		2.96	Positive	0.06
August		451.00		3.77	Positive	0.07
September		184.00		1.53	-	0.03
October		56.00		0.46		0.01
Annual		447.00		3.73	Positive	0.04

According to the Mann-Kendall test results of the minimum air temperature parameter, which is given in Table 3, some increasing trends were detected. The most striking aspect of the results was that all detected belong to the summer season. Also, a significantly increasing trend for the minimum air temperature was calculated for the annual evaluation.

Sen's slope was calculated for June as the maximum, as it shows the most significant trend according to the slope calculation. The following highest slopes were calculated for August and July, respectively. Also, the direction of each Sen's slope value was positive, which is compatible with the Mann-Kendall outputs.

Spearman's rho test results for the minimum air temperature are shared in Table 4.

Tab. 4: Spearman's rho test minimum air temperature results

Hydrologic Time Scale	Alpha	Sr Value	Critical Z Value	ZSr	Trend
November		0.18		1.24	-
December		0.23		1.64	-
January		0.04		0.31	-
February		0.11		0.80	-
March		-0.01		-0.07	-
April		0.04		0.31	-
May	0.05	0.27	1.96	1.91	-
June		0.47		3.73	Positive
July		0.46		3.62	Positive
August		0.55		4.59	Positive
September		0.25		1.79	-
October		0.07		0.47	-
Annual		0.53		4.36	Positive

The monthly and annual evaluation of the minimum air temperature calculated by Spearman's rho was found to be consistent with the other method. Like the Mann-Kendall approach, positive trends were examined for the summer season months and annually. The maximum Z value of Spearman's rho test was calculated for August. Only in March was a trend that tended to be negative observed.

Trend investigation of the maximum air temperature recorded in Kosice station is given in Table 5 for the Mann-Kendall and the Sen's Slope.

Tab. 5: Mann-Kendall test and Sen's Slope results for maximum air temperature

Hydrologic Time Scale	Alpha	MK Stat.	Critical Z Value	Z Stat.	Trend	Sen's Slope
November	0.05	375.00	1.96	3.13	Positive	0.08
December		154.00		1.28	-	0.03
January		120.00		1.00	-	0.03
February		219.00		1.82	-	0.06
March		129.00		1.07	-	0.03
April		306.00		2.55	Positive	0.07
May		210.00		1.75	-	0.03
June		478.00		3.99	Positive	0.09
July		471.00		3.93	Positive	0.08
August		469.00		3.92	Positive	0.07
September		183.00		1.52	-	0.04
October		83.00		0.69	-	0.01
Annual		628.00		5.24	Positive	0.05

The results in Table 5 indicate common trends with minimum and maximum air temperatures for Kosice. Positive trends were detected for maximum air temperature in the summer and annually. Different from the minimum air temperature, meaningful increasing trends were detected in November and April. All calculated Mann-Kendall stats are positive. Unless the trends were not detected for every month, the max. air temperature tends to increase with each time step. The maximum Sen's slope was calculated for June, the same as for the min. air temperature parameter.

Spearman's rho test results of the max. air temperature are given in Table 6 lastly. The evaluation was done within the 95 percent confidence interval, and trends were identified based on the acceptance of the null hypothesis.

Tab. 6: Spearman's rho test maximum air temperature results

Hydrologic Time Scale	Alpha	Sr Value	Critical Z Value	ZSr	Trend
November	0.05	0.44	1.96	3.40	Positive
December		0.20		1.38	-
January		0.15		1.05	-
February		0.27		1.93	-
March		0.14		0.97	-
April		0.38		2.87	Positive
May		0.26		1.83	-
June		0.58		4.92	Positive
July		0.54		4.46	Positive
August		0.56		4.74	Positive
September		0.25		1.81	-
October		0.12		0.82	-
Annual		0.70		6.73	Positive

When the Spearman's rho max. air temperature results are considered, the first thing that catches the eye is that the annual trend tends to rise excessively. The max. Spearman's rho Z value was

calculated for June on a monthly scale. The same as the Mann-Kendall results, all trends tend to rise as all Sr values are positive.

Conclusion

Climatic conditions influence the condition for recreation in the area. In this study, trends of the hydrometeorological variables of the Kosice were investigated by using various traditional methods. The reason of this research is also for recreation purposes. Results showed that Mann-Kendall and Spearman's rho tests have quite similar outputs for this particular study area. Maximum and minimum monthly air temperature records were evaluated separately to see the possible extremums. The Analysis done for the precipitation revealed there are no statistically significant trends in monthly or annual evaluation. However, min. and max. air temperature analysis demonstrated that there is a significantly rising trend in summer for both minimum and maximum air temperature. Moreover, the annual trend is statistically meaningful, which is highly positive for both min. and max. air temperature. Sen's slope values confirmed that the time steps with trend detection have high slope values. One of the other main outputs of the study was that no decreasing trends were detected from any of the approaches used. However, the precipitation outputs of the mentioned approaches have some negative values, which may show that the trend may tend to decrease.

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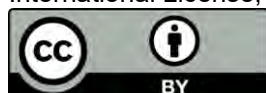
Souhrn

Zkoumání trendů hydrometeorologických proměnných je důležitou součástí adaptace na globální změnu klimatu. Přesné určení probíhajících hydrometeorologických trendů pomůže vytvořit spolehlivější plány pro udržitelnou budoucnost. Tato studie zkoumala 50 let měsíčních a ročních údajů patřících stanici Košice s použitím přístupů Mann-Kendall, Spearman's rho a Sen's slope. Trendy srážek a maximální a minimální teploty vzduchu byly analyzovány za použití uvedených tradičních metod. Záznamy ze stanice Košice začínají v roce 1972 a končí v roce 2022, stejně jako u všech tří parametrů. Zatímco u srážek nebyly identifikovány statisticky významné trendy, u minimální a maximální teploty vzduchu byly zjištěny výrazně rostoucí trendy.

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QUANTIFYING THE COOLING FUNCTION OF URBAN VEGETATION BASED ON IMAGE DATA ANALYSIS

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Abstract

Important regulatory ecosystem functions of vegetation include cooling functions. CICES (ver. 5.1) classifies this function as Regulation of temperature and humidity, including ventilation and transpiration cices (code 2.2.6.2). In urban environments, this is one of the most important biocultural functions of the landscape, which has been highly valued by humans in recent times.

However, for the expected benefit, it is not enough to know only its area but also the spatial distribution and the degree of undulations of a given function throughout the year. This paper presents an analysis of this function in Olomouc and its immediate surroundings. The results for the relative and absolute quantification of a) surface temperature change and b) Cooling Capacity Index are presented. Land surface temperature is the emitted thermal radiation from the ground surface or from the surface of tree canopies in vegetated areas. The urban cooling model (included in InVEST model) calculates a heat mitigation index based on shade, evapotranspiration and albedo, as well as distance from cooling islands. The results are related to the amount, type and distribution of vegetation as well as the population in each urban area.

Keywords: cooling function, satellite images, urban vegetation, Olomouc, spatio-temporal analysis

Introduction

Vegetation is an important factor in mitigation of UHI (Urban Heat Island), a phenomenon of significantly higher temperatures in urban areas (Mirzaei, 2015). Understanding vegetation and its ability to cool its surroundings through evapotranspiration (process of releasing water vapour into atmosphere) is an essential step in general heat mitigation (Stanhill, 2019). Quantifying cooling function is important for understanding urban climate and development of environmental and political strategies. This can be done through calculation of relevant characteristics such as Land Surface Temperature (LST) and Cooling Capacity Index (CCI). LST refers to radiative temperature (temperature based on amount of emitted solar radiation by an object) and is often different from air temperature (which refers to kinetic energy of air particles (Meshesha et al., 2024)). LST can be retrieved using thermal satellite imagery. Difference in land surface temperature values for objects (especially between vegetation and impervious surfaces) can reach up to several tens of degrees Celsius (Naserikia et al., 2023). CCI then refers to a ratio of actual cooling ability of an object compared to their potential (maximal) cooling ability in ideal conditions. This index was developed by Stanford University through Natural Capital Project which includes Urban Cooling Model (Sharp et al., 2018) (one of the characteristics calculated by this model is CCI). This study was done for city of Olomouc, one of the regional capitals of the Czech Republic with focus on urban greenery (parks).

Materials and methods

We calculated LST and CCI using Landsat 8 and Landsat 9 data with additional meteorological data from Czech Hydrometeorological Institute (CHMU) and meteorological data acquired by sensor under the supervision of the department (maximum and minimum air temperature, relative air humidity, wind speed, atmospheric pressure, incoming solar radiation). The satellite sensing days were scattered from March 2023 to the end of March 2024 (see Figure 5). Sensing days were based on amount of clouds which were checked visually. Small clouds or cloud shadows were filtered using Landsat Level 1 Quality Assessment Band. LST was calculated based on Avdan and Jovanovska (Avdan & Jovanovska, 2016), where BT stands for at-sensor temperature (°C), λ is constant of 10.895, p is a constant of 1.438 and ϵ stands for LSE (Land Surface Emissivity).

$$LST = \frac{BT}{1 + \frac{\lambda \times BT}{1.438} \times \log(\epsilon)} \quad (1)$$

CCI was then calculated with proportion of shade in the satellite pixel (S), albedo (α) and ETI (Evapotranspiration Index). All values were normalized to fit the scale from 0 to 1 compared to its

maximal potential; e.g. 0.72 means the pixel shows 72 % of its maximal cooling capacity. Therefore the higher value of CCI the better cooling effect the pixel shows.

$$CCI = 0.6 \times S + 0.2 \times \alpha + 0.2 \times ETI \quad (2)$$

Results

According to the graph (Figure 5) classes Vegetation and Meadows have the highest impact on the CCI with values differing from 0.45 to 0.63 over the twelve months period. Both classes keep a steady trend after they peaked at the start of May 2023, with another smaller uprise in the Meadows classes in September. CCI values for agricultural lands keep dropping in June due to (presumably) periodic works in the fields. Artificial parts of the city keep, for the most part, significantly lower CCI trend compared to all classes.

This changes during late autumn (October), when the values for agricultural classes also go down. A big drop can be seen between October and January for all classes, due to larger data gap which was caused by clouds covering the area of interest. The maps (Figure 6) show that lower values of CCI are located mostly on the water bodies and in places with high volume of built-up areas (mainly the inner city and areas around main railway as they are part of industrial development). Agricultural fields differ depending on individual crops and their growth phase.

These findings are based on tabular data (Table 1) and Landsat 8/9 imagery. We can conclude that the highest impact on CCI values is by the classes Vegetation and Meadows. Both classes peak in first half of May (likely due to plant and crop growth during spring) and are followed by a steady trend until September.

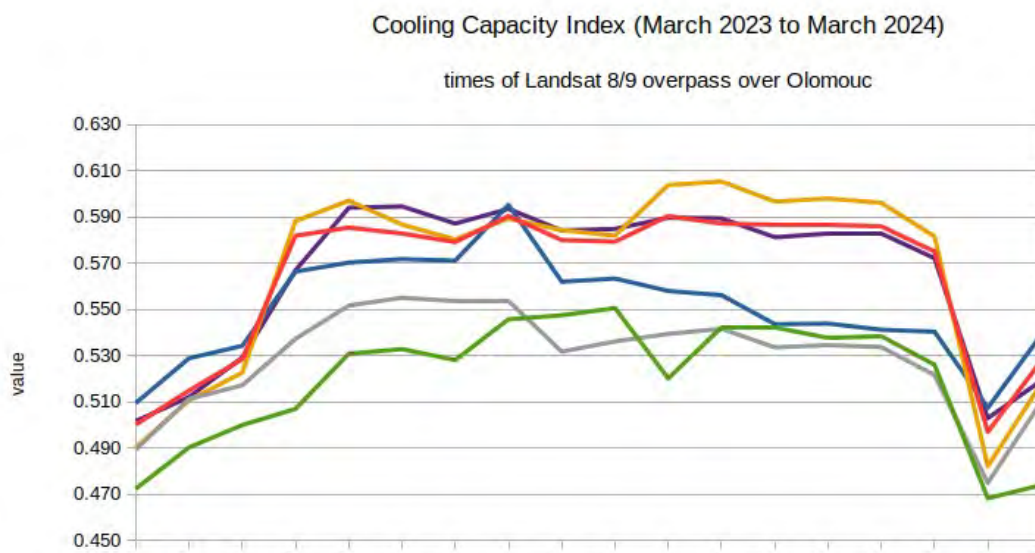


Fig. 5: CCI values through March 2023 to 2024 for biotope groups.

Discussion

The most significant habitat contributing to cooling capacity were proved to be classes vegetation and meadows with values ranging from 0.45 to 0.63. Both of the classes peak during May and maintain a steady trend. The lowest CCI values, as presumed, were in class of artificial areas (Ronchi et al., 2020). A significant gap in data was discovered in time period between October and January causing irregularities in the data due to presence of heavy clouds over the area of interest. The apparently relatively small between the CCI values is caused by averaging primary values. „Average“ is given due to thermal band spatial resolution. Although we have detailed terrestrial vegetation data (visible and infrared spectrum), which more accurately captured the landscape heterogeneity and allowed us to analyze homogeneous parts of the surface, it was necessary to use a coarser spatial resolution (100 m/pixel, scalable to 30 m (Lu et al., 2020)) to create heterogeneous segments (mix of habitat types) where values of surface types are averaged. However, for smaller areas (rural villages) this still can be a challenging spatial resolution to work with as the biotopes are smaller in size compared to the size of pixel. There are no non-commercial satellites with more precise resolution. Sentinel-2 data can be

used, however the problem with this data is missing thermal bands. Thermal bands can be found in Sentinel-3 although its pixel is 1 km (Guzinski & Nieto, 2019), which makes it harder to work with on smaller areas. Understanding such dynamics is vital for several reasons. Heat stress caused by long periods of higher temperatures reflects poorly on life forms. As plants get heat stressed they are unable to photosynthesise and enrich the atmosphere with water vapour used to cool down the air. Heat mitigation is also important for human life, as long time heat exposure can have fatal consequences on health (Stanhill, 2019). These metrics can be used as part of local policy-making in environmental fields.

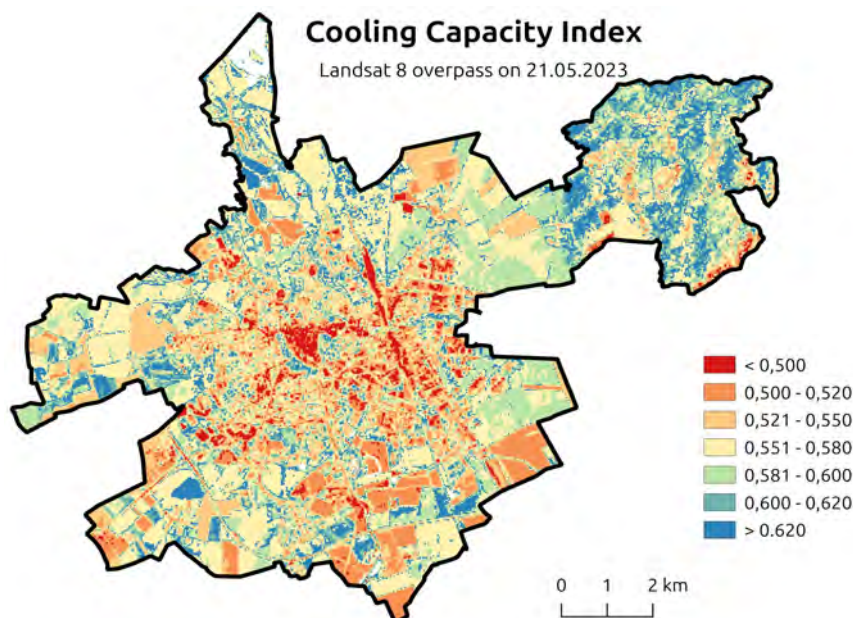


Fig. 6: An example map of chosen CCI values through March 2023 to March 2024 for Olomouc on 21st May 2023.

Conclusions

This study demonstrates vegetation and meadow habitat classes playing critical role in city cooling. These classes show highest CCI values. Agricultural seasonal work is shown to reduce vegetation cover and shading, influencing the cooling capacity. There are limitations for this type of studies due to coarse satellite resolution and clouds during autumn and winter. Using strategies and metrics such as CCI or LST can help to develop strategies which can be then used by local government to mitigate effect of Urban Heat Islands and to promote green spaces and create healthy and comfortable environment.

Tab. 1: Progress of CCI values through March 2023 to March 2024.

HABITAT GROUPS						
	Meadows	Water related	Vegetation	Other	Agricultural	Artificial
20.03.2024	0.518	0.474	0.519	0.528	0.539	0.510
09.01.2024	0.482	0.468	0.503	0.497	0.507	0.475
21.10.2023	0.582	0.526	0.572	0.575	0.540	0.522
05.10.2023	0.596	0.538	0.583	0.586	0.541	0.534
27.09.2023	0.598	0.538	0.583	0.587	0.544	0.535
26.09.2023	0.597	0.542	0.581	0.586	0.544	0.534
11.09.2023	0.605	0.542	0.589	0.587	0.556	0.542
10.09.2023	0.604	0.520	0.590	0.590	0.558	0.539
09.07.2023	0.582	0.551	0.585	0.579	0.563	0.536
08.07.2023	0.584	0.548	0.584	0.580	0.562	0.532
22.06.2023	0.589	0.546	0.594	0.590	0.595	0.554
02.06.2023	0.580	0.528	0.587	0.579	0.571	0.554
29.05.2023	0.587	0.533	0.595	0.583	0.572	0.555
21.05.2023	0.597	0.531	0.594	0.585	0.570	0.552
05.05.2023	0.588	0.507	0.567	0.582	0.566	0.537
12.04.2023	0.523	0.500	0.529	0.529	0.534	0.517
19.03.2023	0.511	0.490	0.512	0.515	0.529	0.511
03.03.2023	0.490	0.472	0.502	0.500	0.509	0.489

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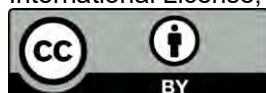
Souhrn

Tato studie zkoumala vliv vegetace na ochlazovací efekt ve městě Olomouc pomocí dat z družic Landsat 8 a Landsat 9 za období od března 2023 do března 2024. Výsledky ukazují, že luční porosty a ostatní vegetace mají nejvýznamnější vliv (CCI v hodnotách 0.45-0.63), zatímco zemědělská půda vykazuje kolísavou chladící kapacitu kvůli sezónním pracím. Jak bylo předpokládáno, umělé a zastavěné povrchy mají nejnižší schopnost ochlazovat. Studie potvrzuje zásadní roli vegetace pro snížení efektu tepelného ostrova a zdůrazňuje potřebu zachování zdravých vegetačních ploch a jejich případného rozšiřování v rámci urbanistických strategií pro zajištění tepelného komfortu obyvatel a příjemnějšího městského prostředí.

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RECREATIONAL AND SPORT FLYING IN THE CONTEXT OF THE PROTECTION AND DEVELOPMENT OF THE NATURAL LANDSCAPE

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Abstract

Civil aviation is generally perceived as an area of human activity that places an extreme burden on the environment. This statement is often published without further explanation of the reasons leading to this clear conclusion. On closer analysis, it can be concluded that aviation has a general adverse impact on the environment, but so do many other human activities. If we were to look at aviation in more detail, we would find that it has been trying to reduce its environmental impact continuously since the second half of the last century. Whether it is in the form of procedures and technical solutions to reduce fuel consumption, or in reducing emissions, noise pollution, etc. In a number of areas (e.g. general aviation), it can contribute to the preservation and protection of the natural landscape (fauna and flora) by forming a natural barrier to the impact of other human activities in the area (road construction, urbanisation, etc.).

Keywords: aerodrome, aviation, land grabbing, recreation

Introduction

Civil aviation means aeronautical activities operated by civil aircraft of any nationality for civil purposes. Under this definition we can imagine all activities in which aircraft are used - from passenger transport, aerobatics, sightseeing flights to drone flights. All these aeronautical activities take place in the airspace of a given State, which according to the legislation extends to the altitude that can be used for flight operations, which in practice represents flight levels up to 10-15km.

Unfortunately, the vast majority of categories of aircraft operations have a not inconsiderable negative impact on the environment in which aircraft, as well as other technical means and man himself, move.

Materials and methods

The negative impact of air traffic on the environment is most often documented through the emissions produced (carbon dioxide CO₂, carbon monoxide CO, nitrogen oxides NO_x - NO, N₂O, sulphur dioxide SO₂, hydrocarbons HC, particulate matter PM and others). Another undesirable effect is noise (both external and internal) or the associated vibrations.

As with other modes of transport, there are standards governing and regulating the production of harmful substances or noise generation.

See Table 1 for a comparison of the emissions production of each mode of transport in the Czech Republic for the calendar year 2022. The table shows that air transport alone does not represent a major environmental burden, although the values do not take into account, for example, the number of passengers transported, the distance, etc. The nature of traffic also differs from one transport to another (e.g. water transport is limited to about 600 km of navigable streams in the Czech Republic, air transport is largely burdened by transit traffic, etc.).

Tab. 1: Comparison of CO₂ emissions (<https://www.sydos.cz>)

Type of transport	CO ₂ [thous.t]	CO [t]	NO _x [t]	N ₂ O [t]	Volatile organic substances [t]	Particulate matter [t]
Road transport	20 032	61 981	47 923	658	11 578	4 207
Rail transport	227	1099	3 935	1,9	370	128
Water transport	10	59	102	0,3	14	7,9
Air transport	819	2673	3 694	22	195	46

In normal operation, the subject of public criticism is mainly noise, for which limit values are set (see Table 2).

Tab. 2: Hygienic limits for traffic noise in front of the façade of residential rooms (Government Regulation No. 272/2011)

Noise source	Hygienic noise limit LAeq,T [dB]	
	6 – 22 h	22 – 6 h
Ground communications	55	45
Main roads	60	50
Traffic on railways	55	50
Air traffic	60	50

However, the biggest environmental burden is the operation of international air transport. If we look at operations in the GA / or recreational and sport aviation segment, this negative impact is much smaller. In addition, the operation of these categories in turn also has a positive impact on the preservation and often protection of a given part of the landscape in the immediate vicinity of these aerodromes.

General aviation GA is the term for all civil aviation operations that are not scheduled, non-scheduled (e.g. charter) or military. General aviation flights therefore include flights of gliders, powered parachutes, small aircraft (ultralights) or business jets. Most of the world's air traffic falls into this category, with most airports accepting only general aviation flights. A wide range of activities fall under this category, whether commercial such as flight schools, agricultural aviation or non-commercial such as recreational flights with smaller aircraft.

Also commonly included in this category are so-called sport flying devices (SFD), which, according to the Czech Civil Aviation Act No 49/1997 Coll., are maximum two-seater aircraft or sport parachutes intended to be flown for personal use or for the use of others, for the purpose of recreation, individual personal transport, sport or pilot training with maximum take off mass 450 (resp. 650) kg.

Under the Act No. 49/1997 Coll. on Civil Aviation § 81, sport flying devices include, but are not limited to:

- an ultralight glider
- an ultralight aeroplane
- powered hang glider
- ultralight helicopter
- an ultralight motorized whirlwind
- powered paraglider
- hang glider
- paraglider
- sport paraglider

In addition to airfields, sport flying devices may also use areas designated for SFDs (often also referred to as airfields) for takeoffs and landings during regular operations, under the Act No. 49/1997 Coll. on Civil Aviation § 84d.

The management of SFDs falls under the competence of the Light Aircraft Association of the Czech Republic by decision of the Ministry of Transport.

The operation of GA/sport and recreational flying is primarily aimed at flight training and at meeting the personal needs of individuals, including leisure activities. Various competitions in aeronautical navigation, precision flying and air rally competitions are also held within this operation. Precision flying and aerial rally competitions, also known as navigation competitions, are designed with knowledge of the surrounding countryside in mind, so that crews are forced to familiarise themselves with the nature of the landscape and geographical features. In a navigation flight, the pilot, who is alone on board, must fly a set course and keep time to within ± 2 seconds. He must also search the ground for the features of the objects, e.g. from photographs he has received before take-off.

The operating characteristics of these categories are focused not only on powered flying, but also to a large extent on so-called nonpowered flying (operation of gliders and gliders, paragliders, etc.), which does not burden the environment in terms of emissions and noise.

All types of aviation activities in the GA / sport and recreational flying category are essentially based on a perfect symbiosis between man and the landscape in which he intends to be active.

The priority of civil aviation is safety, both of the crew and of others, for which the pilot in command is responsible. This presupposes not only perfect knowledge of the environment, but also of meteorological phenomena and climatic conditions, which can be a decisive factor in the safe planning and subsequent execution of a flight.

Land Grabbing

Another negative often presented in transport in general is land take, which is defined as an irreversible process that reduces or completely removes the original function of land. Land take involves transport vehicles, the transport network and transport infrastructure, i.e. roads, railways, airports, ports, garages, depots, bus and rail stations, fuel stations, repair shops, etc. In the case of aviation, however, this statement can be applied without reservation only to the category of international air transport, whereas in the case of the segment referred to as general aviation or sport and recreational flying, we could argue about land grabbing within the limits of the above definition. GA/sport and recreational flying is predominantly carried out from small airports designed for the operation of smaller aircraft types, equipped with unpaved runways (RWY) with grass surfaces. Land take in these cases is limited to only part of the facilities such as hangars, administrative buildings, etc.

Discussion

There are currently 91 aerodromes in the Czech Republic, of which only 6 are public international airports primarily used for air transport of passengers and cargo. The remaining aerodromes are used for general aviation or for sport and recreational flying and in the vast majority of cases they are aerodromes equipped only with unpaved runways with grass surfaces. These airfields account for only a negligible part of the total area of the airport. If we consider as an average size of an airport (in GA category) an area of about 20-30 ha, then the technical facilities alone occupy 5-10% of the total area. From the above it follows that about 90% of the airport area is of a natural character (grassy area) not significantly disturbing the surrounding natural landscape. In addition to the basic delimitation of the aerodrome, there are also so-called protection areas and obstacle planes (especially in the direction of take-off and landing) around the runway system, in order to ensure the safety of air traffic, which has, among other things, the impact that no obstacles (especially buildings, etc.) may be established in the vicinity of the aerodrome. The airports themselves, have historically been established in locations suitable for air traffic (meadows, grass strips), without the need for extensive construction or landscaping. As a result, today these small ('aeroclub') airfields represent an important element in the protection of the original landscape character, as they have in the past prevented, and often still prevent, the encroachment of land for industrial or urban development. They often form an important landscape feature as a natural habitat for rarer plant and animal species.

The fact that these airfields are a popular habitat for various species of wildlife (insects, birds, rodents, game, etc.), both as a source of food (especially at night) and as a natural long-term habitat, also contributes to this. These are often protected species (e.g. the common gopher) that find a natural landscape character for their existence in the aerodrome area. As a result, nature reserves, nature monuments, bio-corridors, etc. have been established in the areas of many airports.

The operation of the airport is naturally also focused on the protection and maintenance of the individual areas, which primarily focuses on the regular mowing of grass areas or their restoration.

The nature of the operation of these airports also contributes to this, with 90% of the traffic concentrated on weekend days and the remainder unevenly spread over the days of the working week.

Due to their nature, the area of these airports is also an attractive location for the general public to engage in leisure activities (running, cycling, hiking, etc.), as the airport premises are often freely accessible (subject to safety rules).

As they are in relative proximity to human settlements, they also fulfil other functions - they are often a place to discover living and non-living nature, they can serve as a place of peace and relaxation at an accessible distance from the urban landscape, etc.



Fig. 1: Area and surroundings of a small sports aerodrome

Conclusion

In conclusion, although civil aviation is perceived as a negative element that negatively affects the quality of the environment, this view may not be entirely unambiguous and, on the contrary, after a more detailed acquaintance with the functioning of the individual areas of aviation, it is possible to find positive contributions to the positive development and preservation of the cultural landscape.

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Act No. 49/1997 Coll., on Civil Aviation, § 81.

Act No. 49/1997 Coll., on Civil Aviation, § 84d

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Government Regulation No. 272/2011 - Government Regulation on the protection of health against the adverse effects of noise and vibration

Souhrn

Civilní letectví je obecně chápáno jako oblast lidské činnosti extrémně zatěžující životní prostředí. Toto konstatování je často publikováno bez bližšího objasnění důvodů vedoucích k tomuto jednoznačnému závěru. Při bližším rozboru můžeme konstatovat, že letectví v obecné rovině nepříznivě působí na životní prostředí, avšak stejně jako řada jiných činností člověka. Pokud bychom se zabývali letectvím podrobněji, tak bychom zjistili, že se snaží snižovat míru zátěže na životní prostředí kontinuálně od druhé poloviny minulého století. Ať jsou to již postupy a technická řešení pro snižování spotřeby paliva, nebo snižování emisí, hlukové zátěže aj. V řadě oblastí (např. všeobecného letectví), pak může přispívat k zachování a ochraně přirozeného rázu krajiny (fauny i fóry), díky tomu, že tvoří přirozenou bariéru působení jiných oblastí činnosti člověka v dané lokalitě (výstavba komunikací, urbanizace apod.).

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RECREATIONAL POSSIBILITIES OF PUBLIC OPEN SPACES IN PÁROVCE, NITRA

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Abstract

Short term recreation is closely connected with the public open spaces in the residential areas. The mental health and satisfaction of the people living in the housing estates are related to the amount and quality of the green open spaces. Quality or success of open spaces is recognised by: great accessibility, logical functional division according to the landscape architectural design, nice and useful equipment/playgrounds, several places to meet with neighbours and plenty possibilities to rest. Another important element for satisfaction is different type of greenery in good health conditions. The outdoor recreation is one of the key factor for development of the physical and mental health of the children, youth, people in productive age and seniors.

Keywords: housing estate, short term recreation, landscape architecture, adaptation to climate changes

Introduction

In the second half of the 20th century the principles of Athen Charter from 1933 were gradually applied in the reconstruction of war-damaged cities as well as in the construction of new urban districts throughout Europe (Moravčíková, 2012). The new Athens Charter (1998) is less dogmatic in its expression of societal desires than planning practices. It expresses trends and priorities in the development of the European Union. It states that open spaces, urban greenery and cultural landscapes are essential elements of urban policy, which must focus more on the creation of pleasant environments and green spaces in the city.

There is a need for a high visual quality of the environment, which is crucial in the perception of individual spaces. It determines the identity of the space, gives a sense of genius loci, creates continuity of environments. The interrelation between the quality of public spaces and the level of social relations is well known (Janto, 2023). Revitalization and establishment of green urban spaces contribute to the formation of local communities (Slobodníková, Tóth, 2022), they promote sustainable development and contribute to environmental improvement (Mariš, 2022). Active local leaders, the support of local government, non-profit as well as business organizations are important in the creation of communities (Marišová et al., 2023).

One of the effective means to improve the quality of public spaces of residential complexes is the application of green infrastructure (GI) and design strategies (Tóth, 2022) and their integration into current landscape-architectural approaches and planning (Fornal-Pienak and Bihuňová, 2022). GI is also referred as part of the concept of the fourth nature (Čibík, Back Prochnov et al., 2020), which can offer a wide range of ecosystem services (Schneider et al., 2020), such as mitigating the negative impacts of climate change (Hus et al., 2021), recreational services (Šinka et al., 2019, Bechera et al., 2022) and enhancing the overall environmental quality of life and well-being (Bihuňová et al., 2021). In addition, the application of GI can support the sustainable development of unused and/or abandoned urban landscapes (Back Prochnov and Čibík, 2022). When designing GI, it is important to consider the interrelationships between people, spaces and current technologies (Čakovská et al., 2019). The quality of housing has major implications for people's health (WHO, 2018). It is also important to put into practice practices resulting from new legislation (Marišová and Lichnerová, 2021) and to apply cooperation between local and state government (Marišová et al. 2023).

Responding to climate change is to increase the resilience of settlements to their impacts, with the help of implementing a balanced range of adaptation and mitigation measures. This will also reduce the carbon footprint, improve the life quality of residents, promoting biodiversity, increase health protection, as well as reduce the financial costs of managing and maintaining the borough's assets and residents (Stano et al., 2020).

Materials and methods

Nitra is one of the oldest Slovak cities. The socialist and dynamic reconstruction of the city between 1950 and 1970 changed Nitra, especially Lower Town (which includes the Párovce housing estate –

once important district of the city with a large Jewish community). Many buildings of the old town from 18th and 19th centuries, were demolished due to new residential development (Vnuk, 2020).

New Párovce district was built in the 60's of the 20. century. Together with Predmostie, belongs to the one of the oldest housing estates in Nitra. It has 27 hectares and is directly connected to the central zone of the town. The main concept of the housing estate was designed by architect Michal Maximilián Scheer in cooperation with Gabriel Strážovec, Štefan Sojko and others. The design and construction of the residential district with 2,300 flats and social equipment was built up between 1956 and 1963 (Dulla and Moravčíková, 2002).

The city's conditions at that time specified the construction of a maximum of five-storey apartment buildings with a maximum repeatability of the buildings. The axis is formed by the wide Štúrova street, with residential apartments, which are combined with shops, services and administration. Two types of houses are most frequently repeated - the high-rise apartment buildings with a concave curved roof and the longitudinal section house (Vnuk, 2020).

During the Design Studio: Green Infrastructure Planning, a group of 18 students were tasked to create the landscape-architectural proposal for new functions and greenery development, including solutions for adaptation to climate changes. The terrain survey and inventory of the greenery were done during September and October 2023, followed by work in the atelier: preparing analyses, studying the literature sources, working on the different concept designs and elaborating original landscape – architectural design of the chosen area with the aim to revitalize the open green spaces, develop the greenery elements, support the safety and comfort of the space, while preserving the character and historical value of the area.

Results

First group of the students have changed the open green spaces in a very significant way. The central part of the area is dedicated to the park with several terrain modelation, including the parking house, which is part of the park and the roof is accessible by the walkway and the lift. On the top is caffee-bar and rest zone. The façade of the parking house is cover by climbing plants. There have been added several children playground, sport zone and quiet zone for the seniors with the pergolas, resting zone and community garden. The biodiversity was support by zones with the intensive lawn, perennial beds and flower meadows.



Fig. 1: Landscape architectural proposal of the central park (Author: Briš, T., Mikovcová, A., Ravasová, T., 2023)

The second chosen segment of Párovce district is an area with the small 4 flats apartments, where is greater potential for community life. The landscape architectural proposal of this segment is aimed at small scale design, where community gardens belong to each family. Current children playground will be extended and small coffee house will be placed by it. The proposal count with the permeable pavement, collecting the rain water from the roofs, new tree plantation and big amount of the flower beds. The street line is supported by small benches, which create visual barrier to semi private areas. At the place of the current parking plot will be underground parking garage with green roof.



Fig. 2: Landscape architectural proposal of the open green spaces (Author: Vedmidska, A., Vavrová, L., Havrila, T., 2023)

Discussion

Nitra city has enough green space per 1 inhabitant (approx. 140 m² /inhabitant). Some districts, in which mass housing prevails, are relatively unfavourable in terms of the amount of green areas and the amount of green areas for a given number of inhabitants is insufficient. The greatest positives of Scheer's architectural design is considered use of the natural features of the terrain, the favourable transition between the continuous development of the town and its edge, created by the rhythmic sequence of buildings. The urban composition and architectural expression of the houses classifies the housing estate as a typical example of late modernism (Dulla, Moravčíková, 2002).

The Paper presents landscape architectural proposals of Párovce district in Nitra city, where are different types of apartment buildings with various quality of open public spaces. Proposals, which were elaborated consider the quality of the area and support green infrastructure, biodiversity, community interaction and creates places for everyday short term recreation.

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Souhrn

Krátkodobá rekreace je úzce spojená s veřejnými prostranstvími v obytných oblastech. Duševní zdraví a spokojenost obyvatel sídlišť souvisí s množstvím a kvalitou volné zeleně. Kvalita či úspěšnost otevřených prostranství se pozná podle: skvělé dostupnosti, logického funkčního členění podle

krajinářsko-architektonického řešení, pěkného a užitečného vybavení/hřišť, několika míst k setkávání se sousedy a dostatku možností k odpočinku. Dalším důležitým prvkem spokojenosti je různý typ zeleně v dobrých zdravotních podmínkách. Rekreace v přírodě je jedním z klíčových faktorů pro rozvoj fyzického a duševního zdraví dětí, mládeže, lidí v produktivním věku a seniorů.

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RECREATIONAL POTENTIAL OF NEWLY BUILT POOLS

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Abstract

Water retention in the landscape is an important activity for improving the hydrological and microclimatic conditions of a particular site. The current trend of building pools in the landscape is certainly one way to contribute to stabilising the hydrological regime in times of climate change. The presented research focuses on the recreational potential of newly built pools, at the Hastman locality in the cadastral area of Janovice u Polné, which are managed by the Czech State Forest. Water quality monitoring in the pools is also part of the research. The recreational potential of the constructed pools is not insignificant for monitoring the increasing biodiversity on the site and in the surrounding area. The evaluation of the measured data was undertaken after one year of monitoring. The development of emergent vegetation and the gradual integration of the pools into the forest ecosystem was monitored at the site of interest.

Keywords: Water retention in the landscape, water quality, emergent vegetation

Introduction

Pools and wetlands are unique and attractive places for recreational activities. People can use these sites to watch birds, admire the diverse flora and relax in connection with nature. They offer space for fishing, hiking, and photography. This recreational use can contribute to public awareness of the importance of wetland conservation. Wetlands are crucial to the ecosystem, providing many ecosystem services. For example, they retain water and use their self-cleaning capacity, transform flood events and store carbon, which contributes to climate regulation. Raising awareness of these services can strengthen wetland conservation. Wetlands and pools are sites of biodiversity. They provide habitat for many species of plants and animals, including endangered and rare species. Ensuring the protection and restoration of wetlands can lead to an increase in overall biodiversity in the landscape. To increase biodiversity around pools and wetlands, it is important to look after the overall landscape. This means minimising water and soil pollution, maintaining the surrounding vegetation and preventing massive deforestation. A diverse landscape is key to maintaining and developing the habitat for wetlands and associated ecosystems. Public involvement in wetland conservation and restoration is also important. Education about the importance of these environments and community involvement in volunteer activities such as wetland cleanup and restoration can help to protect and enhance biodiversity in the landscape. Strategies that combine recreational use, wetland protection and biodiversity enhancement in the surrounding landscape are key to sustainable environmental protection and strengthening the human-nature connection.

Materials and methods

The area in question is located in the municipality of Janovice u Polné (657069), at an altitude of 603-607 m above sea level. (Fig. 1) In the foot of the dam there are currently massive specimens of maple and lime trees. The site is located on a stream: Poděšínský potok, IDVT 10239008 (ČHP 1-09-01-010), administration: Czech State Forest.

In the area of the former floodplain, surface drainage ditches have been used to drain off the forest in the past. The system of ditches is connected to a straight and deepened watercourse. Subsequently, planting of a production forest was carried out in the area of the floodplain. Prior to the implementation of the pools, there was an overgrown stand of alder (*Alnus glutinosa*), 5-10 years old, in the central part of the area in a forestry fence, which drained a significant amount of water through transpiration processes. The stand contained several pieces of old alder stumps, some of which are potentially valuable not only as naturally decaying wood but also as a source of coppice. Most of the area in question was waterlogged, with water being quickly drained away by drainage ditches. The vegetation on the site can be described as fragments of natural alder woodland in combination with production forest of spruce stands. The area has been affected by a high level of ruderalisation of the forest weed

plants, dominated by nettle (*Urtica dioica*) and wood small-reed (*Calamagrostis epigejos*). (Marková, Pelikán, 2022)



Fig. 1 Localization of the area

Five pools with different surface area, depth and bottom diversification were excavated at the site. A small wooden log weir approximately 0.3 m high with a rockfill stabilization was built in the stream bed in front of the culvert inlet at km 0.00650 at upstream slope of a historical dam. The raising of the water level ensured the filling of the pools and also the development of littoral zones with very low water depths - wetland areas. The pools were constructed as separated from the stream by land, except of pool T5 in the northern part of the area. This is connected to the stream, but its deepest part is separated from the part connected to the channel by a cross dam made of riprap up to 80 kg (3×5 m). The terrain has been suitably modelled to protect part of the alder coppice from permanent flooding. In the centre of the site, the existing deepened and straightened Poděšínský stream was undulated in its alignment by the design of six counter-curves - part of the revitalisation measures in km 0.025-0.090. The lengthening of the stream route resulted in a slight reduction in the longitudinal slope of the bed level and therefore in the zone with flowing water to create more favourable conditions for animals and plants associated with this type of ecotope. Pools: total water level area 2288 m², accumulated volume 1229 m³.

Water level area of individual pools:

Pool 1 – 105 m²; Pool 2 – 105 m²; Pool 3 – 1290 m²; Pool 4 – 53 m²; Pool 5 – 735 m². Max. excavation depth 1.5 m. Length of the revitalised section of the stream 65 m.

The landscaping of the excavation of the pools also included the creation of reptile shelters, leaving part of the branches from tree felling on the site in the form of piles, as a possible shelter for fauna. In addition, some tree logs were also left in place, both in the transition area between the aquatic and terrestrial zone and around pools. Solitary stumps were placed in the pool area, with the trunk driven into the bottom. (Tlapák, Pelikán, Marková, 2020)

In April 2022, the site was flown by drone and a digital terrain model was created.

A sensor was installed at the site in May 2022 to continuously monitor local air temperature and humidity. (Fig. 2)

Selected water quality parameters were also monitored at monthly intervals from May 2022. Temperature, O₂ content, pH and conductivity were measured directly in situ. Phosphorus and nitrogen content were then determined in the laboratory.



Fig. 2: View of site 4/2022, sensor located near pool T1 point S1

Results

Despite its remoteness from human settlements, the area has undergone quite dramatic changes, from forest cover to water area, reforestation, drainage to a system of pools. The system of pools built in the autumn of 2021 is certainly a suitable solution for retaining water in the landscape and making the wetland area more attractive.

It was already evident in the first growing season that the site would soon become a habitat for aquatic and wetland species after completion of earthworks. The photo documentation shows the progressive development of aquatic and riparian vegetation. Water-bound insects and small animals were recorded during visits/sampling.

By the beginning of the second growing season, the involvement of the pools in the surrounding area is already visible, with the presence of a diverse range of aquatic and wetland plants such as common cattail (*Typha latifolia*).

In the third growing season, seedlings of alder trees that have been cut down begin to appear on the site, except for a no-intervention zone with coppice alders in the centre of the area. Natural alder regeneration is evident here.

It can be assumed that the current "attractive" state of the pools will persist for about another 5 years. Gradually, the pools will be silted-up and overgrown. Without maintenance, the whole area will gradually become a wetland. This condition is ecologically beneficial and the area will continue to provide ecosystem services such as influencing the microclimate, water retention in the landscape, self-cleaning processes, and act as an important ecotope in the area. In terms of recreational potential, however, the attractiveness of the area will be reduced.

The monitored water quality parameters have been evaluated according to Government Regulation No. 401/2015 Sb. on indicators and values of permissible pollution of surface water and wastewater, details of permits for discharge of wastewater into surface water and sewers and sensitive areas, Annex 3: Indicators reflecting the status of surface water, environmental quality standards and requirements for water use. The established limits of the annual average concentration according to the regulation are for P_{sum} up to 0.15 mg/l and for N_{sum} up to 6 mg/l. Tab. 1 presents the results of the sampling of total nitrogen and phosphorus. The average annual concentration of phosphorus was exceeded for Pools T1, T2 and T4, only Pool T5 met the surface water limit, Pool T3 is at the 0.15 mg/l limit. P_{sum} measurements had the greatest fluctuation at Pools T4, with zero concentrations in May 2022 and a maximum (of all pools) in April 2023, with a P_{sum} value of 0.82 mg/l. The greatest extreme of N_{sum} measurements was registered at Pool T3 with zero N_{sum} values in November 2022 and May 2023, and conversely a maximum value (of all pools) of 13.1 mg/l in February 2023. The annual average N_{sum} concentrations were not exceeded at the pools and met the limits as per the government regulation. Measurement of water quality parameters was also assessed in the stream channel, the sampling point was just above the pools.

Tab. 1: Pool parameters and annual average phosphorus and nitrogen concentrations

Sample point	Level area m ²	Pool area m ²	Volume m ³	Depth m	P _{sum} mg/l	N _{sum} mg/l
Pool T01	105	248	27	0.3	0.159	1.10
Pool T02	105	159	45	0.4	0.222	2.05
Pool T03	1290	1703	798	0.6	0.15	3.82
Pool T04	53	143	12	0.2	0.215	2.54
Pool T05	735	1020	347	0.5	0.138	2.80
Stream	-	-	-	-	0.138	2.37



Fig. 3, 4: Photo of the area 6/22 (Pelikán 2022); 12/23 (Marková 2023)



Fig. 5: Photo of the area 5/23 (Marková 2023)

Conclusion and discussion

The pools in the locality of Hastrman, in the cadastral area of Janovice u Polné, have been monitored since their realization in 2022. Photodocumentation has been taken showing the gradual integration of the pools and the growth of wetland vegetation. In spring 2022, a drone survey was carried out, a digital terrain model was created and a sensor for continuous monitoring of air temperature and humidity was installed. Beginning in May 2022, the water quality of individual pools and the stream is being assessed at monthly intervals.

In the third growing season, it can be concluded that the pools are fully engaged with the surrounding environment. Population by both wetland flora and fauna has occurred. A stable ecological element is established also due to the stable water level in the all pools. The water quality assessment in the first year showed that the water in the pools meets the parameters set by Government Regulation No. 401/2015 Sb. in Annex 3 in the average annual values. The results of water quality measurements and their evaluation (analysis) in the context of Decree No. 401/2015 Sb. may not be relevant to the ecological development of the pools and the entire site. The measurements show a dynamic development of the individual parameters depending on the vegetation development phase. The

gradual overgrowing of the pools and the whole area with wetland vegetation may cause an apparent reduction in the attractiveness of the area, but the ecological function and value of the area will still be high, with possible benefits for observation not only of waterfowl.

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Government Regulation No. 401/2015 Sb. on indicators and values of permissible surface and waste water pollution and permits for the discharge of waste water into surface waters.

Souhrn

Tůňe v lokalitě Hastrman, v katastrálním území Janovice u Polné, jsou sledovány od jejich realizace v roce 2022. Je pořizována fotodokumentace dokládající postupné začleňování tůní a vzrůst mokřadní vegetace. Na jaře 2022 byl realizován průzkum pomocí dronu, vytvořen digitální model terénu a bylo instalováno čidlo pro kontinuální sledování teploty a vlhkosti vzduchu. Od května 2022 je v měsíčních intervalech vyhodnocována kvalita vody v jednotlivých tůních a v toku.

Ve třetí vegetační sezóně lze konstatovat, že tůňe jsou plně zapojeny do okolního prostředí. Došlo k osídlení jak mokřadní florou, tak faunou. Je vytvořen stabilní ekologický prvek i vzhledem k tomu, že hladina vody je v jednotlivých tůních relativně stálá.

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RECREATIONAL POTENTIAL OF THE AGROKOMPLEX NATIONAL EXHIBITION CENTER, STATE ENTERPRISE IN THE CHRENOVÁ URBAN DISTRICT NITRA, SLOVAKIA

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Abstract

Agrokomplex is one of the largest and most significant exhibition complexes in Slovakia and its importance is proven by almost 50 years of exhibition activities. The exhibition area is an important part of the urban structure of Nitra city, despite the fact that a large part of the complex is unused. This article deals with the issue of the exhibition area of Agrokomplex and focuses on re-designing it into a more accessible space with a higher recreational value. Many of the premises of the exhibition complex have a great potential which has not been fully discovered yet. Unfortunately these areas are affected by strong privatization and the negative impact of local policies. One of the specific areas of the exhibition complex is in the immediate vicinity of the Chrenová urban district, which has a significant proportion of urban green spaces, but lacks park areas. Based on these facts, we created a proposal of landscape-architectural design and scenarios, one of which presents the design of a small park mainly for the communities of Chrenová urban district, but also for the all inhabitants or tourists. Presented design can make the exhibition area more accessible, functional and community oriented by maximizing the recreational potential and enhancing the overall aesthetic appeal.

Keywords: public space, urban green space, recreation, research by design

Introduction

Exhibition areas are a large part of the urban system and have a significant impact on the socio-economic aspects of the inhabitants, not only due to the size of the built-up and vacant areas but also due to their commercial intent. These areas are negatively influenced by the private sector, which leads to their unclear strategy and ultimately untapped potential (Čibík, Biľušová, and Tóth, 2022). Due to a lack of financial resources, it is often difficult to maintain exhibition complexes. Therefore, it is important to include sustainability as a main pillar in the design itself, which will help to create a healthy and sustainable environment (Tóth, 2022). In many cases, exhibition grounds are considered as private or semi-private spaces, just like campuses, but the result is always a collective space that should provide inclusive, comfortable, and safe open spaces (Čibík et al., 2020). Unlike campuses, exhibition grounds are many times separated from the surrounding environment by fencing, which can cause an uncomfortable visual barrier between the open areas of the exhibition grounds and the outside environment. A well-designed and well-thought-out open area of an exhibition complex can help to integrate exhibition grounds into the overall fabric of the city (Cejpková et al., 2019). The actual planning and creation of exhibition grounds have not yet been approached in an individual manner, despite their position in the urban structure. In several manuals, they are included in the shared category of all complexes (Vinczeová, 2023). Green spaces are an important component of exhibition areas, which are an essential part of high-quality urban life. Agrokomplex is significant precisely due to its large green areas and its location within the Chrenová urban district. The immediate vicinity to the housing estate opens many possibilities for new solutions for green space of the exhibition complex and possible increase in the quality of the green space of Chrenová urban district, which is currently weak (Melková et al., 2014).

Material and methods

The Agrokomplex currently fulfills primarily a commercial function, which also implies its great regional and national importance. The area of the complex is 143 ha, of which 63 ha are green areas, 20 ha are sidewalks or paved areas, and 6 ha are lakes and streams. The exhibition ground is fenced and is not open to the public outside of the exhibition season. Since the exhibition area has mainly green open areas, there are “deaf” spots in the area which are not used even during the season. These areas have huge potential, which is often overlooked or the investment in such areas is disadvantageous for the city or the management of Agrokomplex. There are many examples of such

areas in the exhibition grounds, but the article deals with only one of them, which is close to the Chrenová urban district.

In the preparatory phase, we focused on collecting scientific literature and documents dealing with the subject of exhibition areas and their proper conception and integration into the urban structure. A complete analysis of the exhibition center was made based on a comprehensive site analysis of the selected area. The elaboration of scenarios and landscape-architectural design emerged from the acquired scientific knowledge. The main method we used for scenarios and the design itself consisted of qualitative research methods and the principles of "Research by Design" (Deming, Swaffield, 2011). Through this method, we integrated research principles with design processes to solve a complex exhibition site problem.

Historical analysis

Due to the influence of the new trade fair events and the resulting need for expanded exhibition grounds, the historical development of the greenery in the exhibition area has taken many different forms. For this reason, some areas were frequently changed and cut down, but new plantings have also been created in certain parts of the Agrokomplex. In the selected area, there was a restaurant located on the shore of one of the lakes. Although the locals loved this location and it was significant for recreation purposes, the restaurant eventually closed. The management had made plans to rebuild this place, but these were never implemented.

Current state analysis

The current state of the selected area has no function, and the visitor rate is very low, which is also due to the overall unaesthetic appearance of the area. In terms of ownership, the selected area is divided into several parcels owned by different private parties. Due to the privatization and lack of financial resources of Agrokomplex, other areas in the exhibition grounds have the same fate. During the design phase, we had to take into account the railway, which is a current part of the selected area, and incorporate it into the design. The overall appearance of the sidewalks is very chaotic and nonconceptual, while the composition and quantity of woody vegetation in the area is positive.



Fig. 1: Current state of the selected area. (Author, Z. Vinczeová, 2023)

Visitor rate analysis

Traditionally, the exhibitions and fairs focus primarily on agricultural production and horticulture, but various engineering and technical exhibitions also take place. The most important and largest exhibitions during the year are "Gardenia" and the "Agrokomplex" exhibition. Most of these exhibitions and fairs are concentrated and arranged in the pavilion areas, which are also the main exhibition areas therefore, the roads connected to the pavilions are the most frequently used, and the

concentration of people is densest in these places. The rear part of the Agrokomplex is mainly used for exhibition events at the time of the largest Agrokomplex exhibition, which is held only in summer. In terms of season, the exhibition center is most visited in spring, summer and autumn, while during winter, the overall cultural life is stopped. The analysis of the visitor rate showed that although the complex offers many exhibition and fair events, the rear parts do not use their great potential, as well as the areas near the Chrenová housing estate, which have the potential to provide various functions and services for the residents of the city, but mainly for the residents of Chrenová.

Results

Based on the comprehensive research of the exhibition site, we have identified an area that is in the immediate vicinity of Chrenová urban district and has high recreational potential. Because of its size, which makes it resemble a small park, we chose to build a concept for a small park. A recreational path that mimics the typology of residential buildings in the Chrenová urban district is the proposal's most notable element. One of the primary tenets of the research was accessibility and openness thus, we concentrated the design on potential new park entrances that would be universally accessible over the long term. The result of the research was a detailed landscape-architectural proposal with several scenarios that were applied to specific locations in the selected area. The main goal of these scenarios, despite their variety of uses and pursuits, was to provide a community garden for the residents of the Chrenová housing estate. We made modifications to the pathways in the proposal and eliminated the superfluous, underutilized sidewalks because they were in poor condition. By connecting them with the recreational path, our new communication system enables users to choose their direction. In the design, we have also included wooden piers connecting the lakes to the recreational path.

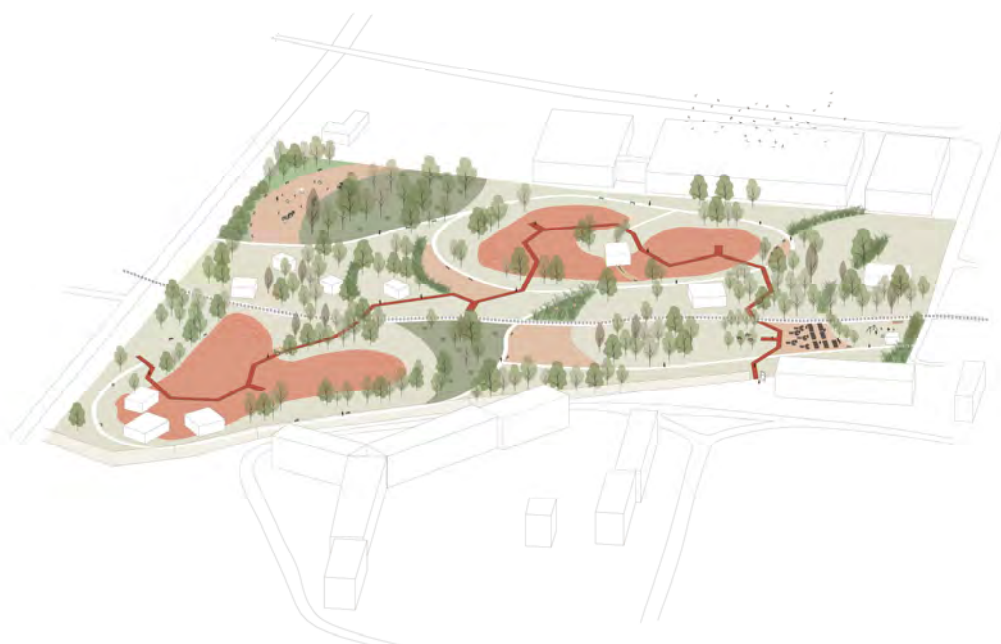


Fig. 2: Axonometry of the landscape-architectural design. (Author, Z. Vinczeová, 2023)

Discussion

The Agrokomplex exhibition complex is undoubtedly an important part of the urban structure of Nitra, but it is frequently negatively impacted by the company's management's economic goals and political views. Many areas of the exhibition complex have huge dormant potential but unfortunately, these areas are affected by strong privatization. This scenario would lead to a gradual degradation of the public space and at the same time would deprive the inhabitants of the city of the opportunity to build a multifunctional facility on the premises of the exhibition complex. Although there is a great deal of interest in the public areas among the residents, these interests are unfortunately different from those of the exhibition center's management.

Residential zone revitalization and greening initiatives play a significant role in the development of local communities, the involvement of local leaders, and the crucial support of commercial, non-profit, and government entities (Marišová et al., 2023). Locals might directly participate in project implementation or participatory planning. They help to enhance the environment and encourage

sustainable growth (Mariš, 2022). Volunteering has increased steadily in recent years to go along with investments in climate change mitigation strategies (Slobodníková, Tóth, 2022). Obtaining good public space requires accessibility first. In this instance, accessibility is severely constrained because the Agrokomplex falls under the category of semi-public space. Therefore, public space needs to foster community connections and deepen the significance of cities. A sustainable approach to planning and design processes is required to attain the overall quality of such areas (Kaw, Wahba, Lee, 2020).

Conclusion

Every public space should be public and accessible to everyone. Public space is formed by diverse communities that shape and give deeper meaning to it. The Agrokomplex offers areas that can serve as gathering areas for residents, which will strengthen community relations. In conclusion, from a psychological point of view, it is important to provide a wide range of options for the users of the residential area for daily relaxation. The final proposal seeks to maximize recreational potential and address all issues. It represents a suitable aesthetic public space for the inhabitants of the Chrenová housing estate, the inhabitants of the town Nitra and tourists.

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Souhrn

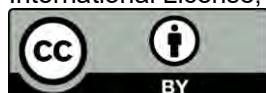
Článek představuje krajinářsko-architektonický návrh malého parku pro komunitu žijící na sídlišti Chrenová, pro obyvatele města, ale i pro turisty. Na základě podrobných analýz a metodického postupu "Research by Design" jsme vytvořili scénáře a návrh, který může zpřístupnit výstavní plochu, učinit ji funkční se zaměřením na komunitu a využití rekreačního potenciálu.

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RECREATIONAL USAGE OF THE CENTRAL PART OF THE JAVORNÍKY MTS

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Abstract

The forest, hiking and active recreation are the topics that are often associated with a person's mental health. It is the forest and the forest environment that are used for tourism associated with active rest and gaining new energy. The Javorníky Mts. are characterized by high recreational attractiveness there are many historical cultural monuments, natural attractions and recreational centres. The territory is a favourite tourist area due to the number and variety of tourist trails, while it is exceptional in its accessibility from the Slovak and Czech sides.

The whole area of the Javorníky Mts. comprises 56 trails with the total length of 859 km, their central part comprises 23 trails with the total length of 309 km. A proposal was created to increase the attractiveness of the area and its tourist potential, namely the proposal of a new multifunctional tourist trail with total length of 22.64 km equipped with recreational mobiliary. The proposed trail will contribute to increasing the accessibility of the territory, while the density of trails will increase to 7.94 m. ha⁻¹.

Keywords: recreation, hiking trail, mobiliary environment

Introduction

The recreational function of the forest is a significant ecosystem service that allows the forest to provide an environment for various forms of recreation. It belongs to functions that exist only if there is interest in them, often independently of the will of the owner or manager of the forest. Accessibility and recreational facilities of the area are important to support this function. The aim of the work was to propose measures to increase the attractiveness and tourism potential of the area of interest - the Javorníky Mountains, based on mapping the recreational use of the area, specifically its central part.

Materials and methods

The work is focused on the Javorníky Mountain, which geomorphologically falls within the area of the Slovak-Moravian Carpathians, forming part of the state border between Slovakia and Czechia in the northwest. Its territory covers an area of 1,113 km², with the Slovak part comprising 869 km² and being divided into 2 subunits: Vysoké Javorníky and Nízke Javorníky (ATLAS KRAJINY SR, 2002, Wikipédia). The area of interest is part of the large protected area of the Kysúce Protected Landscape Area (CHKO Kysúce), and it also contains several nature reserves (Razula, Hričovec, Veľký Javorník, Makyta). The central part of the Javorníky Mountains, as the area of interest, is more precisely delineated on the east and northeast by the Kysuca River, on the south by the channel of the Váh River from the village of Kotešová to the village of Mikšová, on the north along the border of the Žilina and Trenčín self-governing regions, and on the northwest by the state border.

The methodology of the work was established for field data collection of qualitative and quantitative data related to mapping recreational use in the area of interest. Within the field survey, tourist accessibility of the area, movement and activities of tourists, tourist needs through questionnaire (100 respondents), presence of existing tourist trails, and specification of the recreational potential of the area were mapped. Based on the survey outputs, a proposal for improving recreational use was developed, whether in terms of proposing a new trail, functional areas, or recreational infrastructure. The trail proposal in the field was implemented following the STN 736108 Forest Transport Network and methodology of ĽUPTÁK (2010) using a multifunctional navigation application, Locus Map, and computer geoinformation software, QGIS. Proposals for recreational mobiliary were made using CAD software for technical drawing, AutoCAD.

Results

The Javorníky Mountains are characterized by high recreational attractiveness supported by good accessibility from both sides of the state border. There are numerous historical cultural monuments, natural attractions, and recreational centers here. It is a sought-after tourist area due to the abundance

and variety of hiking trails with low difficulty, excellent accessibility, and good facilities. The highest concentration of tourists is in the central and western parts, bordering Czechia, where pedestrian hiking and cycling trails are intensively used, while in winter, cross-country skiing trails and ski resorts are popular.

Among the main attractions of the area are:

- Historical cultural monuments, such as the Greguša settlement with its unique bell tower or the Magale settlement with the Slovak National Uprising memorial, both burned down during World War II.
- Natural attractions, including remnants of beech primeval forests, mountain meadows, surface and subsurface pseudokarst formations, and viewpoints.
- Tourist observation towers, offering beautiful views not only of the Beskids or Kysúce but also as far as the Malá Fatra or Western Tatras. These towers are constructed as multi-level wooden structures, sometimes combined with stone, reaching heights of up to 20 meters. There are 9 such observation towers in the area: Jantov Tower (560 m.a.s.l.), Tábor (697 m.a.s.l.), Zarubaná Kyčera (884 m.a.s.l.), Svederník (551 m.a.s.l.), Stratenec (1055 m.a.s.l.), Zakopčie (854 m.a.s.l.), Veľký Vrch (490 m.a.s.l.), Luby (908 m.a.s.l.), and Mikovčákova Tower (834 m.a.s.l.).
- Recreational centers - There are 7 ski resorts in the area: Ski Čertov, Ski Kasárne Javorníky, Ski Makov, Ski Park Dešná, Ski Podjavorník, Ski Ráztoka, and Ski Šerkov, which offer a wide range of recreational activities not only in the winter but also in the summer season. Overall, there are 20.3 km of downhill ski slopes, 66 ski lifts, and 21 cross-country skiing trails with a total length of 132 km available in these resorts (<https://www.holidayinfo.sk/sk/horske-strediska>).

Hiking trails - In the area of interest, there are 56 marked hiking trails with a total length of 869 km, of which 35 are multifunctional trails with a total length of 289 km, used for various forms of hiking. When specifying trails according to their tourist significance, there are 8 red hiking trails with a total length of 127.8 km, 12 blue trails with a total length of 217.7 km, 12 green trails with a total length of 167.4 km, 24 yellow trails with a total length of 145.9 km, and the remaining trails constitute other designations (<https://www.kst.sk>). The overall density of hiking trails is 9.88 m.ha⁻¹.

The most interesting and visited part of the Javorník Mountains is its central region, which holds tremendous tourist potential and concentrates the majority of tourist infrastructure. There are 23 marked hiking trails in this area with a total length of 309 km, including 3 red trails (47.7 km), 6 blue trails (152 km), 5 green trails (67.15 km), and 9 yellow trails (42.15 km). The density of hiking trails in its central part is 7.39 m.ha⁻¹.

For improving accessibility and enhancing the attractiveness of the area for tourists, a multifunctional hiking trail with recreational mobiliary has been proposed. This trail will serve both pedestrian and cycling tourism, as well as other forms of physical activity. Such multifunctional trails have several limitations, primarily regarding user capacity and safety. Therefore, the proposal utilizes the existing road network with a hardened surface, particularly the forest road network. The width of the roadways is a minimum of 4.0 meters, allowing for the potential simultaneous use of multiple forms of physical activity on the same route. The proposed route will connect the Bytčianska and Petrovecká valleys, which will be significant for the development of tourism for surrounding settlements, the town of Bytča, and the villages of Hliník nad Váhom, Veľké Rovné, Kolárovice, and Petrovice. The proposed trail offers numerous natural phenomena, cultural monuments, untapped water springs, and beautiful viewpoints. The total length of the proposed route is 22.642 kilometers. The trail allows connections to several existing hiking trails and follows these existing roadways:

Stationing

- Kilometer 0.0 - 13.442: Forest road 1L to Hutce (bitumen pavement).
- Kilometer 13.442 - 16.567: Local community road to Korytné (bitumen pavement).
- Kilometer 16.567 - 20.142: Forest road 2L to Čaklov (gravel surface).
- Kilometer 20.142 - 22.642: Forest road 3L (earth surface).

The directional and elevation profile of the trail (Figures 1 and 2) is as follows: The trail begins in the village of Hliník nad Váhom at the starting point on the Class III road near the Hričovský Canal of the Váh River. It continues along the valley road with bitumen pavement, ascending through the forested area beneath the hills of Benková and Paliesok. It then ascends to a saddle, passes beneath the ridge and around the hill of Kočí zámok. Here, there is a change in gradient, leading to a descent and subsequent ascent to the border of the cadastral area of Veľké Rovné. From there, it descends into the village of Kolarovice, passing through the Škoruba and Korytné parts. It then continues to ascend along a gravel-surfaced forest road to the settlements of Bršlica and Pláň, and proceeds along a dirt road, descending more steeply into the Mitášov Grúň area, where the trail ends.

On the trail, 5 starting points have been proposed: Hliník nad Hronom (Hričovský Canal of the Váh River), Zlatníková, Veľké Rovné (Kříž/Ličkov), Fojtovo, and Škoruby. Their selection was based on public transport accessibility and tourist service with recreational amenities. The localization of starting points also allows for great variability for tourists in selecting only a certain part of the trail or connecting to other existing trails. In addition to the starting points, 4 resting areas have been proposed, complementing the existing 5 resting areas equipped with small recreational structures such as information boards, signposts, seating, fireplaces, wells, and garbage bins, totaling 12 units. 21 new recreational mobiliary objects were proposed, along with their material and cost calculation. The proposal also includes their distribution as shown in Table 1. Primarily, these are wooden structures made from debarked spruce logs supplemented with construction timber (boards), and if necessary, with stone or concrete (e.g., for anchoring into the terrain, etc.).

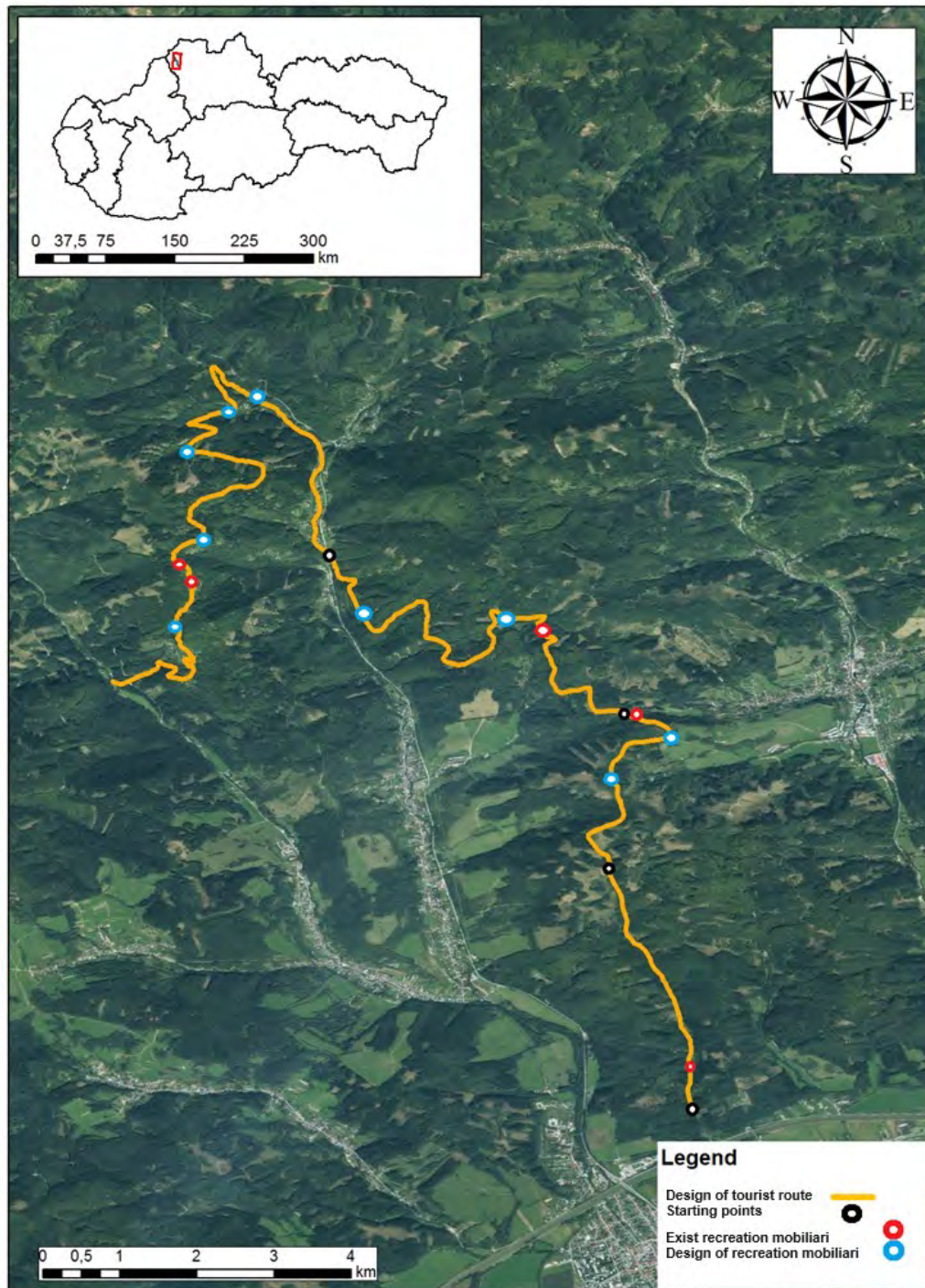


Fig. 1: Map of the area of interest with proposed trails

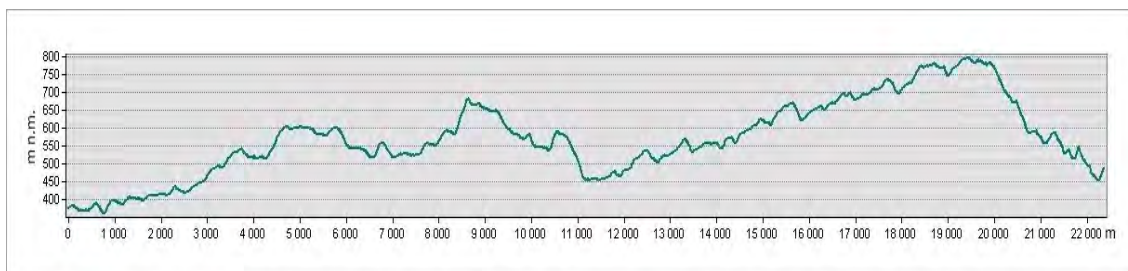


Fig. 2: Longitudinal profile of the proposed multifunctional hiking trail

Tab. 1: Recreational mobiliary

stationing (km)	Recreational mobiliary
3.121	Gazebo with seating, fireplace, garbage bin
3.965	Open seating, garbage bin, signpost
7.056	Water well
11.228	Open seating, fireplace, garbage bin
15.837	Open seating, fireplace, garbage bin
16.912	Water well
17.386	Gazebo with seating, fireplace, garbage bin
19.569	Open seating, garbage bin, signpost
21.572	Information board

Conclusion

The Javorníky Mountains range is among sought-after and popular tourist destinations, further enhanced by its location on the Slovak-Czech border, resulting in sought-after and immediate movement of tourists from one country to another. For cross-border tourism to be attractive, the area must have sufficient recreational facilities. This work addresses the utilization of existing transportation and recreational infrastructure for further recreational development of the area of interest, the central part of the Javorníky Mountains, by proposing a multifunctional hiking trail with a length of 22.64 km, purposefully supplemented with service facilities such as starting points and rest areas equipped with suitable recreational furniture. The implementation of this proposal will effectively complement the existing recreational infrastructure, increase the recreational attractiveness of the area, contribute to improving its accessibility, as the trail density increases to 7.94 m.ha^{-1} , and is expected to attract more tourists.

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Souhrn

Les, turistika a aktivní odpočinek jsou témata, která jsou často spojována s duševním zdravím člověka. Právě les a lesní prostředí slouží k pěší turistice a aktivnímu odpočinku a načerpání sil. Javorníky se vyznačují vysokou rekreační atraktivitou, je zde řada historických kulturních památek, přírodních zajímavostí a rekreačních středisek. Oblast je vyhledávanou turistickou oblastí díky množství a rozmanitosti turistických tras, přičemž je výjimečná svou dostupností ze slovenské i české strany.

Na celém území Javorníků je celkem 56 turistických tras o délce 859 km, přičemž v centrální části Javorníků je 23 turistických tras o celkové délce 309 km. Byl zpracován návrh na zvýšení atraktivity

území a jeho turistického potenciálu návrhem nové multifunkční turistické a cyklistické stezky v délce 22,64 km, vybavené rekreačním zařízením.

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RECREATIONAL USE OF LAND: UNVEILING THE MODERN FRONTIER OF OUTDOOR ADVENTURE – GEOCACHING

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Abstract

Educators play an important role (crucial) in introducing students to new outdoor adventure – Geocaching; however, educators (many) may not be aware of new outdoor adventure and/or lack the training (resource) to incorporate Geocaching into education. Because of that students miss the chance (may) to discover the modern frontier of outdoor adventure; therefore, the present study was aimed at exploring the awareness and level of involvement of students in modern frontier of outdoor adventure – Geocaching. 4-question survey (instrument) was carried out 4 months, as means of exploring the awareness and level of involvement of 1464 students in modern frontier of outdoor adventure – Geocaching. 32.04% of students know Geocaching ($p < .01$; $n = 470$) and 400 (27.32%) of students are familiar with Geocaching ($p < .01$). 56.90% of students do not know anyone who uses the app ($p < .01$; $n = 832$). In terms of lack of awareness and exposure to Geocaching in students, initiatives (efforts) should be undertaken to promote it as available and exciting outdoor adventure. By unveiling the modern frontier of outdoor adventure – Geocaching, students may discover new ways of learning, exploring, and outdoor fun.

Keywords: Awareness, educators, level of involvement, students.

Introduction

Unveiling the modern frontier of outdoor adventure – Geocaching, it attracts the adventurers of fusion of technology and recreational use of land (Battista et al., 2016). Adventurers utilize the technology (Global Positioning System – GPS) to uncover the hidden treasures (across the globe). Geocaching combines the joy of adventure and excitement of uncovering the hidden treasures, making it ideal for individuals/ groups in search of experiences in outdoors (Nemec, Adamčák 2012). It's an activity where participants use GPS coordinates to hide and seek the containers, called “Geocaches” and/or “Caches” at specific locations.

Part of what makes Geocaching so appealing is its ease of access. Anyone with GPS devices may participate, whether it's smartphones and/or dedicated GPS receivers (Referowská-Chodák, 2020). Geocaches are located in urban areas, parks, and/or underwater locations; therefore, it becomes an adaptable pursuit for adventurers (Individuals, groups) of every age and proficiency level (Nemec, Adamčák, 2012; Schlatter, Hurd, 2005). What makes Geocaching apart is the sense of discovery and opportunity to explore the nature (outdoors). Geocache (each) has its own story; finding it often involves solving (deciphering) the clues and/or navigating through challenging terrain (Hara, 2008). It's an amazing way to connect with outdoors, discover the hidden treasures in your community, and even learn about local history and culture (Ihamäki, 2012).

Educators play an important role (crucial) in introducing students to new outdoor adventure – Geocaching; however, educators (many) may not be aware of new outdoor adventure and/or lack the training (resource) to incorporate Geocaching into education. Because of that students miss the chance (may) to discover the modern frontier of outdoor adventure; therefore, the present study was aimed at exploring the awareness and level of involvement of students in modern frontier of outdoor adventure – Geocaching.

Material and methods

Regarding the study aim (see Introduction), 1 464 (100%) students participated in: (i) boys (764, 52.18%); (ii) girls (700, 47.82%), attending the 3rd year in high schools of Slovakia (Table 1). 1 464 (100%) students consisted of convenience sample, recruited by EduPage (Adamčák et al., 2023) and teachers of physical education. Recruitment (EduPage) of 1 464 (100%) was carried out 4 months – September 1 – December 31, 2023), in intervals of 2x (Mon, Thu)/ week, aimed at selective sampling; regarding gender, year of study. Exploring the awareness and level of involvement of 1 464 (100%) of students in modern frontier of out-door adventure – Geocaching (see Introduction) was carried out in accordance with ethical standards as laid down in 1964 Declaration of Helsinki and its later

amendments and/or comparable ethical standards. All subjects (1 464, 100% - survey group) provided written informed consent (Harriss et al., 2020).

Tab. 1: Demographic data of survey group (1 464, 100%)

Demographic data		
Boys	Age	16.60 ± .30 years
Girls		16.80 ± .50 years
Boys	Gender	764, 52.18%
Girls		700, 47.82%

4-question survey (instrument, self-report) was carried out 4 months, as means of exploring; in particular, analyze and/or compare, the awareness and level of involvement of 1 464 (100%) students in modern frontier of outdoor adventure – Geocaching (see Introduction). Developing the instrument (4-question survey) made it easier to explore (analyze, compare) the data, consisting of 2 sections: (i) Demographic data (age, gender, year of study) (Table 1); (ii) Survey items – questions, consisting of 4 (1 question/ 3 answers – Yes, Not sure, No) (Table 2 - 3, see Results). 4-question survey was online (available), collecting the data (Microsoft Forms, M. Office 365). 4-question survey was chosen because of its cost effectiveness, time saving, and easy access (Adamčák et al., 2023).

Available data (4-question survey) of 1 464 (100%) of students was tabulated in database design (Table 1 - 3). Incidence of responses; in particular, each item of survey (4) was analyzed and compared using the Tap3 – Gamo, B. Bystrica (Azor et al., 2023). After cleaning the data (available) of 1 464 (100%) students, descriptive statistics; in particular, measures of frequency and 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 1 464 (100%) students; in particular, boys (764, 52.18%) and girls (700 47.82%) (Turhan, 2020).

Results

Regarding the study aim (see Introduction), Table 2 illustrates (shows) whether 1 464 (100%) students are aware of “concept” Geocaching (Survey items – Q1) and/or are aware (know) of principles – Geocaching (Survey items – Q2). When considering the awareness of “concept” Geocaching, 32.04% (470) of students are aware of “concept” Geocaching; however, 688 (46.98%) of students are not aware of that concept (Table 2). “Not sure” about survey items – Q1 (awareness of “concept” Geocaching) is 20.98% (306) of students (1 464, 100%). Difference between 1 464 (100%) students; in particular, boys (764, 52.18%) and girls (700 47.82%) was significant (statistically; $p < .01$) ($p = 4.62$ E-05; $\chi^2_{(2)} = 18,96$).

When considering the awareness (know) of principles – Geocaching (Table 2), 27.32% (400) of students are aware of principles; however, 52.06% (762) (366, 40.12% of boys; 396, 56.38% of girls) are not aware of principles. “Not sure” in terms of awareness of principles – Geocaching was 302 (20.62%) of students (1 464, 100%). Difference between 1 464 (100%) students; in particular, boys (764, 52.18%) and girls (700 47.82%) was significant (statistically; $p < .01$) ($p = .001$; $\chi^2_{(2)} = 14,98$) (Table 2).

Tab. 2: Survey items – Questions 1-2 (1 464, 100%)

Survey Items – Question 1			
	Yes	Not Sure	No
Boys	280, 36.60%	134, 17.52%	350, 45.88%
Girls	190, 27.04%	172, 24.74%	338, 48.22%
Boys + Girls	470, 32.04%	306, 20.98%	688, 46.98%
P = 4.62 E-05; $\chi^2_{(2)} = 18,96^{**}$			
Survey Items – Question 2			
	Yes	Not Sure	No
Boys	240, 31.24%	158, 20.64%	366, 40.12%
Girls	160, 23.02%	144, 20.60%	396, 56.38%
Boys + Girls	400, 27.32%	302, 20.62%	762, 52.06%
P = .001; $\chi^2_{(2)} = 14,98^{**}$			

** - $p < .01$.

Table 3 illustrates whether 1 464 (100%) students are aware of apps necessary to play Geocaching (Survey items – Q3) and/or are aware of anyone who uses apps necessary to play Geocaching (Survey items – Q4) (Table 3). “Not sure” about survey items – Q3 (awareness of apps necessary to play Geocaching) is 614 (42.02%) students; in particular, 296 (38.82%) boys and 318 (45.20%) girls.

342 (23.30%) of students (1 464, 100%) are aware of apps (any) necessary to play Geocaching; however, 508 (34.68%) students (1 464, 100%) are not aware of apps (Table 3). Difference between 1 464 (100%) students, in particular, girls (700, 47.82%) and boys (764, 52.18%) was significant (statistically, $p < .01$) ($p = .0006$; $\chi^2_{(2)} = 14.56$).

56.90% (832) of students (1 464, 100%) do not know anyone who uses apps ($p < .01$) (Table 3; Survey items – Q4). 300 (20.48%) students (1 464, 100%) are “not sure” whether someone uses apps necessary to play Geocaching. 22.62% (332) of students (1 464, 100%) know anyone who uses apps necessary to play Geocaching. Difference between 1 464 (100%) students, in particular, girls (700 , 47.82%) and boys (764, 52.18%) was significant (statistically, $p < .01$) ($p = .006$; $\chi^2_{(2)} = 10.08$).

Tab. 3: Survey items – Questions 3-4 (1 464, 100%)

Survey Items – Question 3			
	Yes	Not Sure	No
Boys	208, 27.20%	296, 38.82%	260, 33.98%
Girls	134, 19.02%	318, 45.20%	248, 35.48%
Boys + Girls	342, 23.30%	614, 42.02%	508, 34.68%
P = .0006; $\chi^2_{(2)} = 14.56^{**}$			
Survey Items – Question 4			
	Yes	Not Sure	No
Boys	194, 25.36%	138, 18.04%	432, 56.60%
Girls	138, 19.60%	162, 23.18%	400, 57.22%
Boys + Girls	332, 22.62%	300, 20.48%	832, 56.90%
P = .006; $\chi^2_{(2)} = 10.08^{**}$			

** - $p < .01$

Discussion

Educators play an important role (crucial) in introducing students to new outdoor adventure – Geocaching; however, educators (many) may not be aware of new outdoor adventure and/or lack the training (resource) to incorporate Geocaching into education (Čipková et al., 2024). Because many gaps remain in literature in terms of Slovak scale (to the best of authors' knowledge), the present study was aimed at exploring the awareness and level of involvement of students (1 464, 100%) in modern frontier of outdoor adventure – Geocaching.

Schools are changing how they work (Zemko et al., 2016). It was about (all) the teacher; however, now it's about the students. It means that we need new ways of teaching and looking at things to match how the students learn now (Knežek et al., 2013). There are many ways to use Geocaching in schools. It comes (all) down to how good the teachers are, what resources the schools have, and what level the students are at (Lo, 2010). Hartl (2006) described the recreational use of land of Geocaching in Environmental education. Hellgren et al. (2014) looked at how Geocaching may help with teaching/ learning Science.

Conclusion

In terms of lack of awareness and level of involvement (see Results) of students (1 464, 100%) in modern frontier of outdoor adventure – Geocaching ($p < .01$), initiatives (efforts of educators) should be undertaken to promote it as available and exciting outdoor adventure of uncovering the hidden treasures. By unveiling the modern frontier of outdoor adventure – Geocaching, students may discover new ways of learning, exploring and outdoor fun; therefore, pack your sense of curiosity and embark the modern-day treasure hunt, promising the endless fun (excitement) and experiences.

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Souhrn

Pedagogové hrají důležitou (klíčovou) roli při seznamování studentů s novým outdoorovým dobrodružstvím - Geocachingem; nicméně pedagogové (mnozí) nemusí mít povědomí o novém outdoorovém dobrodružství a/nebo jim chybí školení (zdroje) pro začlenění Geocachingu do výuky. Z tohoto důvodu studenti přicházejí o možnost (mohou) objevovat moderní hranici outdoorového dobrodružství; proto byla tato studie zaměřena na zkoumání povědomí a míry zapojení studentů do moderní hranice outdoorového dobrodružství - Geocachingu. Dotazník (nástroj) se 4 otázkami byl prováděn 4 měsíce jako prostředek zkoumání povědomí a úrovně zapojení 1464 studentů do moderní hranice outdoorového dobrodružství - Geocachingu. Geocaching zná 32,04 % studentů ($p < .01$; $n = 470$) a 400 (27,32 %) studentů je s Geocachingem obeznámeno ($p < .01$). Aplikaci nezná 56,90 % studentů, kteří ji používají ($p < .01$; $n = 832$). Z hlediska nedostatečného povědomí a seznámení se s Geocachingem u studentů by měly být podniknuty iniciativy (snahy) o jeho propagaci jako dostupného a vzrušujícího outdoorového dobrodružství. Odhalením moderní hranice outdoorového dobrodružství - Geocachingu - mohou studenti objevit nové způsoby učení, poznávání a zábavy v přírodě.

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REDUCING THE NEGATIVE IMPACT OF TOURISM ON THE ENVIRONMENT BY USING RAIL TRANSPORT. CASE STUDY: BUCHAREST NORD-BRASOV ROUTE

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Abstract

Tourism represents an essential component in the socio-economic development of a state. However, often the methods used affect components of the natural environment. The main source of pollution when it comes to tourism is transport. The transport sector currently generates a quarter of all greenhouse gas emissions in Europe, with the road sector making the largest contribution at around 72%. Projections indicate that emissions generated by the transport sector will increase by approximately 32% in 2030 compared to 1990. A perspective on road transport is given by the use of hybrid cars or alternative fuels (CNG, LPG, hydrogen). By 2025, it is desired to install approximately one million public recharging and refueling stations that will contribute to achieving the goals of zero-emission or low-emission vehicles desired by the European Union. Until these objectives are met, rail transport has multiple advantages over road transport when it comes to environmental protection in the practice of tourism.

Keywords: rail tourism, train, pollution, railways, sustainable development

Introduction

Transport represents a strategic sector of national interest and an essential service for society, whose role is to contribute to the safe and efficient circulation of goods, goods and people, both on the territory of Romania and outside the country.

The transport sector is not only a pillar of support for other sectors, but makes a major contribution to the resilience of an economy, providing a solid basis for accelerated recovery in the event of prolonged crises with a significant negative impact on society as a whole (PNRR, 2023).

Rail has long been recognized as one of the greenest means of mass transit, offering lower carbon emissions, energy efficiency and reduced emissions congestion compared to other modes of transport (Milewicz, J. et al, 2023).

The transport system plays an important role in the development of the tourist destination, thus, railway tourism in Romania started timidly, starting in the 2000s and developed slowly. It is currently found on narrow gauge railway lines (760mm) and very rarely on broad gauge railway lines (1435mm).

Analyzing broad-gauge railway tourism, Valea Prahova represents the largest tourist axis in Romania and, at the same time, an important tourist point. It is crossed both by road (National Road 1) and by rail (CFR Highway 300). Along the valley there are tourist resorts of national and international interest (Predeal, Azuga, Bușteni, Sinaia), as well as a spectacular relief created by the Bucegi and Baiului Mountains, the two massifs that delimit the Prahova valley.

The CFR 300 highway, on the Bucharest Nord-Brașov sector, is crossed by electric trains (being a double electrified railway), as well as diesel trains. According to Mersul Trenurilor 2023, 33 pairs of trains run daily, of which 18 are electric and 15 are diesel. In addition, the CF 300 highway has two electrified traffic directions and has undergone the modernization process, thus the operating speed is over 100 km/h from Ploiești Vest to Câmpina and, at least, 80 km/h h from Câmpina to Predeal. Therefore, compared to the other Carpathian crossings, the railway infrastructure on Prahova Valley is characterized as being the most efficient.

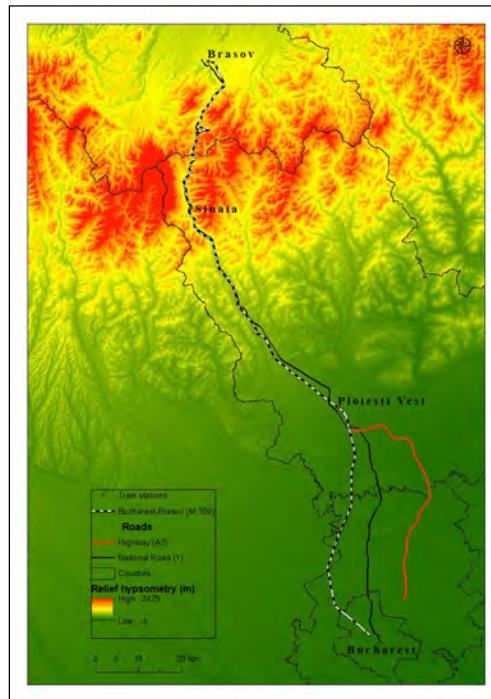


Fig. 1: The analyzed area. Route: Bucharest Nord-Braşov; Source: personal archive

Methodology

The data source was provided by the ESRS Methodology and the Zero Carbon Railways Report. To analyze the impact of emissions and consumption of rail and road transport, EcoPassenger, an internet tool that uses a sound scientific methodology, was used by the Institute for Energy Research and Environment (ifeu) from Heidelberg and the Foundation for Sustainable Development (SusDev) from Romm, scientific partners of this tool, collecting values of emission factors and consumptions of European railways based on the Environmental Strategy Reporting System. Thus, by using EcoPassenger, energy consumption, CO₂ and atmospheric exhaust emissions for cars and passenger trains were determined. At the same time, in making this comparison of the emissions released by means of transport, the method of observation and comparison was also used.

Also, the cartographic method was also used in making the map of the location of the studied area (Bucureşti Nord-Braşov route). Vector data (point, line and polygon type) and raster data (DEM containing relief hypsometry) were used. The map was made in specialized software, from the GIS programming suite (ArcMap 10.6.1).

Results

The tourism phenomenon has the highest growth in the world, in terms of industries. However, in addition to the positive effects on the community (development, income) and the environment (conservation), tourism can also have negative effects such as: depletion of natural resources, environmental pollution. Greenhouse gas emissions and contribution to global warming, physical degradation of ecosystems and loss of biodiversity, soil erosion and unsustainable land use, and overconsumption and waste production.

According to the Annual Transport and Environment Report 2020 (TERM), transport accounted for 25% of the European Union's greenhouse gas emissions in 2018. Emissions from this sector come mainly from road transport (72%), while maritime transport and air had weights of 14% and 13%, respectively, and rail transport only a weight of 0.4%. This 0.4% comes from diesel locomotives, but there are also harmful particles in the air from locomotive and railcar brake pads, tires and rolling stock damage.

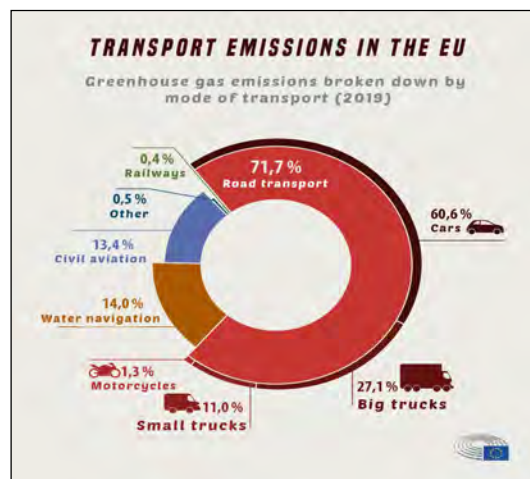


Fig. 2: Emissions from transport in the European Union
Source: European Environment Agency

In order to put into practice the objectives of the European policy regarding climate neutrality included in the European Ecological Pact, respectively in the EU Strategy for Sustainable and Intelligent Mobility, as well as the actions proposed in the Fit for 55 package, it is necessary to establish measures at the national level. Therefore, 3 prospects for the development of rail transport on the Bucharest North-Braşov sector were identified, as follows: the construction of an 8 km tunnel, which avoids the slope from Predeal to facilitate the transport of rolling stock; modernization of the Predeal-Braşov railway sector; introducing the concept of pedal trains on the mocanica trails (Valea Doftanei). Among the advantages of railway tourism are: the revitalization of former industrial platforms and exploitation areas that have lost their initial usefulness; the constructions related to the railways were no longer subjected to demolition or degradation processes, thus avoiding the effect of visual pollution; the former industrial cities affected by the cessation of specific activities showed an intensification of HoReCa activities due to the presence of tourists; some of the employees serving the railway were able to continue their work, not being affected by redundancies or postings. In addition, among the disadvantages, the following can be specified: high operating costs, generated by the salaries of personnel that require special training for this type of activity (for example mechanics, clerks, inspectors); rolling stock maintenance and high fuel consumption; the need for approvals from specialized authorities, such as AFER, in the case of railways that are part of the CFR network.

On a daily basis, Valea Prahova is served by 33 pairs of trains, of which 18 are electric and 15 are diesel. The strengths and weaknesses of electric and diesel trains were identified in order to observe the impact of this means of transport on the environment, as follows:

Tab. 1: Strengths and weaknesses of diesel and electric trains

<i>Diesel train</i>	<i>Electric train</i>
Strengths	Strengths
<i>Accessibility in non-electrified areas</i>	It doesn't pollute
<i>They are not affected by meteorological phenomena</i>	High carrying capacity (high traction power)
<i>It can supplement if the electrical network fails</i>	Comfort assured to travelers
Weaknesses	Weaknesses
<i>Excessive pollution</i>	It is affected by weather conditions
<i>Weaker pulling power</i>	If the power grid fails, the electric trains can no longer run
<i>Noise – passenger discomfort</i>	It does not cover all areas of the country

According to a publicized experiment, the distance covered on the Bucharest-Sinaia sector, by road, on a Friday (during the winter season), the distance was covered in 4-5 hours, while on the railway it was covered in 1 hour and 30 minutes. A train ticket costs approximately 50 lei/adult, while a journey by car costs at least 100 lei (depending on the consumption of the car).

Carrying out an analysis with the help of ECOPassenger, an internet tool, which compares energy consumption, CO₂ and atmospheric exhaust emissions for means of transport, we could see that the train is much more ecological and beneficial for the environment within Prahova Valley. The comparison was made between the tourist train IR 1631 (Bucharest Nord-Braşov) and a car (middle class, EURO 4 diesel). The duration of traveling the distance by rail is 2 hours and 28 minutes, and by road 2 hours and 41 minutes.



Start/destination	Details	Term	Transport
 BUCURESTI NORD (Romania) [RO] BRASOV (Romania) [RO]	From Thursday, 02/01/24, 07:17 to Thursday, 02/01/24, 09:45	2:28	IR 1631
 BUCURESTI NORD (Romania) [RO] BRASOV (Romania) [RO]	Middle class; Diesel Euro 4	1:57	Car

Fig. 3 Subjects compared (train vs. car)

Source: <https://ecopassenger.org/>

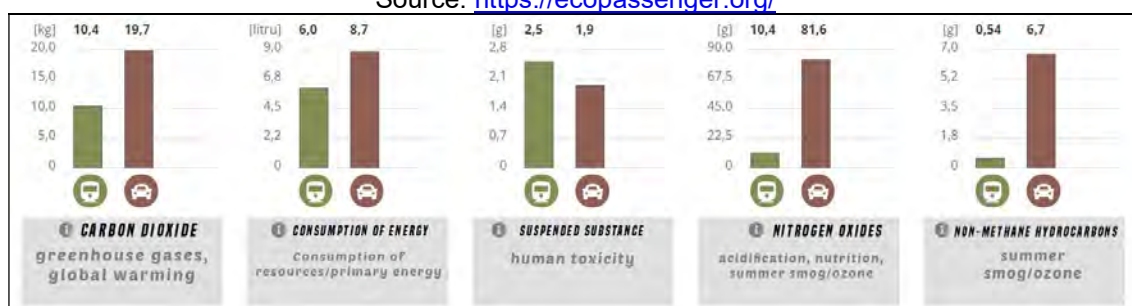


Fig. 4: Emissions generated by the two means of transport

Source: <https://ecopassenger.org/>

COMPOUND	TRAIN	CAR
KILOGRAMS OF CARBON DIOXIDE	10,4	19,7
CONSUMPTION OF ENERGY RESOURCES (EQUIVALENT LITER OF PETROL)	6,0	8,7
GRAMS OF PARTICLES	2,5	1,9
GRAMS OF NITROGEN	10,4	81,6
GRAMS OF NONMETHANIC HYDROCARBONS	0,54	6,7

Fig. 5: The composition of the emissions of the two means of transport

Source: <https://ecopassenger.org/>

The results of the comparison show that the rail means of transport have an impact of less than half that of the road. CO₂ emissions are halved (10.4 kg), and nitrogen oxides and non-methane hydrocarbons are substantially lower than those emitted by passenger cars.

Conclusion

The train is considered the least polluting means of transport, compared to road, air or sea. The European Environment Agency claims that transport is responsible for 25% of greenhouse gas emissions in the European Union.

The train can be considered a solution for reducing the negative impact on the environment, because it has the lowest share of released emissions among the means of transport used within Prahova Valley.

Greenhouse gas emissions released by rail transport account for only 0.4% of the total transport emissions in the European Union.

According to transport decision-makers, trains will represent the means of transport that will neutralize global warming, by purchasing sustainable rolling stock (electric or using hydrogen), as well as by modernizing the existing rolling stock with electric traction equipment with low energy consumption . The Prahova Valley remains the most traveled tourist axis in Romania, where the train plays a very important role among national and international tourists, but also in protecting the natural areas in the vicinity (the Prahovean Abruptul of the Bucegi Mountains and the Baiului Mountains).

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*** <https://www.naturetalks.ro/stiri-despre-mediul/analiza-tren-avion-masina-ambarcatiune-care-e-mai-verde>
*** <https://www.naturetalks.ro/stiri-despre-mediul/ce-este-ruta-ecologica-din-google-maps-si-cum-functioneaza>
*** <https://www.eea.europa.eu/highlights/motorised-transport-train-plane-road>
*** <https://www.eea.europa.eu/publications/transport-and-environment-report-2020>

Souhrn

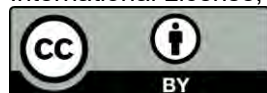
Cestovní ruch je dynamický a komplexní fenomén, který zahrnuje několik složek, mezi něž patří i doprava. Ta většinou není šetrná k životnímu prostředí, takže železniční doprava vítězí nad ostatními druhy dopravy, pokud jde o množství vyprodukovaných emisí, které je velmi malé. Vlak je tedy považován za řešení pro snížení negativního dopadu na životní prostředí, přičemž je zapojen i do cestovního ruchu.

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ROADSIDE TREES – AN IMPORTANT ELEMENT OF THE OPEN AREAS' LANDSCAPE

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Abstract

Tree plantings accompanying communication routes fulfil several technical, aesthetic and environmental functions. In the past, in open areas, they visually marked the route of the road (identification of the local road in the landscape thanks to regular trees - important in winter), protected against unfavourable weather conditions (excessive sun, strong wind, heavy snowfall), emphasized the importance of the space (representative roads, main entrances to villages, cities, residences). Properly shaped (proper structure and adaptation to the spatial context) allows for shaping landscape interiors, exposing an attractive spatial scenery or covering unattractive objects and views. The change and diversity of plantings along roads affect the safety of their users - it prevents monotony and driving fatigue. They have a clear environmental impact (protecting surrounding areas against noise and pollution), especially when part of a coherent system of mid-field trees. Ancient avenues are an essential and valuable element of the cultural landscape. In Europe, roadside tree plantings have a long tradition as a permanent landscape element. In some countries, the accelerated development of the road network in recent years has changed the established order of space organization along expressways and highways.

Keywords: plants along roads, landscape, environment

Introduction

In the landscape of open areas, trees accompanying communication routes play a unique role. In addition to environmental functions, this type of tree stands have purely utilitarian importance, they have long been identified - and used for centuries (Majdecki 1993), and they visually mark the route of the road (e.g. identification of the road in the landscape thanks to regular trees - important in winter), they protected against unfavorable weather conditions (e.g. protection against excessive sun, strong wind, intense snowfall), emphasized the importance of the space (e.g. representative roads, main entrances to villages, cities, residences) (Fortuna-Antoszkiewicz, Łukaszkiwicz 2012). Properly shaped trees (proper structure and adaptation to the spatial context [Fortuna-Antoszkiewicz 2002]) have a landscape significance - they allow for exposing an attractive landscape or covering unattractive objects and views. For travelers, it is the sequences seen from the road that are often the first or even only contact with a given region and the surrounding landscape, and such an image is remembered (Fig. 1). The variety of forms and changes in the rhythm of plantings along roads affect the safety of their users - they counteract monotony and driving fatigue (Graffstein 1989). The presence of ancient avenues is a valuable element of the cultural landscape in the historical dimension (protection of the cultural landscape) and also proves the maturity and sensitivity of the area's owners - to the beauty of the landscape and the value of natural elements (Fortuna-Antoszkiewicz 2019; Fortuna-Antoszkiewicz, Łukaszkiwicz 2016, 2017, 2018).

Author's research

The authors conduct many years of research in selected agricultural areas of Poland (main research site: central Poland - Mazovia). Roadside tree stands are observed in their arrangement and spatial structure - object and overall systems (independent element or part of a more extensive area system). Roads and their surroundings in other European countries are subject to comparatively systematic observation. At the same time, research on the history and tradition of introducing roadside trees in Poland is continued - achievements, research facilities, effectiveness of activities (archival research, literature review).

Results

Agricultural areas of Mazovia, local roads. At the research sites, the authors identify forms of roadside tree stands - rows and strips (less common). Generally, these are projects mainly from the 1960s and

1970s, occasionally older ones (the trees are about 100 years old or more). Their gradual degradation is observed; in many places, there is an apparent loss of continuity and a lack of additions. The structures are built mainly by aging plant material (trees in the mature and senile stages), e.g. short-lived species: poplars (*Populus xcanadensis* 'Marilandica', *Populus xeuroamericana* Guiner, *Populus xberolinensis* (K. Koch) Dippel 'Berlin'), fruit trees (*Malus sp.*, *Pyrus sp.*); longer-lived species: mainly *Tilia sp.*, *Acer sp.*, occasionally e.g. *Fraxinus sp.*, *Quercus rubra*. Due to natural factors (ageing of trees), the first to disappear are tree stands composed of short-lived species and varieties (e.g. *Populus nigra* L. 'Italica', *Populus simonii* Carrière 'Fastigiata', *Populus xcanadensis* Moench, fruit trees species). There is an apparent fragmentation of tree stands, often by cutting down/removing subsequent sections - the most common causes are lack of improper care (strong, invasive cuts in tree crowns), change in land functions, and new road investments. New plantings are introduced sporadically, mainly in the form of sectional trees - these are additions (e.g. *Tilia sp.*) and are introduced relatively locally and on a facility-by-object basis (e.g. historical avenues). A similar problem occurs in other regions of the country.

National roads in Poland. Over the last few years, new road investments have been successively implemented - subsequent sections of highways and national roads are being put into operation. These long-awaited projects undoubtedly improve local and supra-regional communication, enabling efficient domestic and international road transport. At the same time, it is associated with a negative impact of the investment on the surroundings through the emission of noise and pollution, as well as fragmentation of the area. In the vicinity of new national roads, concerning the previously developed principles of using trees and shrubs as protective structures, a significant change is observed:

- limiting the use of tall vegetation as road framing / minimal share of tree plantings - mostly these are row arrangements that are not very diverse, often with excessively dense planting spacing (→ maintenance problems in the future);
- visual dominance of technical solutions (acoustic screens) - used on long sections, often at the very edge of the road (no space for introducing vegetation) (Fig. 13); in some places, the screens are "planted" with vines (currently in various stages of development), which over time will somewhat mask the aggressive presence of this form of cover (Fig. 14).

Acoustic protection, such as screens, are created to protect areas classified in local development plans or based on the commune's classification as areas subject to acoustic protection. So, in theory, one of the essential elements of the investment process is environmental protection. Meanwhile, on roads managed by GDDKiA⁷, noise barriers have an area of over six mln m² (it is constantly growing) (<https://www.gov.pl/web/gddkia/ekrany-akustyczne-przy-drogach---co-mowia-przepisy>), which, taking into account the area of the entire road structure (separated strip of land with roads, roadsides, parking lots and various road technical facilities) significantly increases the impact of road investments on the environment, creating a vast biologically inactive surface. The vines growing on the screens will, over time, minimize this vital problem, which is growing in the face of the climate crisis. Acoustic screens are gradually becoming an increasingly prominent spatial element on a national scale, strongly emphasizing the route as an engineering structure that strongly interferes with the surroundings. In the context of protection and preservation of landscape values, long sections covered with acoustic screens have a negative impact on the physiognomy of a given area.

Acoustic screens are used to reduce noise, but their impact on reducing traffic pollution is practically negligible. The phytoremediation effect is demonstrated by biofilters, including the largest of them - trees, which can directly capture dust particles and also contribute to the reduction of gaseous pollutants in the air, e.g. CO, NO₂, NH₃ (Sadowiec and Gawroński 2013). The simplest, oldest and most effective way to reduce pollution is to plant endangered areas, in this case, the surroundings of roads, with trees with dense foliage (Bell and Treshow 2004) - the more extensive the plant belt, the more effective its impact. As has been found for a long time, the concentration of pollination in a tree-covered area decreases by up to 10%, while in an area with a similar area but without trees, it decreases only to 50% (Niemirski 1973). So, planting rows of trees and shrubs, or preferably diverse strips of trees, is a much more universal solution - it limits the spread of traffic pollution while providing acoustic protection.

Discussion

Observing the landscape of non-urban areas in other European countries (e.g. UK, Czech Republic and Germany), it can be concluded that maintaining roadside trees is a standard for shaping and

⁷ GDDKiA - [Generalna Dyrekcja Dróg Krajowych i Autostrad](https://www.gov.pl/web/gddkia) (General Directorate for National Roads and Motorways) / The national roads in Poland managed by GDDKiA currently total 17 791 km (<https://www.gov.pl/web/gddkia/ogolne-informacje-o-sieci-drog-krajowych>).

using such areas (Figs. 1-2, 5-6). A model level of shaping and permanent maintenance of tree stands on various types of roads is represented, for example, by England (Fortuna-Antoszkiewicz, Łukasziewicz 2016) (Figs. 3-4, 11-12). It is due to the strongly respected tradition, but also to the awareness of the benefits of extensive plant systems accompanying roads - effectiveness in limiting the spread of traffic and noise pollution, and positive impact on the landscape. In various countries, there is a constant presence of mature and older woodlots, which are controlled and protected (Fig. 6), as well as activities involving their supplementation and renewal, as well as the successive introduction of new plantings. Natural covers in the form of various plant systems dominate in open areas around highways (Figs. 9-10). For example, Ukraine is a country where systemic roadside tree plantings have been introduced over the years as an essential element of protecting vast agricultural areas (Fig. 7-8).

Conclusion

- Original research has shown that in selected research areas, the following is observed:
 - agricultural areas of Mazovia region, local roads: gradual degradation of existing roadside tree resources - ageing of trees and disappearance of shrubs, losses in plantings and lack of replacements; cutting/removing individual structures and, above all, lack of systemic continuation (no new plantings); a similar problem occurs in other regions of the country;
 - surroundings of new national roads: low share of tree plantings (mainly little-differentiated row arrangements with excessively dense planting spacing) and visual dominance of technical solutions (acoustic screens) used on long sections.
- The lack of systemic trees on national roads and their replacement only with a technical form (acoustic screens) leads to **the deformation of cultural landscapes**, i.e. to a reduction in their physiognomic value and, consequently, in the tourist attractiveness of a given region (social and economic aspects). Moreover, abandoning tall vegetation along communication routes and running roads on long sections in "corridors" covered with screens **significantly reduces the safety of road users** (weariness with the monotony of the view), which especially applies to people travelling long distances.
- Meanwhile, road trees in open landscapes perform several essential protective functions of significant landscape importance. Appropriate spatial structure of tree stands near roads (location, form of tree cover, internal structure, spatial arrangement) and appropriate selection of tree/shrub species - **ensure the effectiveness of their impact** → landscape and protective function (limiting pollution, ensuring safety).
- **Various tree stands** adapted to the spatial context (landscape) and environmental conditions (topography, climate, soil, water, and habitat conditions) ensure the stability and durability of plant systems, and the road—depending on the situation—can be highlighted or harmoniously "embedded" into the surrounding landscape.

LOCAL ROADS



Fig. 1: **Czech Republic, Moravia** / local road planted with fruit trees - cultivating traditions and effective protection of landscape values [J. Łukasziewicz, 2018]



Fig. 2: **Czech Republic, Moravia** / local road in agricultural landscape - surrounded by *Malus sp.* fruit trees with high decorative and biocenotic values [P. Wiśniewski, V 2022]



Fig. 3: **UK, Surrey county** / local road lined on both sides with hedges and trees of various species - tradition in a modern landscape [J. Łukasziewicz, IV 2015]



Fig. 4: **UK** / local road in a hilly landscape and roadside trees in a linear, two-sided form – the protection of farmland and historic landscape [J. Łukasziewicz, 2007]

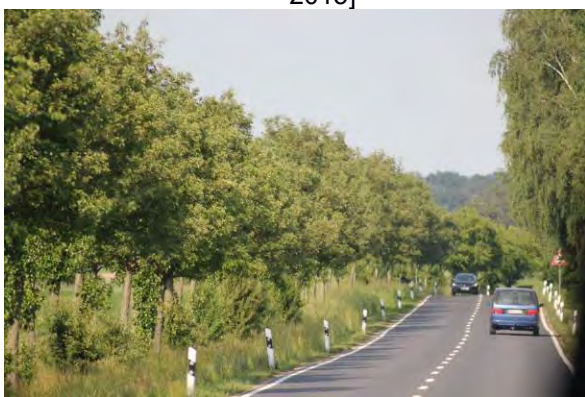


Fig. 5: **Germany, Brandenburg** / local road - fruit trees (left) with additional belt trees of other species, including: silver birch (right) [J. Łukasziewicz, V 2018]



Fig. 6: **Germany, Brandenburg** /the cover of valuable, historical red oaks gives an effective protection along the local road [J. Łukasziewicz, V 2018]



Fig. 7: **Western Ukraine** / local and supra-regional road –representatively planted with weeping willows [B. Fortuna-Antoszkiewicz, IX 2013]



Fig. 8: **Western Ukraine** / roadside woodlots in agricultural areas (field protection) – strip form, double-sided, dense, multi-species [B. Fortuna-Antoszkiewicz, IX 2013]

NATIONAL ROADS



Fig. 9: **Czech Republic, Moravia** / diverse woodlots arranged on slopes along the road and a hedge between the lanes as an anti-glare shield [P. Wiśniewski, IX 2022]



Fig. 10: **Czech Republic, Moravia** / diverse, dense belts of trees on slopes effectively reduce traffic pollution [P. Wiśniewski, IX 2022]



Fig. 11-12: **UK, Surrey county** / diversified arrangements of woodlots instead of linear screens along the M25 motorway, aimed for → traffic pollution's reduction, noise shielding and "blending" the road into the surrounding landscape [J. Łukaszkiwicz, IV 2015]

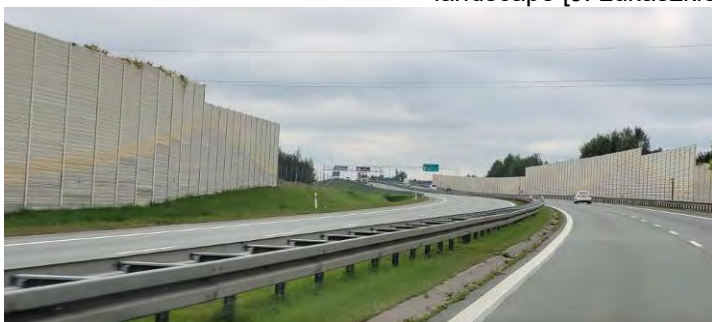


Fig. 13: **Poland** / currently an increasingly typical situation - many kilometers of noise barriers along highways and expressways - limited view and the visual monotony [P. Wiśniewski, IX 2022]



Fig. 14: **Poland** / typical situation - screens located right at the edge of the road - vines (occurring fragmentarily) as the only option for the roadside vegetation [B. Fortuna-Antoszkiewicz, IX 2022]

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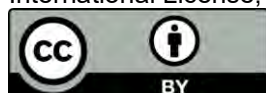
Výsadba stromů doprovázejících komunikace plní několik technických, estetických a ekologických funkcí. V minulosti ve volné krajině vizuálně vyznačovaly trasu komunikace (identifikace místní komunikace v krajině díky pravidelným stromům - důležité v zimě), chránily před nepříznivými povětrnostními podmínkami (nadměrné slunce, silný vítr, husté sněžení), zdůrazňovaly význam prostoru (reprezentativní komunikace, hlavní vstupy do obcí, měst, sídel). Vhodně tvarované (správná struktura a přizpůsobení prostorovému kontextu) umožňují utvářet krajinné interiéry, exponovat atraktivní prostorovou scénérii nebo zakrývat neatraktivní objekty a pohledy. Obměna a rozmanitost výsadeb podél komunikací ovlivňuje bezpečnost jejich uživatelů - zabraňuje monotónnosti a únavě z jízdy. Mají zřetelný vliv na životní prostředí (chrání okolí před hlukem a znečištěním), zejména pokud jsou součástí uceleného systému středoplošných dřevin. Staré aleje jsou zásadním a cenným prvkem kulturní krajiny. V Evropě mají stromořadí u silnic dlouhou tradici jako trvalý krajinný prvek. V některých zemích zrychlený rozvoj silniční sítě v posledních letech změnil zavedený řád organizace prostoru podél rychlostních silnic a dálnic.

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SAFETY PROVIDING ROLE OF URBAN PARKS – A CASE STUDY OF CENTRAL PARK (NEW YORK, USA)

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Abstract

Urban parks are widely recognized as extremely valuable areas for city dwellers thanks to providing green places for rest and leisure for different types of users. Among the limitations to their use, the literature often mentions safety concerns - a security perception among users depending on the time of day, weather, lighting, and park maintenance, but also on the behavior of other park users. The case study of Central Park (NY, USA) based on the data collected by the New York Police Department shows that this huge park visited by hundreds of people each day is significantly safer than the surrounding precincts. In particular, it is interesting that in the park there are fewer cases of crime such as *rape* and *felony assault*, as well as *grand larceny*, which are the most common in green urban areas. The results prove that urban green areas can play an important role in increasing the safety related to recreational activities in the city, which should be taken into account in modern placemaking initiatives.

Keywords: urban green spaces, placemaking, public safety, sustainable society, sustainable city

Introduction

A safe urban park is defined as ‘a dynamic place where the design, maintenance, and policing of the park work together so that the general public perceives the park as a safe place, wants to go to the park regularly, and spends their optional time in the park engaged in valued activities.’ (Hilborn, 2009). Achieving such a state depends on many objective factors and their subjective perception by users. On the one hand, the security of a park is influenced by its overall attractiveness and location, as well as design (Park, 2017), the presence of ‘security infrastructure’ (Zavadskas et al., 2019) or the way it is managed (Wilson, Kelling, 2010), including its maintenance (Lorenc et al., 2013). On the other hand, the perception of a facility is determined by the profile of its users (Mak, Jim, 2018), gender (Jorgensen et al., 2013; Polko, Kimic, 2022), age (Kimic, Polko, 2021, 2022), physical fitness (Cunningham et al., 2020) and expectations towards the park resulting from its use as a place for rest (Zhu et al., 2020), physical activity, or a playground for children (Bai et al., 2013).

Central Park is an urban park between the Upper West Side and Upper East Side neighbourhoods of Manhattan in New York City that was the first landscaped park in the United States. It is the sixth-largest park in the city, covering 341 ha, and the most visited urban park in the United States, with an estimated 42 million visitors annually as of 2016. Visitors might gaze upon nearly 50 fountains, monuments, and sculptures or admire its 36 bridges and arches. Sports facilities include pots to skate, pedal, row, dribble, or climb, as well as 21 playgrounds. The biologically diverse ecosystem has several hundred species of flora and fauna. The park is open every day from 6 AM to 1 AM (Central Park Conservancy, 2024).

Taking into account the importance and use of the park by various users indicated above, safety in this area becomes one of the key issues determining its accessibility and attractiveness, especially for tourists. For this reason, Central Park is patrolled by both the New York City Parks Enforcement Patrol and the New York Police Department (NYPD), and there is a local police station within it. Moreover, in several locations throughout the facility, in addition to 31 video monitoring cameras supervised by the police, special boxes were installed to quickly call for help or report a threat. This applies not only to crime but also to medical problems: medical support is provided by the Central Park Medical Unit, made up of 150 volunteers and three ambulances. The Unit is funded from private donations, and the medical services are free of charge. Moreover, for safety reasons, since 2018, cars are not allowed to enter the park: roads are reserved for runners, walkers, cyclists, skaters, scooters, pedicabs, and horse carriages. Cyclists must ride in a counterclockwise direction. Runners are encouraged to go counterclockwise, but technically both directions are allowed (Regulations & Safety, 2024).

Another solution that ensures a sense of security and encourages people to use the park is the designation of 8 ‘Quiet Zones’ to relax and enjoy the surroundings. In these parts of the park, no music

is allowed. Running, rollerblading, riding a bike, or participating in any organized sports are forbidden, as well as feeding birds or other wildlife. Dogs must always be leashed and on the pathway. In other parts of the park, they are allowed, but they must be on-leash 9:00 AM to 9:00 PM. Apart from these general rules, dogs are never allowed at some locations such as all ballfields, recreational courts, playgrounds, bodies of water, streams, and fountains (Regulations & Safety, 2024).

The sense of security and meeting social expectations regarding its increase are key to improving accessibility and ensuring the comfort of recreation in urban green areas. In this context, safety maps are now becoming a helpful tool both for assessing the real situation and taking preventive actions (Polko, Kimic, 2024; Šerý et al., 2024).

Material and methods

Taking into account the applicable procedures and security measures, as well as the number of users of Central Park in New York (USA), the study aimed to analyze crime occurring in the park compared to its surroundings. The study used city crime data for the fourth quarter of 2023, made publicly available by the New York Police Department. The number and types of crime occurring in Central Park and adjacent precincts were analyzed: no. 19 (Upper East Side, Lenox Hill), no. 20 (Lincoln Square, Upper West Side), no. 24 (Manhattan Valley), no. 23 and no. 28 (East Harlem), and MNT (Manhattan) (Figure 1).

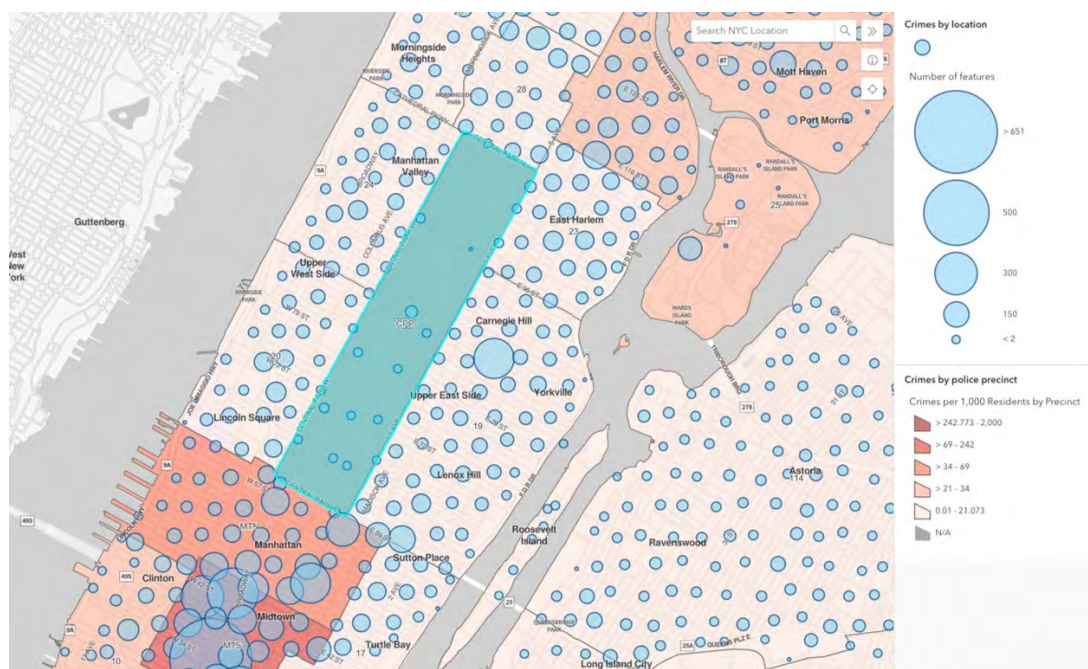


Fig. 1: Crime statistics for New York City provided by the NYPD (NYC Crime Map, 2023).

Results

The data analysis shows that Central Park is the safest precinct in the surveyed Manhattan area. In the park, despite a large number of users, only 1.11% of all cases of crime in the discussed area are committed, which is a negligible number. The scale of the differences is shown by the total number of cases of crime, the number of which, in general terms, is from 11 times (precinct no. 28) to as much as 29 times (precinct no. 19) higher in individual zones surrounding Central Park. Importantly, some types of crime do not occur in the park or their number is small, e.g. *burglary*, which involves entering closed rooms (houses or apartments) or *grand larceny of a motor vehicle*, which is difficult to commit in a place with a ban on driving. This also applies to crimes more 'typical' for urban green areas such as *rapes*, *robbery* or *felony assault*. In the last quarter of 2023, no *murders* were recorded in the park, although generally murders in green areas are not uncommon (Table 1, Figure 1).

Discussion and Conclusions

The results regarding the statistics of selected categories of crime in Central Park are consistent with the theory that urban green areas play a violence prevention role as confirmed by other studies (Kuo, Sullivan, 2001). However, this is not a constant trend, and the situation depends on the safety policies implemented in the park, the availability of the facility and the maintenance of its infrastructure

(McCord, Houser, 2017). Neglected and unmonitored green areas will increase urban crime statistics not only for the area they occupy but also for their surroundings.

Solutions used in Central Park, such as a ban on motor vehicles, clear rules for travelling by other means of transport, rules for using the park by various user groups, video monitoring and a system of rapid communication with police and medical services, as well as good condition of infrastructure and maintenance of green areas make the facility safe despite being open late at night. This provides users with better conditions to spend time there. Recognising that a park as a place important for recreation and tourism should be treated uniquely, for example by creating a separate police station and medical services for it, is one of the key good practices recommended for use in other urban green areas to increase their safety.

Tab. 1: Characteristics of crime in Central Park and adjacent precincts (NYC Crime Map, 2023).

Precinct	Central Park	20	24	28	23	19	MNT
Type of crime							
Burglary	5	111	168	106	142	251	130
Felony Assault	9	110	182	235	424	184	184
Grand Larceny	48	744	511	388	432	1728	1979
Grand Larceny of a Motor Vehicle	0	95	97	88	89	151	83
Murder	0	4	3	4	6	2	3
Rape	3	10	12	7	14	14	9
Robbery	23	102	141	179	209	221	137
Total	88	1176	1114	985	1316	2552	2525

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Souhrn

Městské parky jsou všeobecně uznávány jako mimořádně cenné oblasti pro obyvatele měst, protože poskytují zelená místa pro odpočinek a volný čas různým typům uživatelů. Mezi omezeními jejich využívání se v literatuře často zmiňují obavy o bezpečnost - vnímání bezpečnosti mezi uživateli v závislosti na denní době, počasí, osvětlení a údržbě parku, ale také na chování ostatních uživatelů parku. Případová studie Central Parku (NY, USA) založená na údajích shromážděných newyorským policejním oddělením ukazuje, že tento obrovský park, který denně navštíví stovky lidí, je výrazně bezpečnější než okolní okrsky. Zajímavé je zejména to, že v parku dochází k menšímu počtu případů trestné činnosti, jako je znásilnění a trestný čin ublížení na zdraví, a také velkých krádeží, které jsou v zelených městských oblastech nejčastější. Výsledky dokazují, že městská zeleň může hrát důležitou roli při zvyšování bezpečnosti související s rekreačními aktivitami ve městě, což by mělo být zohledněno v moderních placemakingových iniciativách.

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STRENGTHS AND THREATS OF TOURISM IN THE HRANICE KARST

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Abstract

The Hranice Karst is a globally unique area with many natural and cultural-historical characteristics. However, it should be pointed out that the potential of these values is largely untapped. The main problem is the need for a coordinated communication strategy for all stakeholders and a sustainable regional development plan. The orientation towards tourism is very promising and desirable. However, there needs to be more adequate infrastructure and services for tourists (and residents) based on sustainability and protective facilities. Territorial values are managed without meaningful linkages, and their management can often be considered inadequate. The most attractive site, the Hranice Abyss (the deepest flooded abyss in the world), was monitored in 2022 to provide an overview of visitor numbers and profiles. This site may be overloaded in the future. The monitoring confirmed the site's tourist attraction and transit character (only a minimum of visitors stay longer in the area; there needs to be more information about the area and a more comprehensive range of services). This text summarizes the points for a management plan to diversify the tourist offer, sustainable recreation and local benefits.

Keywords: sustainability, local landscape values, world unique, protection vs. development

Introduction

Sustainability in tourism is already a familiar concept. However, it still needs to be determined whether sustainability is always correctly interpreted. The site's broader context needs to be considered, and a fair balance between the environmental, social and economic pillars needs to be found (Higgins-Desbiolles, 2018). Taking environmental and social dimensions into consideration when prioritizing growth is not enough. Sustainability also has a local rather than a global context. However, it is still impossible to correctly evaluate sustainability tourism trends at the local level (Alfaro Navarro et al., 2020). One of the indicators can be the involvement of the local community in decision-making on activities shaping sustainable tourism. The combination of participatory regional development planning with other tools (e.g. multi-criteria analysis) can be understood as a tool for objectifying and rationalizing the decision-making process. The plan co-proposed and approved by the residents remains the most important (Sisto et al., 2022). Numerous authors point out the advantages of a participatory approach in planning sustainable tourism (e.g. Stacchini et al., 2022). A well-known effect is the complex development of the territory beyond the scope of the tourism sector and significant public acceptance of the spatial changes (Zachrisson et al., 2021). In this context, it is essential to mention the phase of participatory monitoring of the fulfilment of the goals (Brown, 2022), the phase following the public planning process. The goal of sustainable tourism is the creation of a *smart destination*, which enables the development of a sufficient and gentle offer of services, experiences and tourist infrastructure, minimally burdening the environment and, at the same time, integrating the visitor into the social context of residents (Cerdá-Mansilla, 2024). The location must be attractive not only for the visitor but also for the residents. This approach can also relieve over-touristy areas (Fray and Briviba, 2021) and create new regional attractions. It is desirable to apply this concept to the unique and vulnerable small-scale area of the Hranice Karst (49.5322767N, 17.7506514E). This paper is aimed at this study area, and the text below briefly describes the natural and cultural context.

Material and methods

Expert and participative identification of thematic and spatial conflicts was carried out. The expert analysis was based on a review of local and regional strategic documentation and a field survey. For participative identification of problems and possibilities for further development, the following activities were provided in 2022:

- interviews with selected interested parties/stakeholders (representatives of Local Government from three different villages, farmer, forester and cave manager),
- online questionnaire survey among the inhabitants of the Hranice Karst (150 inhabitants),

- a survey among tourists (colonnade in Teplice nad Bečvou and Information point Hranice Abyss – a total of 335 respondents).

The researched areas in the participative part were identical: identification of spatial conflicts, possibilities for improving spatial management, and residents' attitudes to tourism development.

Most of the Hranice Karst area is agricultural land with a low proportion of greenery. Compared to the national average, the total area of forests is slightly lower and dispersed. These forests are often part of a special nature reserve (small-scale).

The karst phenomena are linked to a specific limestone base, but numerous are not documented. The recorded karst phenomena have the character of caves and sinkholes. Among the most significant are the Hranice Abyss and the Zbrašov Aragonite Caves. Healing mineral waters and Spa (Teplice nad Bečvou) are typical for the area. Hranice Karst is geomorphologically highly diversified. There are active and closed quarries in the area. Reclamation was mostly carried out in closed quarries. Bečva River and the surroundings enhance the recreational potential. The cycle path that passes through this area is a significant tourist attraction.

Cultural and historical values can be categorized into point, spatial, and line elements, and existing and defunct structures can be distinguished. Architectural values of a point character prevail, with a significant concentration in the built-up part of the spa town of Teplice nad Bečvou. Those include public buildings (train station, hotels) and private and industrial buildings. Other cultural monuments are, for example, the pavilions of mineral springs in the spa, the ruins of the castle, or the spa park.

The paper presents the results of an expert and participatory analysis of Hranice Karst's tourism potential. Weak points are identified, and recommendations are formulated to increase the development potential.

Results

The following conflicts and recommendations emerged from the meeting with **selected stakeholders**:

- The unsuitable surroundings of the Hranice Abyss (HA) and the necessity of trail revitalization (e.g., improvement of trail drainage and tourist infrastructure).
- The role of the Information point is insufficient, and the necessary modernization of services and equipment is lacking.
- A request to increase tourist attractiveness (e.g., constructing an observation tower in Teplice nad Bečvou is planned) and develop a comprehensive (unified) value management plan. The goal is to keep visitors in the region and change the location's transit character.
- The forest manager draws attention to the HA's excessive tourist attendance and the significant conflict between tourism and nature conservation.

Residents see conflict areas mainly around the Bečva River because of an enormous traffic burden. The spa of Teplice nad Bečvou was also noted. Problems in this context are primarily influenced by the limited role of the spa in the cultural and social life of the wider region. Quarries are also perceived as a burden (mainly due to their further expansion). Most of the spatial conflicts are located in the built-up area, and a minimum of problems were identified in the open landscape. Transport and mining are seen as the most significant problems in the area. Residents lack places to sit along the roads, better permeability of the landscape, and a higher share of greenery in built-up areas and open agricultural landscapes. Residents spoke very positively about the role of tourism, and they support tourist development.

Tourists most often lacked a restaurant or snack stand, tourist infrastructure (benches, information signs, cyclists' infrastructure), educational trails, and overall connectivity of the location, including better information about the region's values, interesting localities, and services. Most respondents spent one day in the locality and continued to other attractions outside the region.

Experts identifying conflicts and development potential – according to the master plans, the land grab will be expanded (residential buildings, expanded areas of mines). This issue is connected with landscape permeability reduction and the negative fragmentation effect strengthened by the parallel traffic constructions of national and international lines. These structures intersect with large mammals' migration corridors, creating obstacles to their natural movement between the Beskydy and Jeseníky Mountains. The most significant problem of day recreation is the transport corridor leading through the Bečva Valley – the most valuable part of the study area. It is both an obstacle to space in movement and a significant noise source. Active limestone quarries are also a source of noise and pollution. However, the fragmented management of values significantly reduces development/tourist potential, and the problem is also poor values promotion and care. There is a fundamental lack of a conceptual plan and cooperation within the region and beyond. The potential for improvement of green infrastructure is also huge. Thus, local governments should focus on adapting the landscape to climate change. A side effect of these activities is the spontaneous growth of tourist potential.

Discussion and conclusion

The vast diversity of natural and cultural values determines the recreation potential of the Hranice Karst. However, the potential is limited in selected cases mainly due to insufficient maintenance and subsequent care (primarily cultural values associated with the spa area). Another problem is the non-conceptual approach to the visitors' management, which is related to the overloading of the most attractive locations (especially Hranice Abyss) and the transit character acceleration (most visitors do not plan to stay more than one day). This is a further important aspect: to find a balance between tourism management (one-day and multi-day tourist visits) and to increase the quality of everyday recreation (for the residents). The overall goal of measures of the recreational potential enhancement should be the tourist attractiveness diversification (with joint management plan) and the distribution of visitors in time and space (preventing over-tourism in vulnerable places and delaying day-trippers), the connection of cultural and natural values and the improvement of the overall spatial permeability (in the form of marked educational circuits and connecting unmarked routes into circuits) and the revitalization of neglected or degraded areas with high recreational potential (e.g. the post-mining areas and selected locations in the spa). The transition to a multi-day visit can be supported primarily by the spa – the spa management should participate more actively in regional development.

However, to propose quality tourism management, examining the area in detail and mapping all the values is necessary (Valjarević et al., 2017). This mapping could help diversify tourist destinations and limit the site's transit character. An exciting concept for encouraging repeat visits is the so-called tourscape (Torres-Moraga, 2024), which is based on identified and inspiring sustainability.

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Souhrn

Hranický kras je celosvětově unikátní oblastí se značnou rozmanitostí přírodních a kulturně-historických hodnot. Lze zde však identifikovat četné atraktivity, jejichž potenciál je limitován nedostatečnou údržbou a následnou péčí. Udržitelný cestovní ruch založený na koncepčním přístupu a účinné komunikaci všech zúčastněných stran je zde velmi žádoucí a perspektivní.

Příspěvek prezentuje výsledky expertní a participativní analýzy potenciálu tohoto území a shrnuje doporučení pro rozvoj šetrného cestovního ruchu. Expertní analýza vycházela z rešerše lokálních a regionálních strategických dokumentací a z terénního průzkumu. Za účelem participativní identifikace konfliktů (tematických i prostorových) byla v průběhu roku 2022 provedena anketa mezi turisty, dále byly vedeny rozhovory s vybranými stakeholdery a proběhlo online dotazníkové šetření mezi místními obyvateli. Okruhy zjišťované v rámci těchto jednotlivých aktivit byly totožné: identifikace problémových lokalit; možnosti zlepšení managementu hodnot území, u residentů také postoje k rozvoji cestovního ruchu.

Na základě výše uvedených zjištění lze formulovat konkrétní doporučení. Souhrnným cílem *opatření zvyšujících rekreační potenciál* území by měla být diverzifikace turistických atraktivit a rozložení návštěvníků v čase a prostoru, propojení kulturních a přírodních hodnot jednotným managementem a zlepšení celkové prostupnosti území.

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STRIP CROP ROTATION IN FARMLAND MANAGEMENT: AN INNOVATIVE APPROACH TO SOIL CONSERVATION AND ENHANCING THE AESTHETIC AND RECREATIONAL POTENTIAL OF THE LANDSCAPE

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Abstract

This article describes the importance of strip crop rotation as an effective means of reducing soil erosion and as an aesthetic feature in the landscape. Strip crop rotation is an integrated approach to sustainable agriculture where different crops are systematically rotated in well-defined strips. We analyse the impact of this system on reducing water erosion, hydrological balance, and improving soil structure. We also focus on the aesthetic impact of crop grazing on the landscape and its ability to create harmonious and attractive visual elements in the landscape. This contributes to a higher aesthetic value of the landscape and enhances the recreational potential. The study presents a specific example of an agricultural area in the cadastral area of Rostěnice, where this approach has been successfully implemented in practice.

Keywords: Soil erosion, strip crop, landscape, farmland

Introduction

In the Czech Republic (CR), more than 50% of farmland is threatened by soil erosion (Podhrázká 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 strip crop rotation.

Strip crop rotation (SCR) is an anti-erosion and soil conservation technology that uses the protective effect of vegetation cover. It is the regular alternation of strips of low-protection crops (legumes, maize, sunflowers, etc.) and strips of high-protection crops (grasses, perennial forage crops, densely sown cereals, legumes, etc.) established in a direction close to the contour lines. The crop strips with different erosion protection effect must be alternated so that water flowing in from the protected strip as well as water from precipitation falling on the strip itself is captured and infiltrated into the soil.

Strip crop rotation is an effective measure against both water and wind erosion, with the following positive effects compared to a single crop option with a low erosion control effect on the soil block:

- reduction of water erosion,
- reducing the transport of erosion products, i.e. sediment and associated nutrients and agrochemicals,
- increasing infiltration rates and soil retention capacity.

Strip crop rotation is implemented on sloping land with a moderately rugged topography, where there is no intensive concentrated runoff after rainfall.

Methods and Results

In 2023, a new type of portable infiltrometers manufactured by ADCIS s.r.o. were tested (Fig. 3). It is a measuring data station (base), equipped with a battery, valves, pumps, which can pump liquid (water) from an external container into prepared cylinders in the soil on the basis of impulses. Water is pumped on the basis of an impulse that occurs when the water level in the cylinder falls below a predefined level (Fig. 4). In our case, if the water in the cylinder becomes saturated, it is automatically pumped out by the device. In 2023, 1 set of measurements was carried out in the autumn period after harvest and waterlogging at a strip crop rotation site near the village of Bošovice (Fig. 1). The measurements were situated in selected locations within the slope (upper part – eluvial – point 1 and 3, middle part – transport – point 7 and 9, lower part – accumulation – point 13 and 15). In each of these locations, two measurements were carried out in a strip with a high protective function against erosion (in 2023 sown with spring barley) and in a strip with a low protective function (in 2023 sown with rape). Infiltration rate measurements on permanent grassland were also processed for comparison (point 25).



Fig. 1: Strip crop rotation in the study area Bošovice

Measurement of infiltration characteristics at the model site



Fig. 2: Measurement of infiltration characteristics in the area of interest Bošovice



Fig. 3: Set of portable infiltrimeters from ADCIS s.r.o. during measurements at the site of interest



Fig. 4: Detailed view of the measuring cylinder

Each measurement starts with the maximum intensity (12 mm/min) of the water supply to the measuring cylinder (diameter 100 mm). If this water supply can be absorbed, the pump continuously pumps water at the same intensity into the measuring cylinder. If the ring is flooded with water, the level sensor stops the pump and the system waits for the level in the measuring cylinder to drop before restarting.

A total of 10 valid measurements were taken in the fall of 2023 for a total of 60 minutes/1 infiltration attempt. More infiltration attempts were made, however some were subsequently assessed as inconclusive. The measurements were taken after the harvest and after the agrotechnical operations in the field.

In 7 cases, the soil infiltration rate exceeded the maximum water delivery rate of the infiltrimeter (12 mm/min). In practice, this means that simulated rainfall of 12 mm/min for 60 minutes was able to infiltrate the soil profile! This indicates a very significant capacity of the soil profile to hold rainfall water. In 3 cases, the infiltration rate was lower than the maximum water delivery rate of the infiltrimeter. In these 3 cases a curve of infiltration rate versus time was plotted.

Tab. 1: List of measurements and infiltration rates at the locations

Point	Locality	Intensity of infiltration (mm/min)	Volume of absorbed water (l)
13	Canola strip (after harvest and agrotechnics)	>12	5,21
13	Canola strip (after harvest and agrotechnics)	>12	5,21
15	Barley belt (after harvest and agrotechnics)	>12	5,21
1	Canola strip (after harvest and agrotechnics)	>12	6,08
3	Barley belt (after harvest and agrotechnics)	6	graf
3	Barley belt (after harvest and agrotechnics)	>12	6,08
7	Canola strip (after harvest and agrotechnics)	14,5	graf
9	Barley belt (after harvest and agrotechnics)	>12	5,21
9	Barley belt (after harvest and agrotechnics)	>12	4,63
25	Permanent grassland	5,9	graf

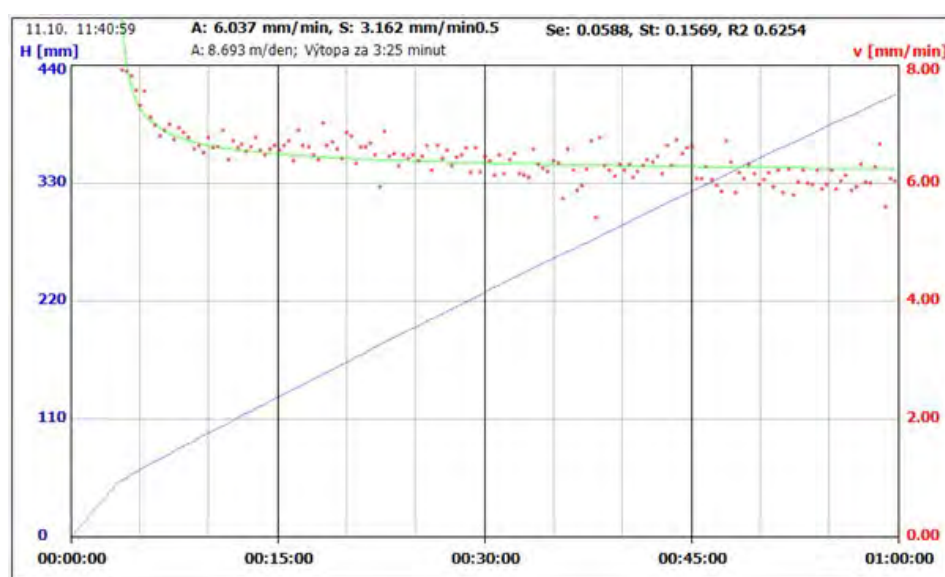


Fig. 5: Example of infiltration rate graph for measurement point 3 (barley belt)

Strip crop rotations in combination with appropriate agrotechniques showed a very good ability to retain rainfall water in simulated infiltration experiments. It was even significantly higher than that of permanent grassland.

In 2024, we plan identical infiltration experiments in spring and summer (during the field crop growing season) for comparison.

Conclusion

Strip crop rotation significantly reduces the effects of water erosion on the land and increases the soil retention potential. It also has a landscape and aesthetic effect. This specific farming regime helps to create a varied landscape mosaic. In the Bošovice area, strip crop rotation is applied to a large area of farmland and is now a destination for many tourists and photographers because of its diversity and uniqueness. It is evident that even a simple change in the farming regime can suitably enhance the tourist and recreational potential of the area. In the future, this type of farming can be expected to be extended to other areas of the Czech Republic.

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Souhrn

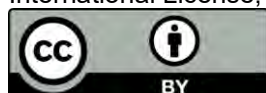
Pásové střídání plodin je integrovaný přístup k udržitelnému zemědělství, při němž se různé plodiny systematicky střídají v přesně vymezených pásích. Cílem této technologie je omezit působení eroze, zvýšit retenci srážkové vody a zvýšit biodiverzitu. Při simulovaných infiltračních pokusech byla prokázána na pozemcích s aplikovaným pásovým střídáním plodin velmi dobrá schopnost zadržovat srážkovou vodu. Intenzita infiltrace převyšovala ve většině případů maximální intenzitu dávkování vody infiltrometrem - 12 mm/min. Jedná se o stav pozemku v podzimním období (po sklizni a podmítce/strip till agrotechnologii). V roce 2024 budeme (za účelem porovnání) provádět na dané lokalitě stejné pokusy v průběhu celé vegetační sezóny.

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SUITABLE AND UNSUITABLE ROOF COVERINGS FOR SMALL BUILDINGS IN THE LANDSCAPE

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Abstract

According to the Building Act, a minor building in the countryside can be, for example, shelters with one storey above ground, which serve public transport, and other publicly accessible shelters up to 40 square meters of built-up area and up to 4 m in height. Such small buildings may serve tourists or cyclists.

The paper focuses on the recommendation of suitable roofing materials for structures intended to enhance the attractiveness and recreational use of the landscape. Roofing materials should be selected mainly according to the slope of the roof. The roof, which terminates the building work, is an important architectural element. For buildings in the landscape, we require that they blend appropriately into the landscape. There is a large variety of roofing materials, but the choice needs to be given the necessary attention. Roofing made from natural materials should be the most appropriate, but a range of other roofing materials can be recommended to suit local conditions.

Keywords: buildings in the landscape, roof slope, natural roofing, vegetation roof

Introduction

To make certain locations more attractive, small buildings are built in the landscape where the roof can be quite a distinctive architectural element. And it is the roofing that can significantly influence how a building fits into a natural site. The roofing material is supposed to be the top waterproof layer of the roof covering, which protects the roof structure and the whole building from the adverse effects of weathering. The durability and impermeability of the roofing material is influenced by the pitch of the roof and the overlap of the components of the composite roofing material, which is made up of individual elements without their rigid interconnection. There are a large number of different roof coverings on the Czech market, and it can sometimes be difficult to choose the most suitable one for a particular building.

Materials and methods

Natural materials, especially stone and wood, should be used in the landscape. However, it is also possible to use some materials that are intended to imitate them.

A natural covering that was used in earlier times for human dwellings is thatch. These are bundles of beaten rye straw, preferably straw, which are tied to the roof battens with twine, rope or wire. At a slope of 30 to 35°, it has a high lifetime of up to 60 years on the sunny side and 30 to 40 years on the northern side. (Matějka, 2007) If the bundles are folded over the battens with the thicker end of the straw, a smooth covering is created. It will be stepped when the bundles are folded over the battens with the thinner end of the straw, see Figure 1. Similarly, reeds can be used to bind the stalks into bundles of greater length. This also makes the distance between the slats larger, up to 500 mm.

Shingle roofing consists of shingles made by splitting from logs or cutting from boards. Chipped shingles are more durable and the wood fibres are not disturbed. Hajek (1997) reports a minimum life of 40 years. These are planks fitted with an edge on one longitudinal side and a groove on the other. These are slid into each other and nailed to the roof battens. It can be implemented as a simple one with an inclination from 30°, but it is not tight enough. It is therefore recommended for watertightness requirements to lay as a double, where the second layer of joints overlaps the first layer, but it must be taken into account that the consumption is double. An imitation of wood shingles is the plastic shingle, see Figure 2. Plastic shingles are lightweight (7 kg/m²), do not weigh down the roof structure and are made from recyclable materials, which can reduce the environmental impact.

Planks can be used for simple shelters or e.g. information boards. Plastered ones, but unplastered ones will look more natural. The boards are laid either parallel to the eaves or perpendicular to the eaves, i.e. along the roof slope. The boards should be laid right side up.

The bitumen roof shingles that are attached to the formwork are made up of templates made from strips of oxidised asphalt with mineral fillers, with a higher asphalt content and strong glass fibres or from SBS modified asphalt made from strong glass fibres. The shingles can be in different shapes,

e.g. beaver tile, rectangle, diamond or hexagon. The tiles are suitable for pitched roofs with an inclination of e.g. 15° to 90°. The surface of the shingle is made up of a slate sprinkle. Due to its low weight (9 kg/m²), these shingles are suitable for use on roofs that cannot be loaded with high weight. In addition to the shingles, whole modified asphalt strips coated with sprinkles, so-called cardboard roofing, can also be used. Bituminous (asphalt) shingles and strips contain a reinforcing insert which prevents degradation at higher temperatures. Asphalt and polymer-modified asphalt are thermoplastic substances. Their hardness decreases with increasing temperature. The action of heat and UV radiation also reacts with oxygen in the air, causing ageing caused by the splitting of molecular chains. This has an effect on the hardening and embrittlement of bitumen. Both processes occur very slowly and especially at the surface. (SCHUNCK, 2003)

Suitable coverings, especially for hunting facilities, are panels of corrugated asphalt board, which is reinforced with cellulose fibres and hardened with resin. It can be used especially where low loads are required and where the covering will not be too visible. The cellulose fibres, derived from wood, add strength to the boards. It is a covering for low gradients (from 12°). They are made of 50% recycled material. The panels are extremely light (only 3.4 kg/m²) flexible and easy to transport on site and on the roof.

The only natural hard roofing material is slate - chipped stone slabs, usually rectangular, square or square with an arch, 4 to 6 mm thick. The weight of the roof can be up to 25 kg/m² for a single covering and up to 33 kg/m² for a double covering. The slate templates are pre-fitted with nail holes.

An imitation of slate roofing is fibre cement roofing, which until almost the end of the 20th century was made with asbestos fibres, which has now been replaced by other materials. Today's fibre cement roofing is made from a mixture of ground cellulose, synthetic fibres, Portland cement and water. The fibres in the finished product form a uniform dense reinforcement which increases the flexural rigidity and toughness of the product. The roofing material also has a special double-sided coating, so it can be used in areas with extreme snow and wind stress. It is available in several colours and shapes, similar to the earlier slate roofing. It can be laid on battens or formwork, which must not be flexible.

For small slopes, metal sheeting is suitable. The basic material is galvanised steel sheet, copper sheet or aluminium alloy sheet, usually 0.6 mm thick. Nowadays, sheet metal with a thick protective layer of plastisol or polyester is used. This protective layer guarantees a high durability of the products. In addition to the straight sheets forming a folded sheet, where the strips are joined together by a double lying groove, tile sheets, which are strips of sheet that are profiled, can be used. The strips are most commonly laid in a gradient from ridge to eaves. The minimum slope can be 5°, but this depends on the height of the profiling, as well as the distance between the ridge and the eaves. Laying is started on the leeward side to prevent moisture entering the longitudinal joint. The strips have differently shaped bends at the edges which join them together. They are attached to the battens or formwork with screws, self-tapping screws and the hollow grooves are attached with screws with a pressure and cover cap, supplemented by a gasket. There are also profiled strips or small metal sheets that are laid horizontally - parallel to the eaves.

Sheet metal roofing can also be assembled from small-area, extremely lightweight aluminium rolled shingles, templates or tiles. Thanks to the "groove-in-groove" installation system and direct mounting or fixing with clips to the supporting structure, this roof can withstand even strong wind loads, even though it is a very light roofing material. The weight of the coated aluminium roof system ranges from 2,3 to 2,75 kg/m² (<https://cz.prefa.com>). These roof coverings can be installed on formwork, but also on battens. Minimum slopes are recommended depending on the type of roofing material and the length of the rafters.

Ceramic and concrete tiles have a high durability, strength, weather resistance, but also a higher weight. The tiles are laid on battens. The tiles are fitted with nosings for hanging.

Ceramic tiles can be uncoated, engobed or glazed. Concrete tiles are made from sand, Portland cement and water with the addition of mineral meal made from limestone and blast furnace slag. The surface is coated with acrylic paint to protect the concrete against weathering and mechanical stress. Metal oxides are used for colouring. Concrete tiles are currently produced in small formats, but also in large formats, where their double size reduces the weight of the roofing material.

Traditional beaver bags or groove bags are produced, where a system of grooves that fit together ensure a tight connection and a secure seal against water and wind. A pitch of over 20° is usually recommended for tile roofing. However, there are also tiles available from manufacturers for a 12° pitch.

Green extensive roofs can also be designed for small buildings in the landscape. For these, the thickness of the vegetation layer varies from 60 to 200 mm. It is mainly used for dry-loving plants such as stonecrops, succulents, etc. Thus, regular watering is not expected on these roofs. Green roofs can be flat with a slope of up to 5°, but also pitched with a slight slope of 5 to 35 %. For these roofs, it is

recommended to secure the substrate with an anti-slide barrier from a slope of 15 % onwards (Šimečková and Večeřová, 2010).

Currently, for example, synthetic palm leaf roofing is used for houses in the treetops, which is sometimes indistinguishable from real natural leaves, see Figure 3. The sheets are made of high density polyethylene, which is pressure-formed at high temperatures. 100% waterproof and 100% recyclable. The palm leaves are eye-catching and create an aesthetic effect even under the roof.



Fig. 1: Thatched roof on the right and shingle roof on the left



Fig. 2: Shelter with plastic shingles



Fig. 3: Tree house with synthetic palm leaf covering



Fig. 4: Information board with slate covering

Results

The thickness of the thatched roof does not let water through and at the same time insulates well in summer. Sitting under such a roof will be more pleasant, especially on hot days, than under thin-film roofing, especially of a dark colour. The ideal eco-friendly roofing material is wood shingles or board roofing. Plank roofing is advantageous because it does not need lathing or formwork. The boards are usually nailed directly to the rafters, but the covering is not reliable enough in terms of waterproofing. Due to volume changes, the boards often collapse, the joints may not be tight, or the knots may fall out. The durability of the boards is also low, but can be increased by impregnation.

Asphalt roofing shingles can be of different colours. Ridge, corner or gutter can be created with solid shingles without flashing. This allows this non-environmental roofing material to blend in better with the natural environment. Not just asphalt shingles, light colours are preferable on the sunny sides of roofs as they will reflect the sunlight better, thus not raising the temperature as much and causing damage.

Natural slate roofing is suitable for locations where slate was previously mined, e.g. near Budišov nad Budišovkou, so that the building or just the structure blends into the environment, see Figure 4. Roofing is relatively expensive and labour intensive. An imitation of this roofing material is fibre cement roofing, which is relatively light, yet strong, and can be used even in mountainous areas.

The disadvantage of metal roofing is its noise level in the rains, which is an important aspect in the landscape so that even wildlife is not disturbed. In buildings, the noise is eliminated with special underlay sheets, which are quite expensive and would probably not be used on small buildings in the countryside.

Fired ceramic tiles are a heavy roofing material, which is traditional in our territory, has a high durability. For open small buildings, even concrete tiles are less suitable due to the fact that the roofing is not firmly fixed and can fall off the roof without nailing during large gusts of wind.

One of the biggest advantages of vegetated areas is the lower temperatures under the roof during summer periods. On green roofs with a slope of up to 30°, the conditions for growing greenery are quite suitable. The design of the composition is based on the expected use of the roof, the slope and the load-bearing capacity of the structure under the roof.

Discussion

There are a large number of roofing materials, but not all are suitable for roofing in the countryside. We are leaning more towards natural materials even at the cost of lower durability. Plastic imitation slates or shingles are already common, cheaper than natural materials and often lighter and therefore do not put as much strain on the supporting roof structure.

Conclusion

Nowadays, in addition to traditional materials, a range of plastic or asphalt imitations are available, which are often more durable, lighter and cheaper. Obviously, they will often be preferred for these

reasons. Nevertheless, in some important recreational locations, only coverings made of natural materials would need to be used. The durability of roofing also depends on its maintenance, and this cannot usually be counted on in the landscape. Settled dirt, fallen leaves, and vegetation can degrade some coverings such as asphalt shingles or wood coverings.

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Souhrn

V příspěvku jsou představeny vhodné i méně vhodné střešní krytiny pro stavby, které mají zvýšit atraktivitu a rekreační využívání krajiny. Střešní krytiny je třeba vybírat zejména podle sklonu střechy. Je velké množství střešních krytin, ale výběru je potřeba věnovat potřebnou pozornost. Krytiny z přírodních materiálů by měly být nejvhodnější, ale je možné doporučit i řadu dalších krytin, které by měly vyhovovat lokálním podmínkám. Je tedy třeba zvážit, zda pro danou stavbu v určité lokalitě využijeme dražší přírodní nebo levnější plastové nebo asfaltové varianty.

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TEMPORAL TRENDS OF HUMAN ACTIVITY IN THE LANDSCAPE AND IN THE CROSSING STRUCTURES ACROSS MAIN ROADS IN AUSTRIA

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Abstract

In recent decades, the pressure on the environment and biodiversity has increased dramatically, mainly due to human activities. In order to improve the connectivity between habitats and also to safeguard both nature conservation and human well-being, elements of grey and green infrastructure have recently been increasingly implemented. Understanding how different human activities change over time is an essential information for conservation and landscape planning. To reveal temporal trends in human activity, annual photo-trapping data were used at sites in the cultural landscape and at crossing structures across main roads in Austria. Data collected throughout the year 2022 were categorized into eight categories of human activity involving pedestrians, pedestrians with dogs, cyclists, equestrians, motorcyclists, cars, farm and forest machinery, and others. Cars were the most represented category (48 %), followed by pedestrians (21 %) and farm and forestry machinery (13 %). Overall, the highest level of human activity during the year was recorded in the spring months. The daily pattern was dominated by human activity before and after noon. The individual categories varied according to the distribution of records over the days of the week, but in general most records were taken on Tuesdays and at the weekends. To understand human behaviour in detail, a focus on a specific category of human activity, is essential.

Keywords: human landscape utilization, monitoring, temporal patterns, underpasses, overpasses, recreation

Introduction

Human activities can be defined as sources of pressure on the environment (EEA 2020). The first human influence on nature and landscape in Europe can be linked to its arrival around 45,000 years ago (Riffkin 2011). Currently, it is estimated that 80% of Europe's surface is altered by human activities such as construction of buildings, roads, industrial infrastructure or agricultural management (EEA 2024). The anthropogenic impact can be described in terms of land use, but recently the increasing impact of outdoor activities must also be taken into account. Although outdoor recreation brings many benefits to human health and well-being (Carpenter and Harper 2015, Zwart and Ewert 2022), negative impacts on wildlife and ecosystems have also been observed (Bötsch et al. 2017, Coppes et al. 2018, Naidoo and Burton 2020, Lewis et al. 2021). In our study, we indicate the aggregate results of temporal human activity over the period of one year in Austria for eight categories of human activities. We suggest that this temporal information can be considered for specific interventions and is suitable for better integration of nature conservation and sustainable management of the landscape.

Materials and methods

Monitoring was carried out using automatic photo traps at 57 selected sites in Austria, which included the federal states of Burgenland as well as Upper and Lower Austria. The selected sites included locations in the landscape on ecological corridors, 5 underpasses and 10 overpasses (green bridges). Information signs about the ongoing monitoring were installed at selected sites. The obtained data were evaluated for the period of the whole year 2022, i.e. from 1.1.2022 to 31.12.2022. The collected data (n = 32,822) were evaluated according to time, abundance and divided into eight categories of human outdoor activities involving e.g. pedestrians, pedestrians with dogs, cyclists, equestrians (horse riders), motorcyclists, cars, farm and forest machinery, and category others (includes excavators, trucks and other unspecified categories).

Results

A total of 35,093 records of human activities in the landscape were identified in the landscapes under consideration (Table 1). Activities characterised by the use of cars were the most numerous category of human activity (48.28 %), followed by those involving pedestrians (21.2 %), farm and forestry machinery (12.62 %), cyclists (8.04 %) and pedestrians with dogs (6.23 %). On the contrary, the least represented categories included motorcyclists (1.73 %), equestrians (0.96 %) and category “others”.

Tab. 1: Categories of human activity in the landscape

Categories	N	%
Cars	16943	48.28
Cyclists	2823	8.04
Equestrians	338	0.96
Farm and forest machinery	4428	12.62
Motorcyclists	606	1.73
Others	330	0.94
Pedestrians	7439	21.20
Pedestrians with dogs	2186	6.23

The highest activity of humans was recorded in the spring months i.e. March, April, May (Fig. 1). Cars, pedestrians with dogs and other activities had the highest frequency in the spring months. Conversely, equestrians, farm and forest machinery and pedestrians were registered with the highest frequency in both spring and autumn. The cyclists and motorcyclists categories had the highest frequency in summer.

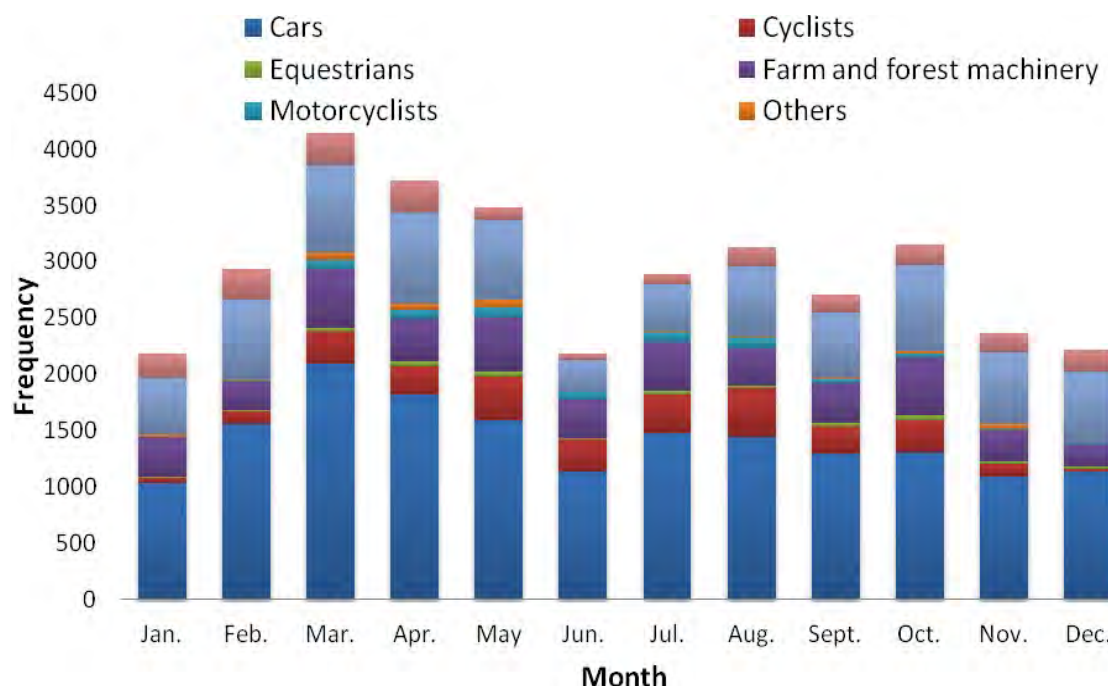


Fig. 1: Annual trends by individual human activity category

Human activities were observed mainly during daylight hours, with the highest values before and after noon (Fig. 2). The highest values of human activity frequency achieved before and after noon were registered for cars, farm and forest machinery and category others. In the afternoon, the highest frequency of activity was found in for categories involving cyclists, equestrians, motorcyclists, pedestrians and pedestrians with dogs.

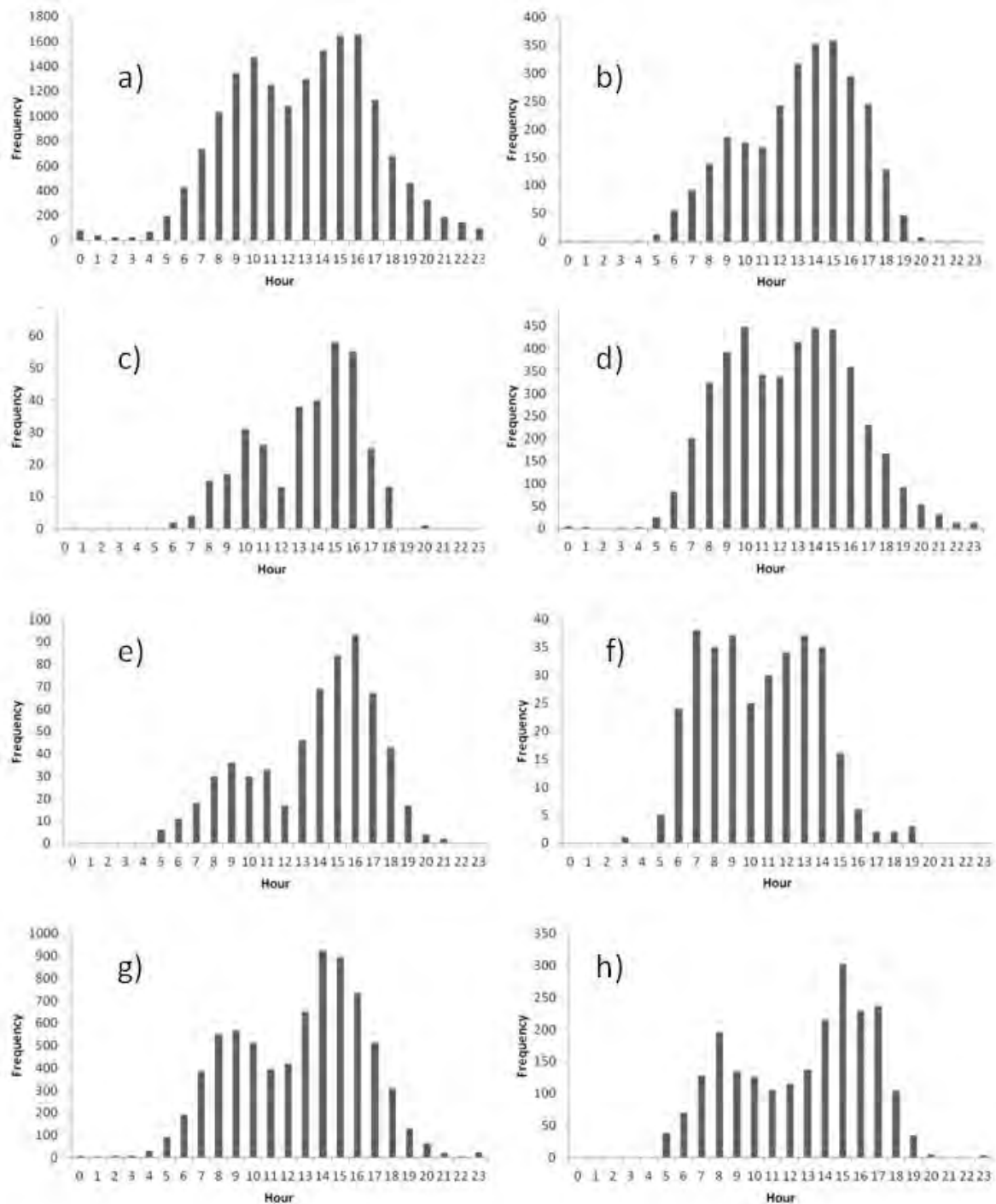


Fig. 2: Daily time trends by human activity category: a) cars, b) cyclists, c) equestrians, d) farm and forest machinery, e) motorcyclists, f) others, g) pedestrians, h) pedestrians with dogs

Overall, most records of human activity were registered on Tuesdays and on the weekends, however, activity varied by category (Fig. 3). Activities characterised by car use and category “others” were most represented on Mondays and Tuesdays, cyclists and motorcyclists were most frequent on Thursdays and Sundays, equestrians were most represented on Saturdays and Sundays, farm and forest machinery dominated on Tuesdays, pedestrians and pedestrians with dogs were most represented on the weekends, with the highest values on Sundays.

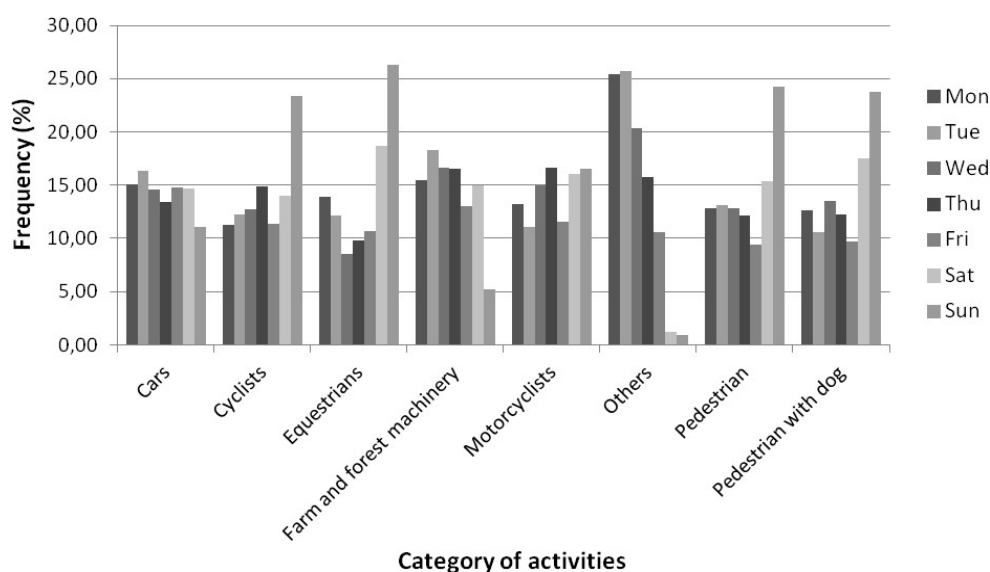


Fig. 3: Relative frequency of human activity during the week

Discussion

The data obtained for each category of human activity provide insight into the temporal use of the landscape by humans. Our results of the temporal distribution support general trends of human activity observed in other studies (Reilly et al. 2017, Lewis et al. 2021). The specific categories of human activities had specific time distributions due to differences in work and free-time (recreational) use. However, it is necessary to take into account that different categories of activities may be influenced by specific conditions, which may vary according to local, regional, national and international contexts. Human activities influence wildlife behaviour patterns, which has been described in many studies (Bötsch et al. 2017, Coppes et al. 2017, 2018, Gaynor et al. 2018). We assume that the results obtained according to the different categories of human activity may be useful for a better understanding of the interaction between humans and wildlife. These insights can also be beneficial for future more detailed studies, landscape planning incl. related human activities, local development policy, recreation and nature protection.

Conclusion

Our study shows (i) the general representation of human activities in the landscape, as well as (ii) daily (iii) weekly and (iv) annual time trends for each category of human activity over a one-year period at representative locations in the Austrian cultural landscape.

Human activities have a critical impact on the environment and its wildlife, so we suggest that these outcomes are relevant for landscape planning and nature conservation.

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Souhrn

Lidská aktivita v krajině významně ovlivňuje životní prostředí, což souvisí s řadou negativních dopadů (fragmentace krajiny, změny chování volně žijící zvěře, aj.). Zjištění časové distribuce výskytu člověka v krajině je základní informací pro pochopení bližších souvislostí a negativních dopadů. V studii prezentujeme časové trendy osmi kategorií lidských aktivit zaznamenané v krajině a na migračních objektech přes liniovou infrastrukturu, které byly zaznamenány během ročního monitoringu v Rakousku. Nejvíce zastoupenou kategorií byly osobní automobily (48 %), dále chodci (21 %) a zemědělské a lesní stroje (13 %). Celkově byla nejvyšší lidská aktivita během roku zaznamenána v jarních měsících. V denní časové struktuře převažovala lidská aktivita před a po poledni. Jednotlivé kategorie se lišily podle dnů v týdnu, ale obecně bylo nejvíce záznamů pořízeno v úterý a o víkend. Získané výstupy mohou být přínosné pro budoucí podrobnější studie, pochopení vlivu člověka na volně žijící živočichy, plánování v krajině, místní rozvojovou politiku, rekreaci a ochranu přírody.

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THE “PLACE MEANING” CONCEPT IN EDUCATION: A CASE STUDY FROM THE BOHEMIAN PARADISE PROTECTED LANDSCAPE AREA, CZECHIA

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Abstract

The local landscape is a part of the space that surrounds people from childhood and offers them opportunities for cognitive, emotional, and psychomotor development. Students grow up within this landscape, forming a relationship with it, that can extend over large areas throughout their lives. This relationship can be influenced by the meanings that students attribute to the given territory. There is limited research focusing on the concept of “place meaning” in education. The presented study aims to fill this research gap. The respondents are 257 fifth-grade students from primary schools located in the Bohemian Paradise Protected Landscape Area and its immediate vicinity (44% of all fifth-grade students). Data was collected through field research using questionnaires and supplemented by interviews with students in focus groups. Responses were evaluated through content analysis, descriptive statistics, and statistical analysis. The results indicate that, with regard to specific places, students most commonly associate the term Bohemian Paradise with Trosky and Turnov. Additionally, students most commonly recognized these places in photographs. Students most commonly associate the Bohemian Paradise with adjectives such as “beautiful”, “nice”, and “protected”. Boys recognized a greater number of important places in the Bohemian Paradise than girls, and overall, knowledge of these places significantly increases with the time children spend in nature. The results contribute to research on sense of place – an important theme of environmental education.

Keywords: environmental education, children, sense of place, landscape protection

Introduction

In primary education in Czechia, the local landscape (local region) of students should be utilized. In the Framework Educational Programme for Basic Education, in the description of the educational area “Humans and Their World”, it is explicitly stated that *“Pupils, based on familiarising themselves with their immediate surroundings, learn about (...) Emphasis is placed on practical knowledge of local and regional reality and on developing pupils’ personal experience. Diverse activities and tasks should naturally encourage pupils to form a positive relationship with the place where they live...”* (MEYS 2021, p. 47).

The concepts of “local landscape” and “local region” are perceived differently by students in Czechia. The term “local landscape” is most commonly associated with the immediate surroundings or possibly the municipality in which they live. Conversely, the term “local region” is typically understood as encompassing the whole region or district (Tomčíková, Rubáš 2023).

In academic literature, there is limited research examining the meaning of the local landscape (local region) for primary school students, or how well students are familiar with this area. Therefore, we conducted a study in one of the most valuable landscapes in Czechia (Bohemian Paradise Protected Landscape Area), aiming to address two research questions: 1) What is the place meaning of the Bohemian Paradise?; 2) How well do children know places in the Bohemian Paradise?

Theoretical Background

The conceptual frameworks of our research is the concept of “sense of place” (SOP), specifically its component sub-concept “place meaning”. According to Relph (1976), SOP is a relationship that was constructed by living and attaching meanings to surrounding environments. Foote, Azaryahu (2009, pp. 96–100) further elaborate that *“SOP is used to describe the distinctiveness or unique character of particular localities and regions.”* According to Stedman (2002), SOP encompasses the overall relationship of a person to a place as a set of cognitions, attitudes, and identities based on meanings

created by humans. Some authors (Kudryavtsev et al. 2012; Harris 2021) consider SOP to be a combination of “place attachment” and “place meaning” (see Figure 1).

Authors understand **“place attachment”** as an emotional bond between individuals and places (Davenport, Anderson 2005). They perceive it as a sense of belonging that gives meaning to life (Proshansky et al. 1983). Authors who deconstruct “place attachment” into individual sub-concepts delineate “place identity”, which expresses an individual's emotions, and “place dependence”, which is a certain potential that a place offers to satisfy an individual's needs (Williams, Vaske 2003).

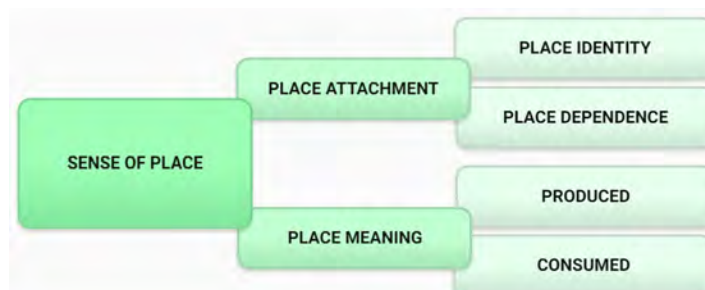


Fig. 1: Concept SOP and its individual sub-concepts (edited according to Kudryavtsev et al. (2012); Semken, Freeman (2008)).

In the literature, **“place meaning”** is understood as the symbolic meaning attributed to a place by individuals (Kudryavtsev et al. 2012). Different people assign different meanings to different places. According to Young (1999), these meanings are socially constructed and negotiated between those who “produce” and those who “consume” (hold or construct) meanings. Semken, Freeman (2008) suggest that in the context of education, teachers might be considered “producers” and students “consumers”. Among the “producers”, educational materials (such as textbooks) that convey the meanings of places to students can be also included.

Stedman (2003) states that quantitative research on SOP has focused on “place attachment” and neglected “place meaning”. *“Researchers ought to examine not just how much the place means... but what does it mean?”* (p. 826). Semken, Freeman (2008) attribute the lag in “place meaning” research to the fact that “place meaning” is more localized than “place attachment”, and further, that potential sources of meaning for a given place may be too numerous and diverse. From the above, there arises a need for research on “place meaning”, both within the realm of education and beyond.

Methods

Study populations

The data was collected in February 2024 through field research using a questionnaire, which was filled out by fifth-grade students from 17 primary schools located within or in close proximity (within 2 km from the boundary) to the Bohemian Paradise Protected Landscape Area. The questionnaire was completed by 257 students, representing 44% of all fifth-grade students who attended schools in the study area during this period. In terms of sex, 51.8% were female and 48.2% were male. 63% of the students attended schools located in urban areas, 37% attended schools located outside urban areas.

Data collection and analysis

A content analysis of textbooks⁸ was conducted before creating the questionnaire. In this analysis all mentioned locations located in the Bohemian Paradise Protected Landscape Area or in its vicinity were identified, along with all the meanings attributed to the Bohemian Paradise by the authors. A total of 21 specific places were identified. Subsequently, their photographic documentation was carried out for use in the questionnaire. The questionnaire consisted of several parts, and before its use, a pilot study was conducted with fifth-grade students outside the study area. To address the first research question, the question *“What do you imagine when you hear the term Bohemian Paradise?”* was used, which was evaluated through inductive qualitative content analysis. The answer to the second research question was obtained using photographs of all 21 locations mentioned in the textbooks. The task of the students was to name these locations. Evaluation was performed using descriptive

⁸ All textbooks in the educational area “Humans and Their World” for the 4th and 5th grades of primary schools in Czechia were analysed, which had a valid approval certificate from the MEYS as of September 6, 2023. A total of 50 textbooks were included in the analysis.

statistics methods, with t-tests, ANOVA, and the Scheffehé post-hoc test utilized to determine significance. Data obtained from the questionnaire was supplemented by interviews with students in focus groups.

Results

“Produced” place meaning, which refers to the meaning of the Bohemian Paradise derived from content analysis of textbooks, and “consumed” place meaning, attributed to the Bohemian Paradise by fifth-grade students of local schools, are presented in Table 1. Specific meanings categorized are listed within the table. The results indicate that both “produced” and “consumed” place meaning fall into the categories of cultural, natural, institutional, economic sectors, and aesthetic (landscape). In addition, students associate the Bohemian Paradise with home, with emotions and feelings, and with family, friends, and other people.

Furthermore, inspired by Young (1999), we focused on the general meanings of the landscape. These meanings are expressed through adjectives. Students most commonly associate the Bohemian Paradise with terms such as “beautiful”, “nice”, and “protected”, whereas textbook authors associate it with terms like “rock”, “sandstone”, and “protected” (see Figures 2, 3).

Tab. 1: “Produced” and “consumed” place meaning of the Bohemian Paradise.

Categories of meanings		“Produced” place meaning (referenced in textbooks)	“Consumed” place meaning (written by students)
Cultural	tangible	castles; folk architecture; chateaux; monuments; ruins; towns	buildings; castles; folk architecture; chateaux; monuments; ruins; sacred architecture; towns; villages
	intangible	fairy tale of Rumcajs	art; fairy tales (Rumcajs); history; local legends; our homeland; speak Czech; state symbols
Natural	natural environment	hills; nature	arboretum; fields; forests; gardens; hills; lakes; meadows, nature, orchards; parks; pastures; ponds; rivers; sea; springs; streams; water; waterfalls
	animate nature		animal home; coexistence of humans and animals; fauna; flora
	inanimate nature	bottom of ancient seas; igneous (volcanic) hills (rocks); rocks; rock formations; rock towns; sandstone rocks	air; caves; gemstones; chasms; natural elements; rock towns; rocks, sand; sandstone; sandstone rocks; stones; sun; weather
Institutional		border of Liberec Region, Hradec Králové Region and Central Bohemian Region; geopark; specially protected areas	Czechia or its part; Central Bohemian Region; Hradec Králové Region; Liberec Region; specially protected areas
Economic sectors	primary sector	gemstone deposit; mineral extraction (glass sand); sandstone quarry	crop; feeders; soil
	secondary sector	glass and jewellery production	cars; Czech garnet; honey; industry; machines
	tertiary sector	campsite; climbing; tourism	camp; campsites; climbing; cycling (cycle paths); holiday; hospital; hotels; motorways; museums; pools; pubs; restaurants; roads; schools; shops; slope; spa; sport; tourism (hiking trails; lookout towers; trips, walks); zoo
Aesthetic		viewpoints	viewpoints; views

(landscape)			
Home			home; place where I live
Emotions and feelings			adventure; beauty; calm; colourfulness; experiences; fun; joy; paradise; passion; peace; pride; purity; safety; silence; smell of nature; well-being
Social			family; friends; happy children; people
Others			a lot of waste, no waste

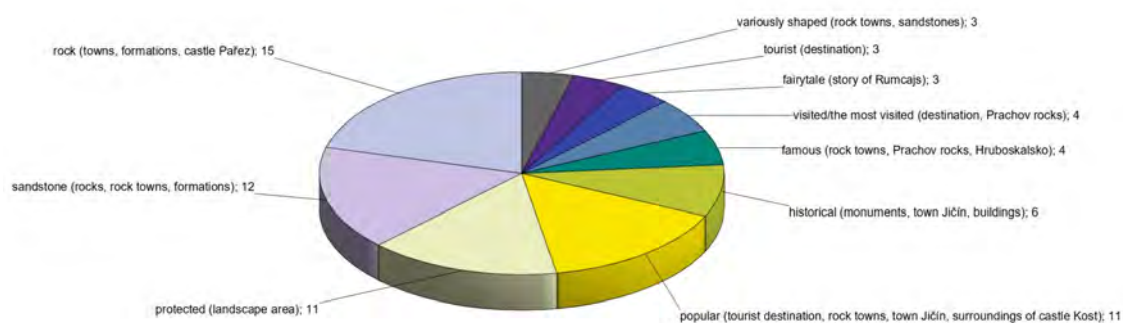


Fig. 2: "Produced" place meaning (referenced in textbooks 3 or more times).

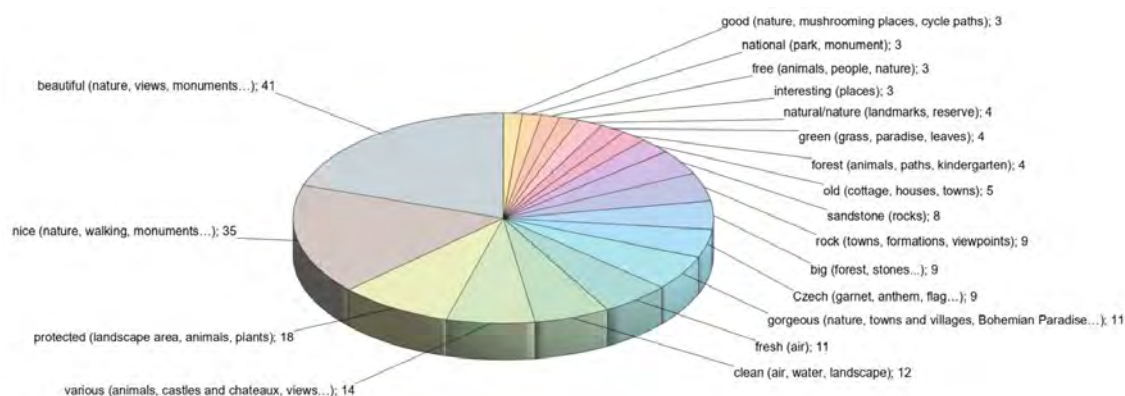


Fig. 3: "Consumed" place meaning (written by students 3 or more times).

Figure 4 presents specific places that come to students' minds when they hear the term "Bohemian Paradise". The most commonly mentioned places were Trosky, Turnov, Kost, Valdštejn, and Prachov rocks.

The response to the second research question is summarized in Figure 5. It depicts how students recognize significant places in the Bohemian Paradise which are mentioned in the textbooks. It is evident that students most commonly recognized Trosky, Turnov, and Kozákov. Boys recognized more places than girls, although this difference was not significant. Conversely, there were significant differences ($p < 0.05$) in the number of recognized places between students who go to nature least frequently (average of 18.6% recognized places) and those who go most frequently (average of 31.0% recognized places).



Fig. 4: Places children associated with the Bohemian Paradise. Photos by A. Nejedlová.

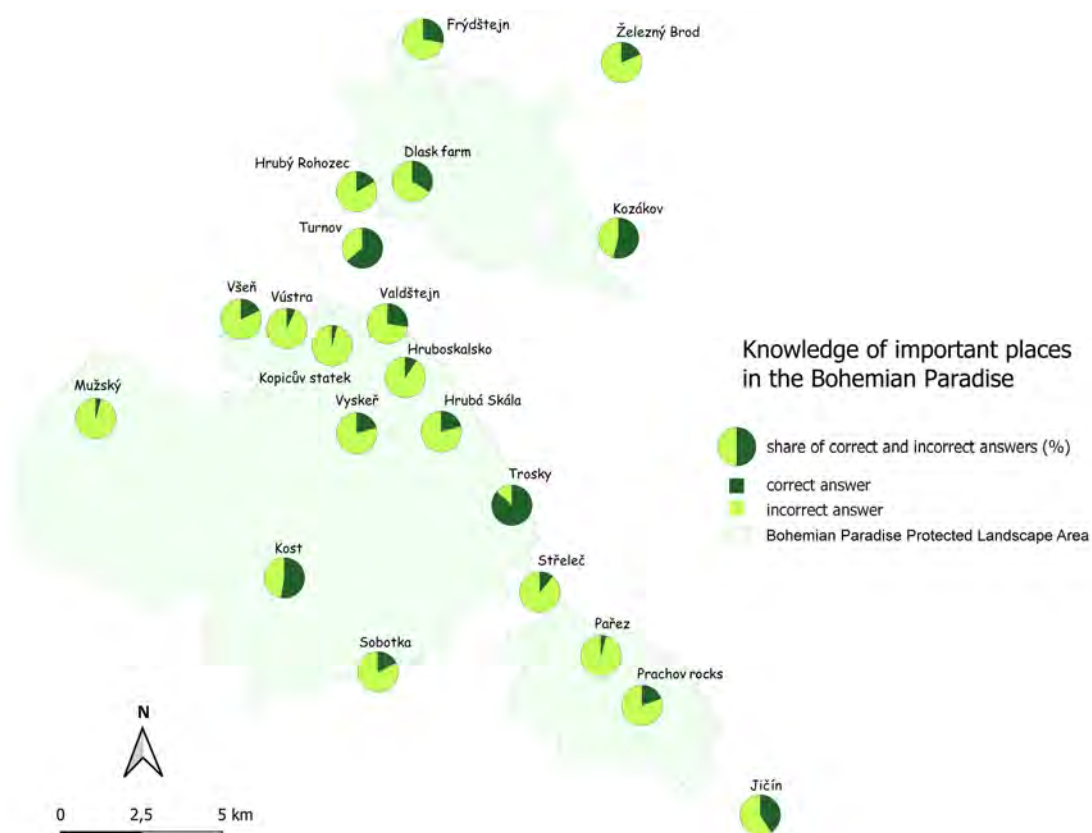


Fig. 5: Knowledge of important places in the Bohemian Paradise.

Discussion and conclusion

The results suggest that students most frequently associate the Bohemian Paradise with castles (Trosky, Kost, Valdštejn), the town of Turnov, and the Prachov Rocks. According to Chromý et al. (2014), who examined the main symbols of the Bohemian Paradise from the perspective of adult respondents, Trosky and rock formations are pan-regional symbols. When identifying the meanings expressed by the most frequently used adjectives (whether from the perspective of textbook authors or the students themselves), we drew inspiration from Young (1999). This author empirically derived a place meaning survey for a tropical World Heritage parkland region in Australia, creating a list of 30 place meaning items, which consisted of adjectives (e.g., beautiful; unique...).

The place most commonly recognized by students is Trosky. Chromý et al. (2014) state that it is likely the most depicted symbol of the Bohemian Paradise. The results suggest that there is a significant relationship between students' knowledge of significant places in the Bohemian Paradise and how often they spend time in nature. This relationship between the frequency of outdoor experiences and students' knowledge supports the implementation of the conception of place-based education, in which students learn, among other things, based on real experiences in the local landscape (Sobel 2004). Studies demonstrate the positive impact of this educational conception on fifth-grade students' SOP (Lee, Chiang 2016).

Overall, this article presents research findings in an area that has not been overly emphasized in research. Therefore, we suggest that greater attention be given to research on the concept of "place meaning" (or the concept of SOP) in education, as the SOP concept is one of the effective tools for the development of environmentally responsible behaviour of children, thus contributing to sustainable development as one of the main goals of contemporary education (UNESCO 2015).

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Souhrn

Místní krajina je část prostoru, která člověka obklopuje od jeho dětství a nabízí mu možnosti kognitivního, emocionálního i psychomotorického rozvoje. Žáci v ní vyrůstají a vytvářejí si k ní vztah, který se může v průběhu života rozšířit i na větší prostorová měřítka. Tento vztah může být ovlivněn významy, které žáci danému území přidělují. Existuje ovšem jen málo výzkumů, které by se zabývaly konceptem “place meaning” ve vzdělávání. Předkládaný výzkum se snaží tuto mezeru ve výzkumu vyplnit. Respondenty jsou žáci 5. ročníků základních škol, nacházejících se v oblasti CHKO Český ráj či v její těsné blízkosti. Výzkumu se zúčastnilo 257 žáků, tedy 44 % z jejich celkového počtu. Data byla shromážděna pomocí terénního výzkumu s využitím dotazníku. Doplněna byla rozhovory s žáky ve focus group. Odpovědi byly vyhodnoceny pomocí obsahové analýzy, deskriptivní statistiky a statistické analýzy. Výsledky ukazují, že z konkrétních míst si žáci pod pojmem Český ráj představí nejčastěji Trosky a Turnov. Zároveň byla tato místa žáky nejčastěji rozpoznána na fotografiích. Žáci nejčastěji spojují Český ráj s přídavnými jmény “krásný”, “hezký” a “chráněný”. Chlapci poznali více významných míst než dívky a celkově znalost těchto míst signifikantně roste s časem, který děti tráví v přírodě. Výsledky přispívají k výzkumu vztahu k místu – důležité oblasti environmentálního vzdělávání.

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THE BLATNÁ WATER DITCH – AN EXAMPLE OF CONNECTING MULTIPLE INTERESTS WHILE PRESERVING A FUNCTIONAL MONUMENT OF TECHNICAL HERITAGE

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Abstract

The Blatná water ditch, also named “Blatenský” water channel, belongs to a specific group of monuments of so-called technical and industrial heritage, which have managed to preserve their work even in the face of a change in function and repeated degradation of the structure and partial structures. It was necessary during the previous two reconstruction phases to balance the often-conflicting interests of historic preservation, nature protection, provision of water management functions and interests connected with tourism in the Ore Mountains. This was due to the nature of the water ditch representing an artificial water channel itself with many accompanying structures, e.g. the aqueduct and water distribution facilities. This paper aims to demonstrate the possibilities of solving the reconstruction of similar waterworks taking into account the aforementioned interests and at the same time preserving the maximum possible authenticity of the work, including the structural design and the techniques used for carrying out the work.

Keywords: Water channel, industrial heritage, authenticity, tourism, waterworks reconstruction

Introduction

In the last decade, cultural heritage protection has become significantly focused, both in the Czech Republic and in other countries, on the description, documentation, preservation and presentation of industrial heritage (Douet, 2015). An integral part of cultural heritage protection is the typology of structures of individual fields, their identification, assessment of their current state and protection (Ryšková and Dzuráková et al., 2022). Preservation and reconstruction activities are complemented by popularising this type of heritage in various ways. Popularisation through visualisations of structures and their functional units is one of the suitable tools for making the preservation of this heritage and awareness of it possible. As far as the water management field is concerned, these procedures of visualisation of structures will enable the retention of information about their state in a certain period because continuous reconstruction, additions to structures, replacement of technological equipment and often also changes of usage are typical for this field. This is typical for structures both on regulated water courses (especially reservoirs, regulating and distribution structures) and on artificial channels, the representative of which is the Blatná water ditch.

The Blatná water ditch has been heritage-protected since 1981, and in 2017 it was declared a national cultural monument. It is also part of the Erzgebirge/Krušnohoří (Ore Mountains) Mining Cultural Landscape which was, together with waterworks for ore mining and processing, inscribed on the World Heritage List in 2019 (UNESCO, 2019), which makes the channel itself a popular tourist destination.

Materials and methods

The field working methods include, apart from walking and taking photos and geodetic positioning of structures and sections of watercourses (here the ditch trough), the following approaches: (i) modern methods of providing source materials in the field were used to identify and document structures and their functional units (electronic versions of forms, acquisition of images using UAV equipment); (ii) GNSS receiver Trimble R2 was used to determine the spatial position of Ground Control Points (GCP); (iii) the source materials were further processed using special SW tools, e.g. GIS; (iv) the processing of the aerial images acquired was carried out using the Agisoft PhotoScan Professional software. This software uses digital photogrammetry and Structure from Motion (SfM) methods and the output is a textured 3D model of the captured scene.

Archive research is an essential part of the study of historical waterworks and their functional units (Sviták et al., 2022). In the case of the Blatná water ditch, it consisted of the following steps: (i)

detailed research, analysis and interpretation of available archive fonds, ii) research of map works, plans and schemes, iii) digitalisation of selected archive (map, project and other) materials and their interpretation using SW tools (GIS).

Results

History of the water ditch operation

According to written sources, the Blatná water ditch was built at the turn of the 1540s by a person called Stephan Lenk, not long after the discovery of tin deposits in the vicinity of Blatenský hill and the subsequent foundation of the town of Horní Blatná (1532). An almost 12 km-long water ditch with an average slope of 3 ‰ was started to the west of Boží Dar, where it took water from Černá Brook, from where it led through Myslivny, Ryžovna, Bludná, along the northern slope of Blatenský Hill to Horní Blatná (Fig. 1), where its water provided the propulsion power for the equipment and machinery in mining and processing operations (the crushing and smelting plant of extracted tin ore) situated to the west of the core of the town buildings. To the south of the town the ditch led into the Blatenský Brook. From the early 1870s, the Blatná water ditch operated under the name of a newly formed water cooperative based in Horní Blatná. The water ditch served its function and was maintained till the displacement of the local German population after the Second World War. Then it lay decaying for half a century (Cais, 2018).



Fig. 1: The Blatná water ditch route

Results of the field research

The water ditch is about 2 metres wide and over 1 metre deep (Fig. 2). Its trough was reinforced with wooden battens or lined with stone cladding and in the past it was covered year round. The whole works was equipped with necessary technical elements which ensured the desired function. It involved: (i) a system of sluice gates; (ii) supply and drainage branch channels; (iii) traps for gravel and sand deposits drifted by the current of tributaries which supplied water to the ditch; (iv) overflows which, on the contrary, served to drain an excessive amount of water from it into the Černá River; (v) culverts under roads; (vi) bridges over the ditch or water transfer (via aqueduct) allowing crossing the brook. They could be used to carry out regular walking inspections of the ditch (nowadays they are often used by tourists), check its flow rate and remove any obstacles or repair damage to the structure.



Fig. 2: Channel of the ditch in a forest area (left) and in an open landscape (right)

Between 1995 and 2001, this technical-heritage monument was repaired according to a reconstruction project from the 1920s (final inspection documentation is from 1929) with partial modifications. A number of stakeholders participated in the project proposal – the municipality of Boží Dar, Karlovy Vary District Council, State Bureau for Amelioration, Ohře River Basin, state enterprise, and Forests of the CR, state enterprise. The project was approved and supervised by the National Heritage Institute. The reason for its preservation was not only to preserve the historical waterworks but also to comply with the current water management requirements in the area. Until today, the task of the water ditch has been to drain acidic water from the Boží Dar peat bog out of the water surface of the Myslivna reservoir, which serves as a source of drinking water; and in the event of an accident or technological problems with the quality of the drainage water at the Boží Dar town WWTP, to divert these waters out of the water reservoir. Furthermore, the repair of the trough was to prevent the degradation of forest cover around the ditch, into which the water seeped due to the leaking structure. Forest ameliorations were also to be led into the ditch.

Problems identified

Due to the effects of climatic conditions, about ten years after the end of the restoration from the turn of the 21st century, new major repairs were made. Damaged spruce round logs were replaced and masonry elements were reinforced. The trough was cleaned from the turf which grew in places without natural inflow. Ensuring a sufficient flow through the waterworks is a problem. In 2011, a regular staff service of the ditch was launched to check its state. Both the channel body and many other structures were gradually falling into serious disrepair. The filling structure did not work, the relief structures were apparently intentionally damaged and oak planks were stolen. Water escaped from the ditch due to the damaged wooden reinforcement and the trough became overgrown with vegetation. Weather conditions also affected its state. The last reconstruction, focused on the overall repair of reinforcement and structures (along the entire length of the water channel) lasted two years and was completed at the end of 2023. The reconstruction was carried out with respect to the preservation of the heritage value of the waterworks, with an emphasis on the authenticity of the material but also the procedures used, i.e. a large proportion of manual work, in a relatively difficult to reach area.

Discussion

The use of UAV equipment for the documentation of historical structures has been one of the established techniques in recent years (Lo Brutto et al., 2014). The imaging results, together with suitable SW tools, are used to prepare visualisations and map outputs (Nex and Remondino, 2014), as was the case of the Blatná water ditch. The heritage value of the Blatná water ditch is based above all on its operational continuity with a clearly documented beginning in the 16th century. On the other hand, this operational continuity has resulted in repeated reconstructions. Nevertheless, during the present reconstruction, it turns out that a lot of structures or substructures have been preserved presumably from the 18th century.

The Blatná water ditch belongs to a specific group of technical and industrial-heritage monuments in the case of which the waterworks itself has been preserved even with changes in function and a repeated degradation of its structure and sub-structures. The change in function in the course of history and the approach to repairs and reconstructions, as well as the selection of technological methods of repair and technology used, correspond to the requirements and possibilities of the time for this type of water management structure and does not always reflect the requirement to maintain authenticity (Ryšková and Dzuráková et al., 2022). In spite of that, in the case of this ditch, both during the major reconstruction in the 1920s and during the recent ones, the requirements for authenticity have been taken into account. All this happened thanks to the efforts of a number of enthusiasts and experts and the helpfulness of the organisations that were responsible for the management and operation of the ditch. Its regular, frequently repeated inspection is essential to the maintenance of the channel, on the basis of which its cleaning and any necessary repairs are done without undue delay.

Conclusion

The uniqueness of the Blatná water ditch resides also in its size and its operational link to two Renaissance mining towns of Horní Blatná and Boží Dar. With its long in operation length of 13 km, it is an excellent example of technological ingenuity, but also of foresight in the context of the area use, which has survived even the decline of mining. It is also one of the most significant examples of the colonisation landscape of the early 16th century, showing the interconnection of anthropogenic activity (mining), mining towns with a strong commercial and economic component, as well as architectural and artistic works. During the last two reconstructions (in the 1990s and current), it was necessary due

to the nature of the works, which comprises the trough of an artificial water channel with many accompanying structures (aqueduct, relief structures, etc.), to balance the often contradictory interests of heritage protection, nature conservation, water management functions and the interests associated with growing tourism in the Ore Mountains. More information, photo documentation and plans of the ditch body and related structures can be found on the project website:

(<https://heis.vuv.cz/data/webmap/datovesady/projekty/kanaly/default.asp>)

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Souhrn

Blatenský vodní kanál patří do specifické skupiny památek tzv. technického a industriálního dědictví, u nichž se podařilo zachovat vlastní dílo i při změně funkce a opakované degradaci konstrukce a dílčích objektů. Vzhledem k charakteru díla, které představuje koryto umělého vodního kanálu s mnoha doprovodnými objekty (akvadukt, odlehčovací objekty aj.), bylo nutné během posledních rekonstrukcí vyvážit často protichůdné zájmy památkové ochrany, ochrany přírody, zajištění vodohospodářských funkcí a zájmy spojené s rostoucím turistickým ruchem v oblasti Krušných hor. Cílem příspěvku je představit možnosti řešení rekonstrukce podobných vodních děl se zohledněním těchto zájmů a současně zachováním maximálně možné autenticity díla, včetně konstrukčního provedení a použitých technik provádění prací.

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THE ENVIRONMENTAL ASPECT OF TOURISM AND RECREATION ALSO AFFECTS THE VALUE OF RESIDENTIAL PROPERTIES

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Abstract

Recreation, as a phenomenon of modern life, encompasses diverse activities that provide escape and relaxation from everyday routine and work stress. This short-term leisure activity is often associated with travel to various locations, both nearby and distant, offering various forms of relaxation and entertainment. These activities include spa stays, beach vacations, but also active holidays involving outdoor sports, exploring new cultures, and environments.

Increased tourist traffic brings both positive and negative impacts to destinations. From an economic perspective, tourism can be a source of income for local businesses and contribute to the economic growth of the destination. However, the negative aspect is often associated with the strain on infrastructure, increased resource consumption, and environmental pollution.

In the context of property value, tourism can have a dual effect. On one hand, the attractiveness of the destination may increase residential property prices in the area, especially if it is considered a prestigious tourist spot. On the other hand, excessive tourist traffic may reduce attractiveness for potential residents due to issues such as noise, pollution, and overcrowding. The study focuses on evaluating this complex relationship between tourism and property value in a given location. The article presents the final results of the study and cohesively builds upon previously presented articles and partial findings.

Keywords: The impact on the environment, tourism, property value, determinants of pricing, tourist destinations.

Introduction

The analysis of the current state of knowledge indicates that tourism has been dynamically developing in the Czech Republic in recent years, excluding the SARS-CoV-2 virus epidemic in the years 2020-2022. In some locations, this sector has a significant impact on the value of real estate. Attention in the real estate market is primarily focused on the influence of tourism on the market value of recreational properties and accommodation facilities. It is evident that the value of these properties will be higher. Less attention is being paid to the impact of tourism on other types of properties, where this influence may be opposite. For example, a high number of visitors (tourists) can lead to traffic congestion, waste, air pollution, noise in surrounding areas, and similar issues. These negative consequences can then decrease the quality of life and the environment, as well as the value of properties. Tourism and associated travel, which can have both positive and negative impacts, can thus be considered as environmental externality affecting property value. The article presents the summary results of several studies conducted by the authors over a four-year period at the Institute of Forensic Engineering.

Materials and methods

Two most visited tourist locations were selected from each region across the Czech Republic, based on data from the Czech Statistical Office. For further analysis, data on residential property prices were obtained, specifically from realized sales prices of family houses and apartment units recorded in purchase agreements registered at the Czech Office of Surveying, Mapping and Cadastre. Simultaneously, statistical information on the volume and trends of tourism in specific locations and time periods was obtained from the Czech Statistical Office database. Due to being public databases managed by state institutions, the acquired data and their sources are considered reliable. This assessment underscores the importance of credibility and accessibility of information from public data sources for scientific research. The Czech Office of Surveying, Mapping and Cadastre has been mandatorily recording price data on realized sales since 2014, with older data unavailable. Consequently, databases of price data covering the period from 2014 to the present have been established. Parallel to this database, data on tourism are gathered and compiled from the public database of the Czech Statistical Office, specifically comprising time series relating to the development of tourism in the examined locations. For the analysis of the overall impact of tourism, data are used and evaluated only up to the year 2019, inclusive. The significant decrease in the

number of tourists in the years 2020-2021, caused by the COVID-19 pandemic, is statistically significant, and its inclusion in the model would distort the achieved results. This led to the decision to evaluate the overall data only for the period from 2014 to 2019, inclusive. In order to eliminate potential interferences that could affect the results of tourism impact, an additional analysis of another determinant was used, primarily the natural inflation of apartment units and family houses in the examined locations, respectively regions. To neutralize this effect, the House Price Index was used, which was again sourced from the database of the Czech Statistical Office. For the evaluation of the compiled databases, dependency analysis was used, especially its tools, correlation and regression analysis. All results were evaluated in the professional statistical program Stat graphic Centurion using regression modelling.

Results – statistically significant results

From our own solution and achieved results, locations where there is a statistically significant positive as well as negative impact of tourism on property value have been identified. In these locations, a higher degree of correlation between the number of tourists and property prices was mostly observed compared to the House Price Index (HPI), where this influence was either excluded or was at a minimum level, similar to or very close to the observed correlation. The results are clearly displayed in the following table.

Tab. 1: Statistically significant localities (Source: Own processing)

No.	Region	Location	Type of property	Correlation HPI vs. price	Correlation tourism vs. price	Influence	Coefficient of determination	P - value
1.	Jihočeský	Český Krumlov	House	0,904	0,960	Positive	93,16%	0,002
2.	Jihočeský	Český Krumlov	Flat	0,817	0,967	Positive	95,68%	0,001
3.	Jihočeský	Hluboká nad Vltavou	House	0,992	0,982	Positive	99,66%	0,000
4.	Jihočeský	Hluboká nad Vltavou	Flat	0,932	0,847	Positive	80,69%	0,015
5.	Jihomoravský	Lednice	Flat	0,880	0,925	Positive	89,95%	0,004
6.	Jihomoravský	Mikulov	House	0,924	0,973	Positive	96,01%	0,001
7.	Jihomoravský	Mikulov	Flat	0,990	0,974	Positive	96,27%	0,001
8.	Jihomoravský	Znojmo	House	0,903	0,913	Positive	85,19%	0,009
9.	Jihomoravský	Znojmo	Flat	0,955	0,991	Positive	98,54%	0,000
10.	Karlovarský	Karlovy Vary	Flat	0,902	0,928	Positive	86,87%	0,007
11.	Karlovarský	Loket	Flat	0,548	0,846	Positive	74,89%	0,026
12.	Vysočina	Jihlava	Flat	0,989	0,946	Positive	94,23%	0,001
13.	Vysočina	Pelhřimov	Flat	0,984	0,865	Positive	78,62%	0,019
14.	Vysočina	Telč	House	0,636	0,851	Positive	77,04%	0,022
15.	Královéhradecký	Dvůr Králové	Flat	0,954	0,965	Positive	95,29%	0,001
16.	Královéhradecký	Jičín	Flat	0,897	0,786	Positive	67,69%	0,044
17.	Liberecký	Frýdlant	House	0,918	0,992	Positive	98,65%	0,000
18.	Liberecký	Frýdlant	Flat	0,973	0,955	Positive	93,71%	0,000
19.	Liberecký	Liberec	Flat	0,907	0,883	Positive	86,30%	0,007
20.	Olomoucký	Šumperk	Flat	0,980	0,979	Positive	96,51%	0,001
21.	Plzeňský	Klatovy	Flat	0,977	0,796	Positive	68,87%	0,041
22.	Plzeňský	Tachov	Flat	0,991	0,781	Positive	70,69%	0,036
23.	Ústecký	Děčín	Flat	0,972	0,948	Positive	92,82%	0,002
24.	Ústecký	Ústí nad Labem	House	0,770	0,813	Positive	68,89%	0,041
25.	Ústecký	Ústí nad Labem	Flat	0,968	0,791	Positive	70,72%	0,036
26.	Zlínský	Rožnov	Flat	0,984	0,868	Positive	81,48%	0,014
27.	Zlínský	Vizovice	Flat	0,741	-0,894	Negative	85,13%	0,009

The *p-value* in regression analysis expresses the probability of obtaining the observed data if the null hypothesis were true. Furthermore, in this analysis, the null hypothesis that there is no relationship between the independent (or independent) and dependent variables is often tested, which would mean that the coefficients of the regression model are zero.

If the *p-value* is low (for example, less than 0.05 when testing at a 95% confidence level), the null hypothesis is typically rejected, indicating that there is a statistically significant relationship between the independent (or independents) and dependent variables. If the *p-value* is high, the null hypothesis is not rejected, suggesting that there is insufficient evidence to assume a significant relationship. Thus, the *p-value* is an important indicator of statistical significance in regression analysis and helps determine whether the analysis results are statistically significant.

The coefficient of determination (also known as R-squared) in regression analysis is a statistical measure that expresses how well the regression model explains the variability of the dependent variable compared to the mean value of the dependent variable. In practice, the R-squared value is typically interpreted such that, for example, a value of 0.70 would mean that 70% of the variability of the dependent variable is explained by the regression model, while the remaining 30% of variability remains unexplained and may be caused by other factors.

Results – statistically insignificant results

The following table presents the locations where statistically insignificant results were obtained, i.e., locations where the influence of tourism on property value was not demonstrated.

Tab. 2: Statistically insignificant localities (Source: Own processing)

No.	Region	Location	Type of property	Correlation HPI vs. price	Correlation tourism vs. price	Influence	Coefficient of determination	P - value
1.	Jihomoravský	Lednice	House	0,931	0,446	Positive	22,25%	0,345
2.	Jihomoravský	Valtice	House	0,867	0,511	Positive	31,94%	0,243
3.	Jihomoravský	Valtice	Flat	0,964	0,451	Positive	26,92%	0,292
4.	Jihomoravský	Vranov nad Dyjí	House	0,036	0,405	Positive	16,91%	0,418
5.	Karlovarský	Karlovy Vary	House	0,536	0,576	Positive	39,62%	0,181
6.	Karlovarský	Loket	House	0,275	0,336	Positive	13,28%	0,478
7.	Vysočina	Jihlava	House	0,675	0,506	Positive	37,87%	0,193
8.	Vysočina	Pelhřimov	House	0,880	0,512	Positive	28,56%	0,275
9.	Vysočina	Vysočina	Flat	0,809	0,604	Positive	41,11%	0,170
10.	Královéhradecký	Dvůr Králové	House	0,819	0,570	Positive	34,66%	0,219
11.	Královéhradecký	Jičín	House	0,173	-0,425	Negative	24,24%	0,321
12.	Liberecký	Liberec	House	0,337	0,375	Positive	22,94%	0,337
13.	Olomoucký	Litovel	House	0,453	0,577	Positive	35,05%	0,216
14.	Olomoucký	Litovel	Flat	0,840	0,432	Positive	42,58%	0,160
15.	Olomoucký	Šternberk	House	-0,447	-0,041	Negative	0,37%	0,909
16.	Olomoucký	Šternberk	Flat	0,995	0,655	Positive	47,28%	0,131
17.	Olomoucký	Šumperk	House	0,452	0,610	Positive	46,80%	0,134
18.	Plzeňský	Klatovy	House	-0,159	0,169	Positive	6,31%	0,631
19.	Plzeňský	Tachov	House	0,754	0,599	Positive	41,15%	0,170
20.	Plzeňský	Železná Ruda	House	0,639	0,771	Positive	62,14%	0,063
21.	Plzeňský	Železná Ruda	Flat	0,880	0,779	Positive	64,79%	0,053
22.	Ústecký	Děčín	House	-0,689	-0,623	Negativní	42,09%	0,163
23.	Zlínský	Luhačovice	House	0,549	-0,011	Negative	0,27%	0,922
24.	Zlínský	Luhačovice	Flat	0,811	-0,349	Negative	14,19%	0,462
25.	Zlínský	Rožnov	House	0,489	0,335	Positive	12,33%	0,495
26.	Zlínský	Vizovice	House	0,807	-0,496	Negative	35,86%	0,209

Discussion

The aim of the studies was to evaluate the impact of tourism on the value of residential properties. In 27 locations, a statistically significant influence of tourism on the value of family houses and apartment units was observed, while in 26 locations, this influence was statistically insignificant. However, it is important to consider possible reasons for this discrepancy. One possible explanation for the mixed results could be the evaluation of a relatively short time series. The Czech Office of Surveying, Mapping and Cadastre records price data from 2014 to the present. However, the outbreak of the SARS-CoV-2 virus in 2020 led to a halt in tourist activities for almost two years. As a result, the data were evaluated only for the period between 2014 and 2019. The short-term nature of the data may have limited the ability to capture the full extent of the relationship between tourism and property value over time.

It is also necessary to note that although the authors of the studies attempted to assess similar, or comparable, locations, not every tourist-attractive location is identical. Another explanation for the differing impact of tourism in statistically significant and insignificant locations may therefore be related to the varying characteristics of these locations and variables that were not included in the analysis.

Differential tourist attractiveness: Locations with a significant impact of tourism may have a more pronounced tourist attractiveness than others. For instance, a location with popular landmarks, natural beauty spots, or cultural events could be more appealing to a larger number of tourists, which could also manifest in a statistically significant impact on property value.

Differential infrastructure and services: Locations with a higher level of tourist infrastructure and accessibility of services for tourists, such as hotels, restaurants, or recreational activities, may better leverage the economic benefits of tourism, which would also be reflected in the property value.

Variability in price growth: Locations with different levels of property price growth may exhibit varying impacts of tourism. If property prices in statistically significant locations were consistently higher than in other locations during the study period, it may indicate a stronger link between tourist demand and property prices. However, this would require a more comprehensive study involving more locations, including those less touristy, and a comparative analysis based on the results obtained.

Geographic and economic factors: Other factors may include the geographic and economic characteristics of individual locations, such as transportation accessibility, unemployment rate, or the presence of other economic sectors beyond the tourism industry, which may influence the real estate market. These additional factors may explain the differential impact of tourism on property value in various locations and contribute to the variability of analysis results. Further research, encompassing a longer time series, including both pre- and post-pandemic periods, could provide a more comprehensive insight into the relationship between tourism and property value. Additionally, investigating other potential factors, such as local economic conditions and government policies, could help clarify the complex dynamics occurring among the variables under study.

Conclusion

In conclusion, the study results offer valuable insights into the field of real estate valuation, specifically addressing one of the potential value-creating factors that may affect residential property value. They shed light on the relationship between tourism and the price value of residential properties. The aim of the studies is to quantify, elucidate, and evaluate this relatively underexplored aspect, namely the impact of tourism, which can influence property value. Subsequently, based on the achieved results, the search for a suitable approach in potential implementation into valuation methods ensues. Scientific methods of dependency analysis, particularly correlation and regression analysis, have been successfully utilized to identify and quantify the interrelationships.

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Czech Surveying and Cadastre Office, available from: <https://cuzk.cz/Uvod.aspx>

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Souhrn

Ve všech studiích byly použité metody a postupy aplikovány na věci nemovité s rezidenční funkcí, konkrétně na bytové jednoty a rodinné domy. Avšak časový rámec, ve kterém byl vliv turistiky na hodnotu těchto nemovitostí zkoumán, byl omezen, a to jak z hlediska cenových údajů, které

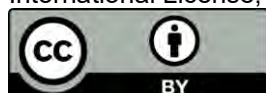
katastrální úřad eviduje od roku 2014 po současnost, stejně tak faktorem viru Sars-CoV-2, který v roce 2020 a následujícím, zásadně ovlivnil a téměř na dva roky zastavil turistickou aktivitu. Z tohoto důvodu bylo možné zkoumat pouze omezené časové období. Pro budoucí výzkum by bylo vhodné a přínosné posuzovat delší časové období, do kterého nezasáhne statisticky významný vliv další proměnné, jako například již zmíněný vir Sars-CoV-2 nebo jiná abnormalita. Při zkoumání a vyhodnocování delšího časového období, bez těchto interferencí, by jistě byly výsledky těchto studií důraznější, statisticky významnější a přesnější.

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THE FUTURE OF DESIGNED LANDSCAPES IN THE NATIONAL PARK

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Abstract

The Czech Republic is unique for its high number of preserved landscape compositions linked to noble settlements and pilgrimage sites. The historical designed landscape has an exceptional potential for the development of recreation. If it's located in a specially protected area, the question arises of how to reconcile the conflicting interests of conservation, tourism development and nature protection. The current system of conservation and spatial planning hasn't optimally set processes for dealing with this issue. The subject of the research is the area Vranovsko-Bítovsko. It's an area that is highly used for recreation, with the concentration of recreationists concentrated in 3 specific places - Vranov Castle, Bítov Castle and Vranov Dam. However, the potential of the whole area is much higher and unused. Promoting recreation is the way to increase the economy and awareness of the cultural and natural values. It's a relatively neglected area hasn't been the subject of systematic research. There isn't comprehensive identification and interpretation; there isn't plan for the protection and regeneration. The NP Podyjí now encroaches upon a significant part of the composition and it's in these places that the two protection regimes are clashing, leading to the slow demise of the main body of the composition. The aim of the research is to identify all the elements, define the most endangered places and propose a suitable solution.

Keywords: Vranovsko-Bítovsko, Podyjí, heritage conservation, nature protection, recreation

Introduction

Designed landscapes are one of the categories of historic cultural landscape that were defined at the 16th session of the World Heritage Committee in Santa Fe (USA) in 1992 (UNESCO, 2015). It is a specific type of cultural landscape that has been shaped by humans on the basis of a "higher" artistic, aesthetic and symbolic order (Kuča, 2015). It is landscaping on the owner's land tenure, which is connected to the residential estate, characterized by the installation and highlighting of significant points and relationships, emphasizing administrative, cultural and spiritual centers and idealization of landscape scenes (Salašová, 2020). The identification and interpretation of the designed landscape was the subject of research by Ehrlich, Kuča et al. 2020. "Typology of the historical cultural landscape of the Czech Republic", Flekalová, 2011. Composite Landscapes, Houward. 2003. "Heritage: Management, Interpretation, Identity", Keller and Keller, "How to Evaluate and Nominate Designed Historic Landscapes" and many others. Department of Landscape Planning has been working on the topic of designed landscapes for many years as part of NAKI projects. So far, several detailed studies and documents have been created for selected designed landscapes such as Lednice-Valtice area (Salašová et al., 2013), Chroustovice (Salašová et al., 2019) or Hlubocko (Salašová et al., 2019). Previous research has shown that it is desirable to create further detailed background information for the landscape of the Vranov-Bítov region. This area is partly covered by the landscape heritage area. There is a strong presumption that these are two separate compositions with a common history. The aim is to build on this research and to comprehensively identify and interpret these composite landscapes. The present article deals with the composite landscape of the Vranov region, which is partly covered by the Podyjí National Park.

Materials and methods

The beginning of the Vranov composition (Fig. 1) can be considered the beginning of the 17th century, when the Vranov estate passed into the possession of the noble Althann family. The Althanns were the most important family and during their tenure the castle and the surrounding landscape were significantly transformed. The Baroque style influenced the perception of the surrounding landscape. In the second half of the 18th century, the Althanns began to establish preserves, expand and improve the forests. The so-called lusthaus were built in the preserves in Braitava and near Čížov, which are still preserved today. Small religious buildings were built throughout the surrounding area. Michal Josef Althann began landscaping on Rose Hill to the west of Vranov Castle, where, for example, the House of the Philosophers and the Temple of Diana were built. In 1793, the estate was bought by Josef Hilgartner of Lilienborn, who continued the work of the Althanns, especially in building and

rebuilding preserves. He established a new boar preserve near Čížov, a preserve in the Vracovice and Štítar district and the New Pheasantry preserve between Šumná and Lesná. Josef Hilgathner sold the estate in 1799 to Stanislav Mniszko-Buzenin, whose descendants owned the estate until 1947. The Mniszek family and the Stadič family continued the Romantic-style landscaping by building viewpoints (the Dancer's Lookout, Helen's Lookout "Zikkurat", Martin's Lookout) and other voluptuary structures (Felicita's Well, Clary's Cross or Mniszek's Cross). They also established farmyards with associated landscaping (Kuča, 2015). The Podyjí National Park was proclaimed by Government Decree of 20 March 1991 (No. 164/1991 Coll.) with effect from 10 May 1991. On 1 July 1991, the Podyjí NP Administration was established to ensure nature protection in the territory of the Podyjí NP and its protective zone. Since January 2020, the new zonation of the Podyjí National Park has been in force (Škorpík, [online]). The identification of the landscape composition was based on the analysis and correlation of historical mapping data (Indication sketches, stable cadastre maps and the Second Military Mapping) with current maps and orthophotos in ArcGIS Pro. The basic compositional elements were determined and subsequently redrawn into a separate map layer including compositional connection (Trpáková, 2014).

Results

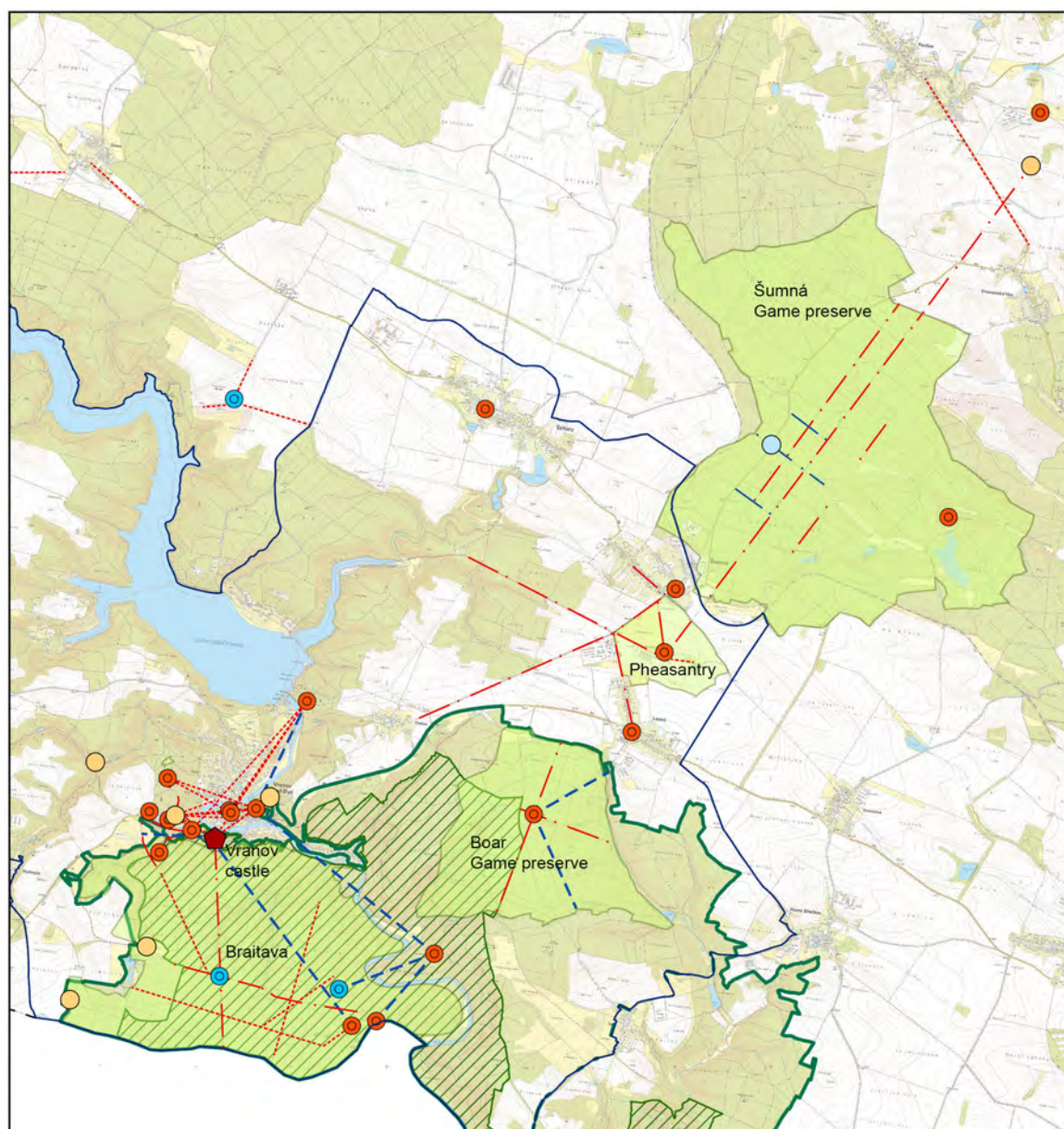
The overall composition of the Vranov region was identified (Fig. 1), among whose basic and endangered compositional elements is the Braitava Game Preserve (Fig. 2). There are preserved buildings that form the basis of the internal composition: the Vranov Castle, Felicita's Well, the Braitava Lusthaus, the Zikkurat at Helen's Lookout and the Obelisk above the Ice Sloughs. The main compositional lines are also preserved here in the form of paths, one leading to the Vranov castle and the other connecting the grove with the Braitava Lusthaus. Four secondary compositional lines in the form of existing forest paths have also been preserved. In addition, the now defunct visual links between the no longer existing Martinská Lookout, Braitava Lusthaus and Obelisk above the Ice Sloughs and between Zikkurat and Vranov Castle have been identified. Also, a defunct summerhouse at the crossing of the main axes in the western part of the preserve was identified and documented on the 1st military mapping. The analysis shows that basically the entire Braitava Game Preserve is located in the quiet area of the Podyjí National Park, where access outside the marked hiking trails is prohibited. The only hiking trail - Felicita's Circle - is located in the northern part of the Game preserve (Fig. 2), which means that the entire Game preserve is inaccessible to humans. Thus, the visitor does not have the opportunity to see a significant part of the composition in situ. And this part of the composition and its preserved elements have a great recreational potential, where one can experience the composed landscape and understand the different phases of its historical development.

Discussion

In the places where the Braitava Game Preserve and the Boar Game preserve near Čížov are located in the quiet area of the Podyjí National Park, there is a conflict between two protection regimes. This is the protection regime of the national park according to Act No. 114/1992 Coll., the Act on Nature and Landscape Protection, and the protection regime of the landscape heritage zone according to Act No. 20/1987 Coll., the Act on State Heritage Care. There is a situation where the protection of one value makes the protection of the other value impossible. As a result of this conflict, the main constituent elements of the designed landscape, such as visual connections, are gradually disappearing. At present, it is not possible to restore the transects in the forest cover as it is located in Zone A of the National Park (Fig. 2). With the disappearance of the adjacent part of the composition, individual buildings are suddenly taken out of the context of the compositional intent. There is also a great risk of dilapidation of the individual cultural monuments (Lusthaus Braitava and Zikkurat), to which no one has access without permission. Without mutual discussion, the establishment of exceptions and the setting of a care and protection plan for these sensitive landscapes, their imminent demise is imminent.

Conclusion

The essential elements of the Vranov composition were identified - building objects, compositional axes and important visual connections. Sensitive parts of the composition were identified, where the composite landscape is at risk of disappearing due to conflicts between the interests of two protection regimes: nature protection and cultural heritage protection.



0 0,5 1 2 Kilometers

Legend

Landscape heritage
area Vranovsko-
Bítovsko

Compositional elements

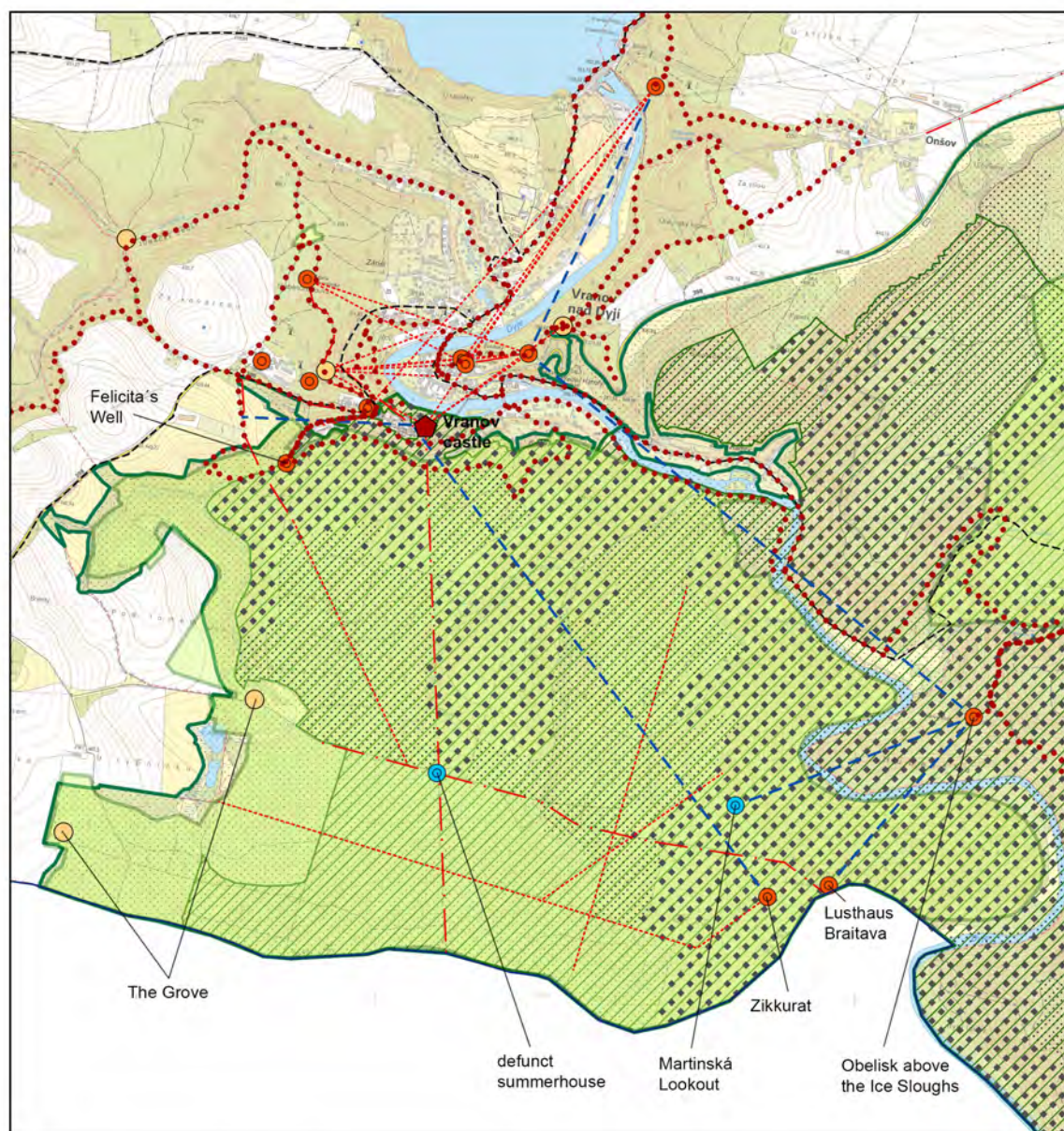
- existing supplementary
object
- existing main object

- existing secondary
object
- defunct supplementary
object
- defunct secondary
object
- existing main axis
- existing minor axis
- defunct main axis

- defunct minor axis
- Game preserve
- The border of the Podyjí
National Park
- quiet area of the
National Park
- The border of the South
Moravian region



Fig. 1: The overall composition of the Vranov region



0 0,2 0,4 0,8 Kilometers

Legend

- hiking trails
- cycle paths
- Landscape heritage area Vranovsko-Bítovsko
- Compositional elements
- existing supplementary object
- existing main object
- existing secondary object
- defunct supplementary object
- defunct secondary object
- existing main axis
- existing minor axis
- defunct main axis
- defunct minor axis
- Game preserve
- The border of the Podyjí National Park
- quiet area of the National Park
- The border of the South Moravian region
- zone A - natural
- zone B - close to nature
- × zone C - concentrated care for nature



Fig. 2: The composition of Braitava Game preserve and the zonation of Podyjí National Park, the individual zones have different nature care character

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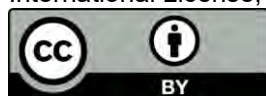
Souhrn

V rámci výzkumu byla identifikována celková kompozice Vranovska, mezi jejíž základní a ohrožené skladební prvky patří obora Braitava. Z provedené analýzy vyplývá, že v podstatě celá obora Braitava se nachází v klidovém území NP Podyjí, kde je zakázán přístup mimo značené turistické cesty. Jediná turistická trasa se nachází v severní části obory, ale přesto návštěvník nemá možnost poznat významnou část kompozice in situ. Obora Braitava se nachází na území střetu dvou ochranných režimů: ochrany přírody a ochrany kulturního dědictví. Dochází zde k situaci, kdy ochrana jedné hodnoty znemožňuje ochranu hodnoty druhé. Bez vzájemné diskuze, stanovení výjimek a nastavení plánu péče a ochrany o tyto citlivé krajiny hrozí jejich bezprostřední zánik.

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THE IMPORTANCE OF HISTORICAL VINEYARD LANDSCAPES IN NATURE CONSERVATION AND RECREATION

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<https://doi.org/10.11118/978-80-7509-963-1-0332>

Abstract

One of the current research projects in the Czech Republic, focusing on complex landscape research is represented by Centre for Landscape and Biodiversity (Divland). Within this project, one part focuses on historical cultural landscapes and their structures. Historical cultural landscapes are long-term created and influenced by human activities. These are mainly sustainable activities without intensive mechanization, and lead to an increase in the cultural and natural values of the area. The vineyard landscape can be also evaluated as one of the valuable historical structures of the landscape. In the model area around the towns of Hodonín and Kyjov, the individual features of this landscape, their importance of preservation for cultural and natural heritage, sustainable business in agriculture and the development of tourism were monitored. During map archival research and field investigation, various types of preserved traditional historical structures of landscapes with typical features, which are desirable to maintain and preserve for future generations, were found. The difficulty of maintaining this type of landscape was discussed with local winemakers. From discussions with local operators of wineries, accommodation facilities and restaurants, it emerged that the historical structures of wine landscapes are one of the important aspects for tourists to visit this region.

Keywords: Extensive agriculture, vineyards, archival maps, tourism

Introduction

Historical landscape structures are a very important phenomenon of the cultural landscape as they record the historical way of using the landscape and at the same time give the territory a specific landscape character (Muchová, Petrovič, 2014). In agricultural landscapes, it is desirable to preserve or restore valuable landscape structures with traditional farming methods (Petrovič et al., 2017; Dawson et al., 2017), which help to preserve/increase biodiversity (Skokanová et al., 2016), and can be considered as a form of sustainable management of agricultural land (Dumbrovský, Larišová, 2016). The remains of traditional and regionally conditioned farming methods are very attractive landscape features, showing the mixture of arable fields, meadows, orchards, pastures, gardens, hop fields, vineyards, and borders (Amici et al., 2017; Sůľovský et al., 2017). In the Czech Republic, complex landscape research is currently undertaken under the umbrella of the project Centre for Landscape and Biodiversity (Divland), where one part deals with the research of historical landscape structures (HLS). It focuses on identifying potential localities of preserved HLS of different types, ranging from agricultural landscapes with small arable fields through forest, meadow, orchard, hop-field, vineyard and pond landscapes to composed landscapes of spas, pilgrimage landscapes and mining landscapes. The first result is represented by a map of these landscapes (Šantrůčková et al., 2023). The map was based on various existing data, including historical land use (TopoLandUse), using old topographic maps (Havlíček et al., 2018a). The map of historical landscapes shows a potential localisation of above mentioned HLS. However, follow-up field research is necessary to assess objectively significance and value of historical landscape structures (Havlíček et al., 2018b).

The aim of this article is to focus on verifying identified potential vineyard HLS from the map of potential HLS (Šantrůčková et al. 2023). In particular, it assesses the individual features of the vineyard historical landscapes and evaluates their importance for the preservation of cultural and natural heritage, for sustainable agricultural management and tourism development. The research was conducted in the vineyard landscapes of the Hodonínsko and Kyjovsko regions, using archival map research as well as field investigations and discussions with local winemakers and entrepreneurs in the tourism industry.

Materials and methods

Detailed cadastral maps at a scale of 1:2,880 from around 1830, aerial photographs from around 1950 and aerial photographs from 2022 were used to target the historical vineyard landscape structure. All these maps were available in digital form and were processed in ArcMap software. By comparing these map materials, areas with a predominance and preservation of vineyards were selected, in

which more detailed field research (including survey with UAV), focusing on specific vineyard-related features (e.g. wine sheds, trees, wine cellars), and interviews with local winemakers and entrepreneurs in accommodation services were carried out. For 15 municipalities we also assessed parameters related to tourism. They were represented by number of inhabitants, area of vineyards in hectares and number of accommodation facilities listed in three different sources: portal www.mapy.cz, Booking.com and Czech Statistical Office (CSO), where accommodation capacities with more than 10 beds are registered.

For a detailed assessment we selected the municipalities in the vicinity of Hodonín and Kyjov, which are located in a predominantly hilly relief (Fig. 1).

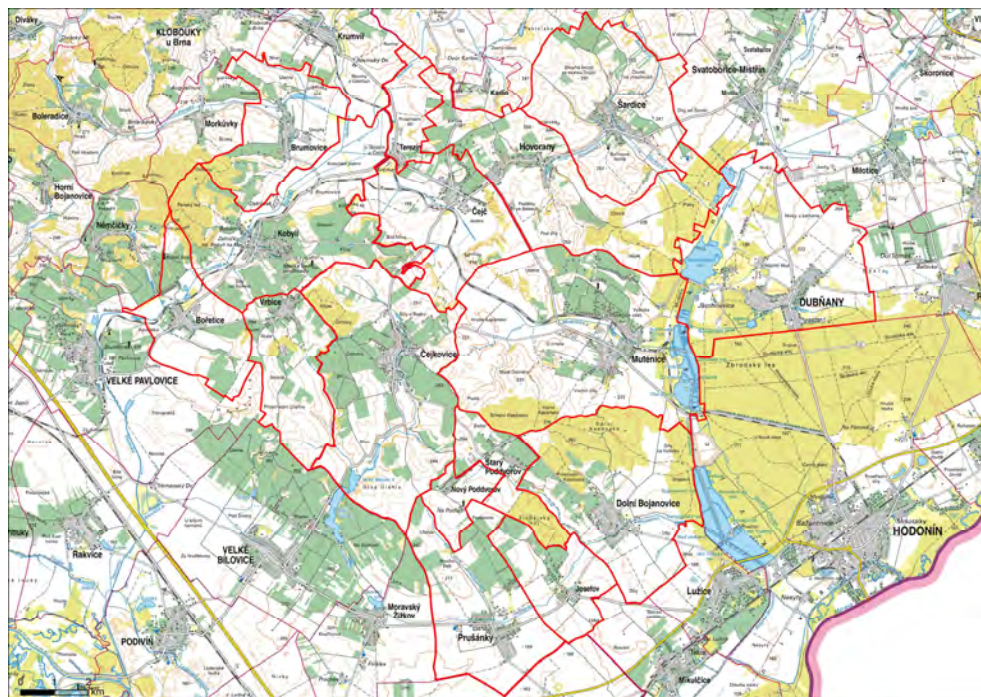


Fig. 1: Study area of historical vineyard landscapes, source: Base map of Czechia 1:100 000 (State Administration of Land Surveying and Cadastre)

Results and discussion

The highest representation of preserved vineyard structures were identified in the villages of Čejkovice, Mutěnice, Dubňany, Bořetice, Vrbice, Kobyli, Prušánky, Hovorany. Smaller areas of preserved historic vineyard structures were registered in the municipalities of Dolní Bojanovice, Čejč, Starý Poddvorov, Josefov. In the other municipalities, the historical structures of the landscape were disturbed by new plantings of vineyards in a different system and, in general, by changes in the distribution of land. During the evaluation of preserved historical wine structures, three basic types were recorded:

1. Historical vineyard structures in combination with other types of agricultural land, most often small orchards, small fields or meadows; these landscape structures are typical for the municipalities of Čejkovice, Vrbice, Kobyli, Hovorany (Fig. 2 and Fig. 3). Nowadays, some localities have lost their solitary trees, although they retain their small-scale structure (Fig. 3). From the interviews with local winemakers, we found out that they are very reluctant to replant old solitary trees. It is due to the fact that the solitary trees can create an obstacle in the management of their vineyards, since the vineyard management has turned mostly from manual to mechanisation.



Fig. 2: Historical vineyard, orchard a and arable land (Čejkovice)



Fig. 3: Historical vineyards with lack of solitary trees (Čejkovice)

2. Historical vineyard structures, which included the original wine cellars and directly adjoining plots of vineyards, or a combination of vineyards, orchards and small arable fields. Such objects can be found, for example, in the villages of Dubřany, Prušánky, Bořetice, and partly also in the village of Čejč (Fig. 4).



Fig. 4: Wine cellars and adjacent plots of vineyards and orchards (Dubňany)

3. Historical vineyard structures, which include working wooden or brick buildings/sheds intended mainly for the storage of tools, aids for work in the vineyard, for collecting rainwater for use in chemical treatment of plants, exceptionally also with a smaller cellar. These objects are most represented in the village of Mutěnice, Hovorany, Čejč, Prušánky (Fig. 5).



Fig. 5: Wooden sheds for storing tools in the vineyards (Mutěnice)

Interviews with hikers, cyclists, visitors to wineries, winemakers and owners of accommodation facilities and restaurants in the model area, revealed that the historical vineyard landscapes and preserved wine cellars are one of the most important attractions for visiting the region. The importance of the historical structures is also evidenced by the number of accommodation facilities and their types (Table 1).

While before 1990 accommodation in these villages was only available in hostels, or there were no accommodation options, today there are dozens of guesthouses, private accommodation, several ordinary hotels, luxury hotels, parking options for caravans, glamping, etc. For some municipalities, a typical way of accommodation is directly in wine cellars with the possibility of wine tasting (Mutěnice, Bořetice, Prušánky, Vrbice). Table 1 shows that the highest number of accommodation facilities is currently registered on the map application www.mapy.cz and a large number of objects for accommodation are offered on the international accommodation platform Booking.com. Large accommodation facilities (hotels, larger guesthouses, campsites) are registered by the Czech Statistical Office (CSO). The differences between these three providers can be explained by different

conditions for registering the accommodation. While at mapy.cz the accommodation provider can only provide basic information (e.g. telephone number and email), at booking.com the provider needs to provide more information. Furthermore the booking.com platform requires a fee from the provider to be registered with their platform. Finally, the CSO registers only accommodation with more than 10 beds. The research on accommodation facilities shows that the municipalities with the highest proportion of historic wine-growing regions also provide the most accommodation options (Table 1).

In addition to the very existence of historical landscape structures, their accessibility through hiking trails and bike paths also plays a role. The attractiveness of the historical landscape structures in the model area has been internationally recognized in recent years thanks to the photographic phenomenon of Moravian Tuscany. In this undulating agricultural area, photographs of small agricultural holdings with vineyards are increasingly becoming the subject of interest for both Czech and foreign photographers.

During the ongoing research activities focused also on the differences in biodiversity in the normal intensively farmed landscape and the landscape of historical vineyard structures. Especially in the combination of small vineyards with orchards and small fields, the biodiversity of plant species, insects and birds is many times higher than in large blocks of arable land.

Tab. 1: The number of accommodation facilities, the number of inhabitants and the area of vineyards

Village	Inhabitants	Vineyards (ha)	www.mapy.cz	Booking	CSO
Mutěnice	3770	302	40	17	6
Bořetice	1379	140	29	18	10
Čejkovice	2401	375	19	11	7
Vrbice	1087	115	18	5	4
Prušánky	2170	213	14	7	3
Dubrňany	6234	81	11	6	2
Hovorany	2168	177	10	7	4
Kobyly	2001	313	10	7	5
Dolní Bojanovice	3044	121	7	5	2
Šardice	2177	99	6	2	2
Čejč	1286	70	4	0	2
Nový Poddvorov	228	21	4	3	0
Starý Poddvorov	950	70	4	2	0
Brumovice	1017	80	3	2	0
Terezín	381	23	3	2	0
Josefov	453	137	2	2	0

Conclusion

Preserved historical vineyard landscapes can contain different landscape features, making them more attractive and desirable for tourism. This is clearly shown by here presented research, which shows not only examples of different vineyards but also quite large number of tourism facilities and interviews with tourists. Furthermore, the interviews with local business owners revealed that attraction of preserved historical vineyard landscapes can be one of their incomes. Therefore protection and preservation of historical vineyard landscapes is essential for the sustainable development of the territory and the preservation of cultural and natural heritage.

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Souhrn

V České republice je v současné době řešen komplexní krajinný výzkum v rámci projektu Centrum krajiny a biodiverzity (Divland), část projektu se zabývá historickými strukturami v krajině. Historická kulturní krajina je dlouhodobě vytvářena a ovlivňována lidskou činností. Lidské aktivity jsou zde převážně udržitelné aktivity bez intenzivní mechanizace, tyto aktivity vedou ke zvýšení kulturních a přírodních hodnot území. Vinohradnická krajina byla také hodnocena jako jedna z cenných historických struktur krajiny. V modelovém území v okolí měst Hodonín a Kyjov byly sledovány jednotlivé znaky této krajiny, jejich význam pro zachování kulturního a přírodního dědictví, udržitelné podnikání v zemědělství a rozvoj cestovního ruchu. Při mapovém archivním průzkumu a terénním průzkumu byly nalezeny různé typy dochovaných tradičních historických struktur krajiny s typickými rysy, které je žádoucí zachovat a zachovat pro další generace. S místními vinaři byla diskutována náročnost údržby tohoto typu krajiny. Při terénní šetření a diskuzích s místními vinaři, podnikateli v cestovním ruchu a turisty bylo zjištěno, že typické historické viniční krajiny a přilehlé historické vinné sklepy jsou jedním ze zásadních důvodů pro pravidelné návštěvy regionu. Jejich ochrana a zachování je nezbytná pro udržitelný rozvoj území a zachování kulturního a přírodního dědictví.

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THE REQUALIFICATION OF ANCIENT ROADS FOR PUBLIC RECREATION

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Abstract

The shape that Man gave to his environment is evidenced by the legacy currently existing in several rural places. In many areas of Europe, the original design inspiration for roads has been unfortunately lost throughout the ages. A key strategy for the sustainable growth of rural tourism may pass through the requalification of some ancient roads. It could include the analysis of the historic route-based itineraries created on time, such those constructed in Europe by the Romans, or later for religious pilgrimages in the Middle Ages. Some of these paths, already existing – like the “*Francigena Way*” and the “*Herculia Way*”, crossing Southern Italy – currently constitute a collection of arterial roadways, dating back to the Roman Empire. In the present paper, the potential requalification of these ways has been examined. Together with the ancillary minor road network – known as “*tratturi*” (sheep-tracks), which are partially still in use - their potential structural and functional restoration may be considered, to valorize paths that could be traveled on foot, by bicycle, or by horseback. The preservation and improvement of these important landscape elements, aimed to an enhancement of rural historic heritage and sustainable environmental management, could thus improve the consequent promotion of public recreation.

Keywords: Historical Routes, Roman Vestiges, Historic Heritage, Sustainable Tourism, Landscape Protection

Introduction

The current heritage in a rural area represents the form that the man has been able to give to his surrounding environment (Picuno P., 2022). Throughout the ages, all over the European countryside, historical roads lost their traditional design motivation (Hruza et al., 2019). Their requalification in the framework of a sustainable development of rural areas can be even an important way for the sustainable development of tourism, focused on participating in a rural lifestyle (Statuto et al., 2017). It could also pass through the valorization of route-based itineraries designed by some ancient roads, as those built in Europe by the Romans, or during the middle-age for religious pilgrimages. The present paper aims to identify the characteristic elements of the rural landscape along a portion of the “*Herculia Way*” route, in the Basilicata Region (Southern Italy). This analysis, would suggest possible environmental and functional interventions, aimed to protect the historical identity of the local landscape (Cillis et al., 2021), while experimenting new forms of public recreation in rural areas.

Material and methods

The Herculia Way is an ancient road artery connecting the north to the south of the Basilicata Region (Fig. 1).

This road was built during the Roman period, at the time of the emperors Diocletian and Maximian Herculus - from which, it takes its name - in order to connect (Fig. 2) the City of Grumento with the “*Appia Way*” in the north, as well as the “*Popilia Way*” and the Ionian Coast eastward. The stretch of the Herculia Way eastbound assumed historical significance for religious pilgrims, in consequence of the passage of Saint Mark the Evangelist and the Apostle Peter and his followers, travelling to Rome, in the Bishopric of Anglona, an apostolic foundation sited in the territory of the Tursi municipality, located along the Herculia Way in the Basilicata Region. It was subsequently used by commercial traffic crossing the region. In the Middle Ages, the main axis of road network of Basilicata Region reproduced the ancient Roman paths, linking, as far as possible, all the territory of the old region.



Fig. 1: The Herculia Way in Southern Italy, in the "Descriptio Augustea"

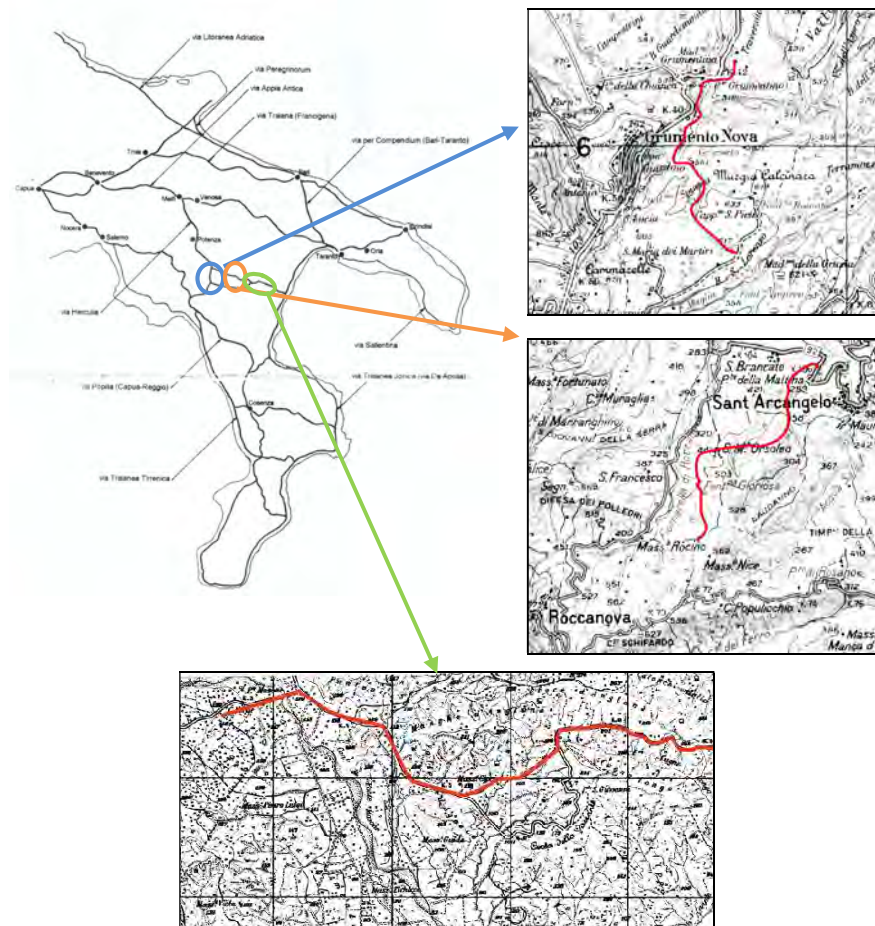


Fig. 2: Roman roads in the Middle Ages in the Basilicata Region (southern Italy) and sheep tracks identified.

In the present research, local rural architecture and sheep tracks along three paths of the Herculia Way were detected and analyzed by photographic surveys and GPS geographical coordinates. Their historical significance was assessed by consulting historical cartographic material (Statuto et al.,

2013), used to analyze rural buildings as well. This allowed for the identification of original sheep tracks, connecting the ancient buildings, near historical points of interest.

Results

The field survey that was conducted has allowed the identification of the main elements of the rural landscape, generally different in type and use, like rural buildings and sheep tracks. In particular, it emerged the presence of several distinguished rural constructions, both buildings and minor roads, characterized by a significant architectural, environmental and historical value (Fig. 3).



Fig. 3: Rural religious building in Anglona and a minor road thereby.

In some limited cases, medium and large buildings appeared as well preserved. They are often constructions - especially of a religious nature, such as churches and rural sanctuaries - testifying the great importance that these territories had in the past for religious pilgrimages.

A second type of construction, observed in a smaller number of cases, is referred to buildings of smaller size. They are related to small shelters, located in the area of internal roads, once used by local farmers, as auxiliaries for local agricultural activities carried out in the fields, or as a refuge for animals raised for family consumption (Picuno et al., 2017). In some cases, in the vicinity of these structures, fountains can be found, which were used in the past for local agricultural use or for the needs of travelers, traders and soldiers.

Concerning the three analyzed road paths, constructions of small and medium-size (Fig. 4) have been observed; currently they suffer of low maintenance, or they are completely abandoned. However, in some limited cases, medium and large buildings were well preserved.



Fig. 4: Particular of sheep track in original flooring built in local stone and constructions of small size.

Discussion

Over the centuries, agriculture has become progressively intensive (Picuno et al., 2019; Picuno et al., 2020; Sica & Picuno, 2000). This change, happened during time, has required less manual labour, causing economic pressure on some villages, and leading to an exodus of young people to urban areas, with consequent abandonment of farm buildings.

In the cases analyzed in this research, the observed structures are built with poor simple materials locally available - such as stones, clays and wood, wisely used. In a few cases, especially along the third section investigated, rural buildings for agricultural and husbandry of a larger size were observed. It was also important the presence of production facilities, used for the storage or the processing of agricultural products, such as small mills. A link between the identified structures has been observed,

through sheep-tracks, mainly private, identifiable in the natural landscape. From their positioning on the georeferenced cartographic material, a concentration of buildings along rural paths connected to roads of higher relevance was observed. In this way, it was possible to identify the traits of sheep tracks belonging to the Herculia Way. This result would confirm the role of this road in the Middle Ages, as one of the most important links within Southern Italy.

The current growing interest in rediscovering places of cultural and natural interest and the possibility of a recovery of the old rural routes, linked to local cultural traditions, is essential to raise awareness of landscape resources poorly perceived. The hypothesis of a structural restoration of the observed paths can be useful for new forms of alternative economic activities, compatible with the nature of the place, as the provision of accessible paths on foot or horseback. These activities could use the old abandoned rural structures, intended for sheltering pilgrims and their horses, on the way along ancient paths roads. Similarly, the presence of fountains along the roads could be useful. In this way, the natural equilibrium of the environment would remain unchanged, and especially the natural resources would be preserved and respected (Statuto et al., 2019). The preservation of the rural landscape and the sense of place in the long term, could then be achieved by increasing their economic competitiveness and environmental compatibility, in accordance with the mainstreaming international directives on sustainable development.

Conclusion

The analysis of rural elements along the Herculia Way revealed this road as an interesting cultural asset, strictly connected to the local history. However, the current state of abandonment could lead to the loss of this important legacy. Restoring pathways and structures could help regenerate the local rural heritage, especially in relation to the natural environment. Protecting and making these resources accessible for future generations is essential for an integrated conservation of the rural landscape. Creating new complementary activities could promote sustainable rural tourism, while deepening the knowledge about the ancient road network. New investigations are anyway needed in order to complete the path of reunification of the identified roads, deepening their knowledge, so as to stimulate a systematic study aimed to the promotion of the ancient road network all over Europe.

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Souhrn

Současné venkovské dědictví v určité oblasti představuje podobu, kterou člověk dokázal dát svému okolí. V průběhu staletí ztratily cesty v mnoha evropských venkovských oblastech svou tradiční motivaci k projektování. Jejich rekvalifikace v rámci udržitelného rozvoje venkovských oblastí může být důležitou cestou pro udržitelný rozvoj venkovského cestovního ruchu. Mohlo by to projít valorizací tras založených na trasách navržených na některých starobyklých cestách, jako byly ty, které v Evropě vybudovali Římané nebo ve středověku pro náboženské poutě. "Františkánská cesta" je kombinací dopravních tepen z římské éry; "Herkulova cesta" je součástí "Františkánské cesty", která byla vybudována v jižní Itálii. Tento článek informuje o výsledcích územní analýzy zaměřené na možnou rekvalifikaci části Herkulské cesty. Byly zjištěny a na historických mapách lokalizovány některé staré cesty, známé jako "tratturi" (ovčí stezky), a staré tradiční zemědělské budovy nacházející se podél těchto cest, které zčásti stále existují, pro případnou stavební a funkční obnovu s vytvořením trasy, po níž by bylo možné se pohybovat pěšky, na kole nebo na koni. Tato obnova by mohla přispět k ochraně a posílení zkoumaných prvků venkovské krajiny, jakož i k udržitelnému řízení životního prostředí a posílení historie venkova a obecněji k podpoře veřejné rekreace prostřednictvím vytvoření nových alternativních aktivit slučitelných se zvláštním charakterem místního prostředí.

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THE URBAN GREENERY OF THE BRNO CITY AS AN ENVIRONMENT FOR PEOPLE'S RECREATION AS WELL AS THE LIFE OF LARGE WILD MAMMALS

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Abstract

In the model area of the Brno city, research focused on monitoring the occurrence of wild medium-sized and large mammals is underway. The task of the project is to find out the species spectrum of mammals occurring in the landscape structure of the city, to estimate their density, risk situations and to provide guidance to the state administration and self-government for their management and solving situations. After the first year of the solution, it is possible to present the results from the part of the research dealing with the regular monitoring of urban greenery. Paired areas of large urban parks, forest parks, areas after mining, horticultural colonies and suburban forests were selected. These were inspected regularly, once a month, 2 hours after sunset with a thermal imaging device. The following species were recorded: domestic cat, red squirrel, marten, red fox, wild boar, roe deer, badger and raccoon dog. Free-living mammals thus adapt to life in an urban environment, get used to the presence of humans, and become part of the urban landscape. This brings with it many negative consequences that will have to be actively addressed sooner or later.

Keywords: Urban environment, human-wildlife conflicts, wild boar, roe deer, wildlife management

Introduction

In recent decades, the problem of the occurrence of animals in urban areas has come to the forefront of the research interest of many scientific teams all over the world. In particular, the consequences of this state are addressed, which can more or less threaten the safety, but also the health and life of residents, their pets, etc. (e.g. Perry et al. 2020; Franklin et al. 2021). The causes of synanthropic behaviour of animals, which can and will vary across countries, municipalities, animal species and individuals, are less investigated (McForlane et al. 2012). For some species, the urban environment will serve as a new alternative source of food, a refugee from predators or hunting, but also as an involuntary corner into which the individual got during a long-distance migration or as a result of a disturbing influence.

In the Czech environment, however, research on wild animals in cities is only at the beginning and there is a lack of basic information about the species spectrum of animals in cities, their way of life and possible threats. However, the media often draw attention to extreme situations in the form of the appearance of groups of wild boars in cities, rooted parks or golf courses by wild boars, attacks of dogs by wild boars, damage to vehicles by martens, damage to fences by badgers, the appearance of bears on the streets, etc. There is also no clear record of the species occurring, based on in which it would be possible to identify problems and solve them effectively, or looking for ways to successfully co-exist (where possible).

Using the example of the city of Brno, we decided to map selected types of environments with urban greenery, taking into account the possible occurrence of large and medium-sized wild mammals. Monitoring was carried out at night using thermal imaging devices. The aim of this research was to determine the species spectrum of mammals inhabiting the urban development of the South Moravian metropolis.

Materials and methods

The research was carried out within the model area of the city of Brno. This city is inhabited by around 700 thousand inhabitants (including students) and has an area of 230 km². It consists of several dozen city districts, which are very rich in forest and urban greenery. The city is also home to many brownfields, horticultural colonies and areas created by the extraction of mineral resources. Paired areas were selected within this territory: parks (Lužánky, Špilberk), forest parks (Willsonův les, Bílá hora), areas after mining (Černovice, Borky), horticultural colonies (Přehrada, Palackého vrch) and suburban forests (Hády, Mariánské valleys), where monitoring took place using a thermal imaging device (TETRAO Aquila H-35). Monitoring took place from June 2023 to February 2024. Areas were monitored once a month, always 2 hours after sunset, so that at least 90% of the area of each area was inspected. The geographical coordinates of each medium-sized and large mammal, zoological

species, sex and age class were recorded. As the research is still ongoing, we will limit the results presented here to the species spectrum of large mammals found in urban greenery.

Results

The study found that medium and large mammals frequently utilise urban greenery. The domestic cat was present in all surveyed areas, along with the red squirrel, red fox, and brown hare. The forest badger was also commonly found, with the exception of Lužánky Park. The red deer was not observed in Špilberk Park, and wild boar were present in all areas except parks. Repeated observations indicate that all species were present in the areas throughout the months, suggesting a long-term relationship with the environment. The number of individuals in certain environments could also be determined. For instance, in Lužánky Park, there were five brown hares and a female red deer with a fawn. Two badgers also inhabited the park around Špilberk Castle consistently. The Willson Forest Park was consistently inhabited by three badgers, and once, a wild boar wandered in exceptionally. The areas outside the city intravilanes were relatively open, resulting in greater fluctuation in the number of species present. The numbers of cats and squirrels also varied greatly across all areas. It was surprising to find an isolated record of an invasive species, the raccoon dog, at the Bílá Hora and Černovice sites.

Discussion

The results indicate that medium and large mammal species are relatively stable inhabitants of urban greenery. The occurrence of domestic cats as synanthropic species associated with human landscape structures is a common phenomenon, as is the presence of squirrels in public green spaces. The presence of brown hare, which has relatively small home ranges and can find sufficient food and cover in greenery, is also not surprising.

Nevertheless, cities can offer these animals benefits such as food, shelter, and absence of predators, which in combination with ecological plasticity and adaptability of species may be the reason why they return to or permanently settle in urban greenery. However, larger mammal species that do not seek human presence are bound to natural habitats. The red fox and the European badger are species that can benefit from alternative food sources and move around the city when public spaces are empty, particularly at night. Nocturnal activity is also typical of other large mammals, such as roe deer or wild boar, which hide during the day in dense vegetation, unused areas, or inaccessible gardens. From there, they venture out into the streets, where they cause damage with their feeding behaviour. Citizens of the city are generally unaware of these animals because they are active at night, live a generally hidden lifestyle, and their life manifestations are quite inconspicuous. Direct contact can occur in the event of a traffic accident or chance encounter during movements between shelters or food sources. There have also been cases where a wild boar has attacked a person while walking a dog, when the dog encountered the boar in its shelter, and it tried to defend itself or its piglets.

Currently, the most well-known cases of wild boar appearing in the outskirts of Brno are in areas adjacent to forests or near allotment gardens. In this environment and its immediate surroundings, wild boar enter inadequately secured land and dig up lawns and flower beds. Understandably, people are afraid of them and are putting pressure on public authorities to address this problem. According to the law no. 449/2001 Sb. concerns land where hunting is not possible, and exceptions to hunting are granted by public administration. However, hunters are significantly limited in this environment as the use of firearms is either dangerous or against the will of local citizens. Public administration also lacks the means to compel or motivate hunters to effectively regulate animals in this environment.

The risk associated with the presence of mammals in cities is primarily linked to the health risk of possible transmission of infectious diseases to humans or their domestic animals. Based on the ongoing research, we will also evaluate the health status of these animals, which will complement the knowledge of their occurrence in urban areas.

Conclusion

Wild mammals are adapting to life in Brno, getting used to the presence of humans and becoming part of the urban landscape. This brings with it a number of negative consequences that will need to be actively addressed sooner or later.

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Souhrn

V modelovém území města Brna probíhá výzkum zaměřený na sledování výskytu volně žijících středně velkých a velkých savců. Úkolem projektu je zjistit jaké druhové spektrum savců se vyskytuje v krajinné struktuře města, odhadnout jejich hustotu, rizikové situace a poskytnout státní správě a samosprávě návod pro jejich management a řešení situací. Po prvním roce řešení je možné prezentovat výsledky z části výzkumu zabývající se pravidelným monitoringem městské zeleně. Byly vybrány párové plochy velkých městských parků, lesoparků, ploch po těžbě, zahrádkářských kolonií a příměstských lesů. Tyto byly pravidelně kontrolovány jednou měsíčně dvě hodiny po západu slunce termovizním přístrojem. Byly zaznamenány následující druhy: kočka domácí, veverka obecná, zajíc polní, kuna, liška obecná, prase divoké, srnec obecný, jezevec lesní a psík mývalovitý. Volně žijící savci se tak přizpůsobují životu v městském prostředí, zvykají si na přítomnost člověka a stávají se součástí městské krajiny. To s sebou přináší řadu negativních důsledků, které bude potřeba začít dříve či později řešit.

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TOURISM USE OF POST VOLCANIC RESOURCES IN COVASNA, ROMANIA AND THE IMPACT ON THE NATURAL ENVIRONMENT

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Abstract

Tourism and natural environments are closely linked, but tourism can create landscape imbalances by exploiting natural resources in a territory. This study presents the expansion of tourism and services in Covasna County, where carbon dioxide emissions and sulfurous gas releases manifest current post-volcanic activities resulting from the Pliocene volcanic activity. Today, these sulfurous gases are used for therapeutic purposes in the form of mofette. In recent years, hotels and guesthouses have been built, and recreational facilities have been expanded. Large forested areas have been cleared for construction, leading to significant natural landscape changes. The Covasna resort is known for its rich and varied mineral waters, which include radioactive mofette. It is an essential destination in Romania, particularly for those seeking treatment for cardiovascular diseases. However, for sustainability reasons, it is essential to maintain a balance between tourism and the natural environment.

Keywords: cardiovascular diseases, mofette, services, landscaping, deforestation

Introduction

Between tourism and the natural environment, there has always been a direct and complex relationship emphasizing both short and long-term effects and determining particular territorial synergies in the light of present societal and land use changes (Dincă, A.-I., 2013). Natural resources have represented the main form of tourist attraction. Tourism, in turn, promotes the understanding of natural elements through theoretical description and practical use of the values that nature provides, even giving them a cultural connotation by including them in the local tradition (Teodorescu et al., 2013), or simply through occasional visual appreciation, through hiking or recreational activities, such as in the case of forest resources (Oprea et al., 2020). However, human activity can create imbalances, sometimes irreversible, through deforestation (Zeľňáková et al., 2017) or any other type of excessive exploitation (Teodorescu et al., 2022). These were very much accelerated in Romania in the post-communist period, especially after property restitution laws, which also referred to forested areas and jeopardized even forested protected areas in the Romanian Carpathians.

Material and methods

For the present study, an analysis of land use changes over different years was conducted, from 1990 until 2023, with 2018 as an intermediate year. The study focused on constructions built for tourism purposes between these years. The information was highlighted through specific cartographic representations. Covasna resort, displaying complex tourism activities, relies on natural resources from the adjacent geographical area. The area analyzed in our study was expanded to comprise the area of hiking activities for tourists in this resort. It can thus be said that not only the town of Covasna itself was analyzed but also the forested area in its vicinity. The attraction of this resort is given by the post-volcanic therapeutic resources, as well as the resources offered by the environmental setting for recreational purposes. On the other hand, the natural resources in this extended analyzed area also represent an economic resource for the Covasna resort. The evolution and gradual changes can be observed through cartographic representations.

Another method employed in this research was the interview survey with tourists in the resort regarding the overall aspect it offers. A total of 62 tourists were interviewed, of which 11 mentioned that they have been visiting Covasna since 1990 every year. This second category was a valuable sample group for our study that was able to notice the changes that occurred throughout this period and provide valuable information. Tourists' perception is an important factor in evaluating the overall state displayed by a resort, in its complexity.

Results

Covasna resort is one of the most attractive resorts in Romania, with carbon dioxide emissions and mineral waters as its primary natural resource. It is also known as the resort of 1000 springs. Besides these hydrogeologic and groundwater resources, there are essential post-volcanic manifestations. These could be considered elements of the continuity of the volcanic phenomena that occurred in the Pliocene and gave birth to the volcanic chain in the area (Harhita-Calimani). The present manifestations are noticeable by the rich carbon dioxide emissions and sulfurous gas and arsenic outgassing. Carbon dioxide that comes into contact with water in the aquifers dissolves and turns into carbonic acid. In addition to the richness of mineral waters and therapeutic emanations, the natural landscape was considered a third therapeutic factor. The Covasna resort is considered to display the most important growth potential among the health resorts in Romania. The consistency of the land use supports these statements, the forest vegetation occupying quite a large area (fig. 1).

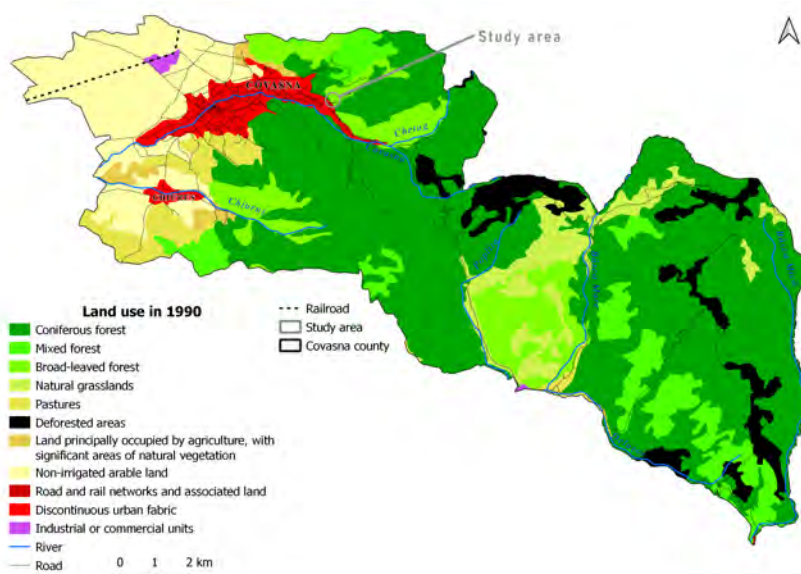


Fig. 1: Land use in the neighborhood of Covasna resort in 1990

After 1990, the economic and social situation in Romania changed once with the political changes and the transition from the centralized communist economy to the market economy. Significant changes occurred, including for the tourism domain, but also for the less organized forest exploitation. The need for investments and the construction of 4-star hotels has become a necessity, given the growing attractiveness of the area. However, this is reflected negatively in the surrounding forest area through deforestation, but also through the less pleasant image of logging roads (fig. 5), as also signaled for other regions in Romania (Dincă, A.-I., 2013). It should be mentioned that tourism has not been the most important factor leading to logging in this geographical area, but could also be counted among these factors. In 2018, more logging areas can be distinguished, especially towards the southwest, but also in the northeast of the settlement where, in addition, the resort hotels were built (fig. 2). Between 2018 and 2023, logging continues, but there are also small areas of re-logging. In the southern part of the settlement (fig. 3), small logging areas could be noticed, giving the impression that there is a possibility of further expansion of accommodation structures. By 1990, in the eastern part of the resort and relatively isolated from the rest of the settlement, there were only two buildings, namely the Cardiology Hospital and the hunting house of President Nicolae Ceausescu (today) in conservation. This one is now positioned at a reduced distance from the two 4**** hotels, Hotel Clermont and Hotel TTS (fig. 4). Another local attraction is the "mocănița" or the narrow gauge railway line (fig. 6). This is not yet operational. Still, works are being in progress copying other similar good practice examples already existing and with tradition in Romania (Dincă, A.-I., 2013). It can also be used to extend the visitor area. Other smaller tourist buildings have also appeared. However, the four-star hotels that were built have, in addition to the necessary interior facilities, also exterior facilities, which may affect the forested area nearby. Large car parking spaces and extended recreational areas for adults and children are examples of this. Covasna resort needs 3-star and 4-star accommodation, and this has been achieved by modernizing already existing units in the central area. This is beneficial for recreation and tourism, but the need for tourist expansion may affect the environment.

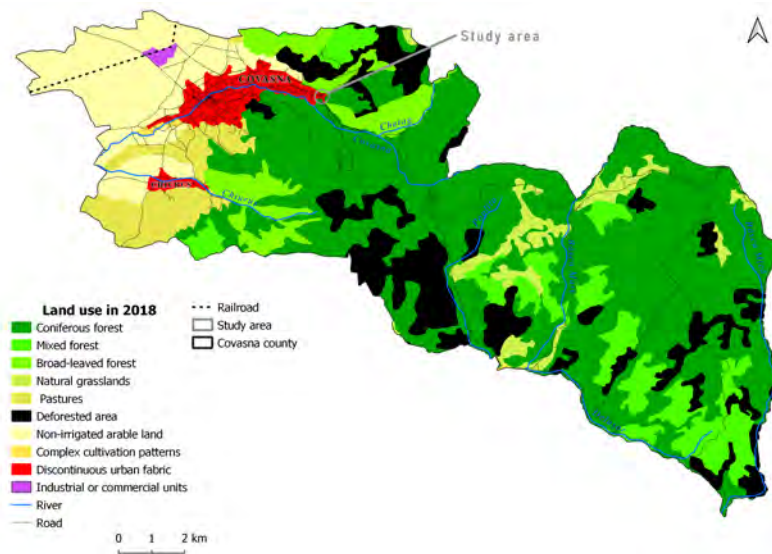


Fig. 2: Land use in the neighborhood of Covasna resort in 2018

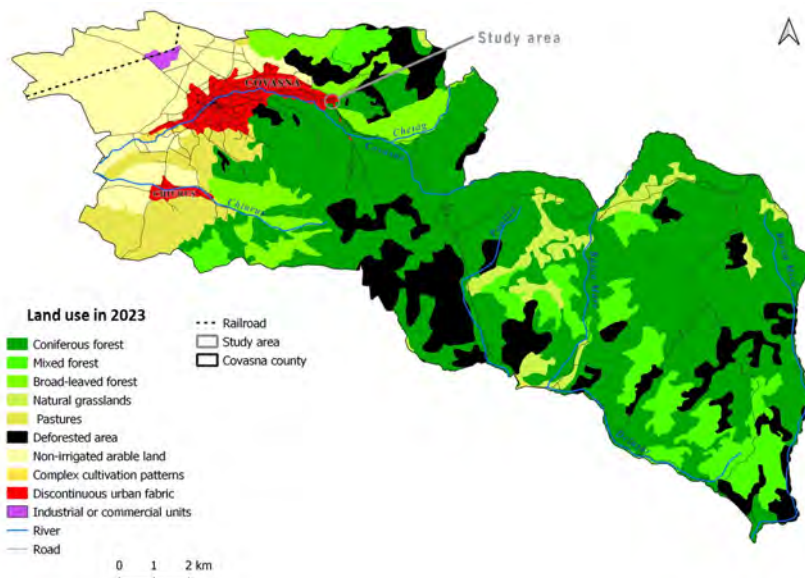


Fig. 3: Land use in the neighborhood of Covasna resort in 2023.

Referring to tourists' perception of the resort's appearance and its landscape, the 11 interviewees who had visited the resort before 1990 remarked on changes in the appearance of the forest, access roads, and the modernization of accommodation facilities. Many of these responses are somewhat nostalgic coming from silver tourists mainly associated to health tourism in Romania and clearly emphasize important deforestation and its essential impact on the landscape.

„It is beautiful, but the naturalness is slowly disappearing. It used to be a resort with a particular, intimate atmosphere. Now, it looks like a resort without personality. Only the "Devil's Pool" with its mud reminds of the old times. The forest is there, but it's young, replacing the cut trees. It's still good!" (Ion Ispas, 76 years, Bucharest).

"We come with pleasure every year in Covasna resort. But we see the changes, and we are disappointed to see how much the forest is cut down..." (Vasile Popa, 71 years, Cluj Napoca);

"I have been coming here since 1984. The forest is gone! Today they are just shoots!" (Ana Mihaie, 89 years, Satu Mare)

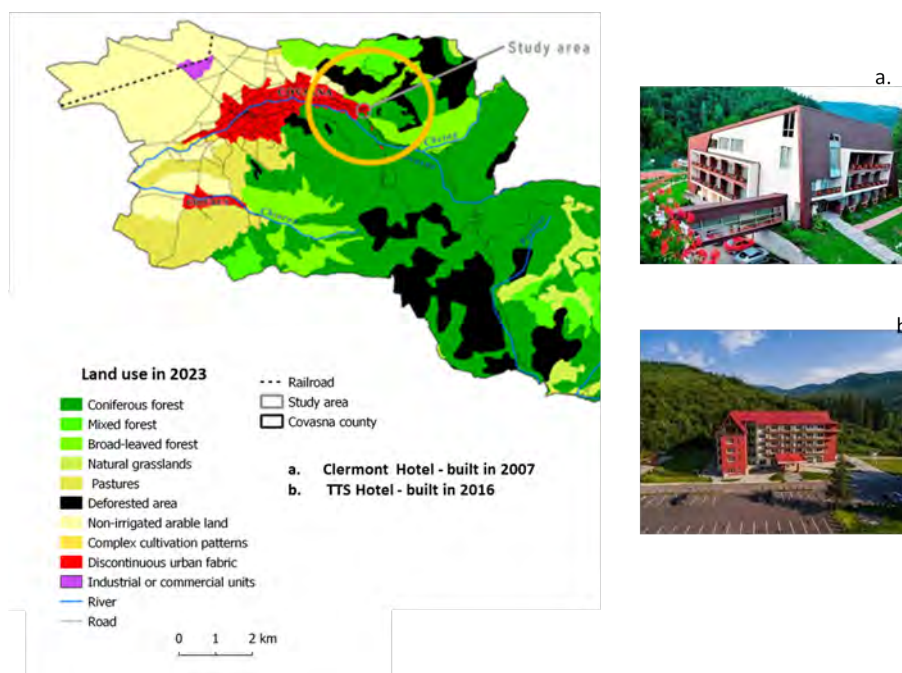


Fig. 4: Extension of the built-up area with hotels in the forest area.



Fig. 5: Deforested forest area



Fig. 6: The hotel structure that appeared after deforestation



Fig. 7: The access road for transporting wood

Discussion

In Romania important post-volcanic springs and resources are grouped around Covasna resort. The mineral waters are linked to the watershed, existing in the river deposits or the alluvial deposits of its tributaries. In the geographical area of Covasna, carbonated, bicarbonated, sodic, calcareous, magnesium and arsenical springs predominate. Their degree of mineralization depends on the proximity or distance from the aquifer, the transverse fracture, and the radiation systems that affect the underlying phyllium deposits (Pisota et al., 1975). The mofette are used for therapeutic purposes for cardiovascular diseases. For this purpose, several accommodation structures including a hospital for cardiovascular diseases have been built here in Covasna. Each hotel structure has a treatment center based on local resources. During the communist period until 1990, tourist activities were concentrated in Covasna resort in the existing structures located in the central area. They were oriented towards exploiting the existing natural resources, especially of mofetta type and mineral waters. The forests occupied a relatively large and uniform area and were represented by coniferous and mixed forests (fig. 1). Until 1990, there were no 4-star hotels. The Hospital for Cardiovascular Diseases occupies an eastern marginal position in the vicinity of the forest area, and the paths that could be used for recreational purposes used to be narrow and unpaved. Hiking was the only recreational activity that could take place outside the hotels.

Conclusion

Many of the sites where deforestation has taken place are now occupied by shoots and young forests. There are measures in place to prevent "clear-cut" logging and to control logging, but there is also an obvious tendency for hotel and guesthouse construction to expand into the area once occupied by forest. The forest area might not be heavily affected if the logging rules established by the local administration are respected. Along the *mocanita* routes or tourist roads, rest areas (shelters with a minimum of infrastructure needed by tourists) made of natural materials could represent the mix between tourism and the natural environment without destroying the latter.

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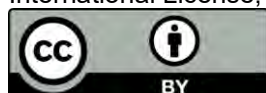
Souhrn

Zdroje minerálních vod, emanace plynů ze sopečné činnosti a lesní prostředí umožnily vznik a udržení turistických aktivit v letovisku Covasna. Předpokládáme, že některá z těchto složek bude nadhodnocením zničena. V takovém případě vede nerovnováha k likvidaci celého systému a právě tento detail je třeba vzít v úvahu.

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TREES AS A PART OF SMALL SACRAL ARCHITECTURE IN THE LIPTOV REGION

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Abstract

Elements of small sacral architecture such as the wayside shrines, chapels, belfries, sculpture of saints, but also crosses represent significant features in the cultural landscape of Slovakia. The article provides an overview of the origin, historical development, typology and meaning of small sacral architecture elements, with a particular focus on their functional and symbolic links with woody plants, especially with the trees that accompany them. Trees are an accompanying element of sacral monuments and, as in the past, as well as today, they contribute to the appearance of these cultural monuments in an urbanized areas or in the landscape. At the municipal or regional level, they create a whole set of small cultural and natural monuments, which as a system has a high value and importance for local communities and potential for local tourism and recreation, as well as for nature and landscape protection. The paper presents new and original results and knowledge obtained from field research of small sacral architecture and the trees that are part of it in the Liptov region, located in the northern part of Slovakia. Trees mapping near small sacral architecture facilities in Liptov took place in 2019-2021 on the territory of 37 Liptov municipalities.

Keywords: landscape architecture, greenery, historical heritage, symbolism

Introduction

Small sacral objects, such as roadside crosses, shrines, chapels, statues of saints, crucifixes, belfries or other typological forms of small sacral objects and other types are integral components of our cultural landscapes and their traditional character and features all over Europe including most Slovak regions (Biľušová and Michalica, 2019; Kristiánová et al., 2020; Tóth et al., 2019; Tóth et al., 2021). They are jewels of Christian cultural landscapes with a significant social value and a legacy of our ancestors' religiosity (Matáková, 2012). Small sacral objects are present at roads and crossroads, on elevated places in the landscape, at the borders between municipalities and their cadastral territories, they dominate squares and street areas, complete the surroundings of churches and chapels, stand out in cemeteries and places of reverence (Kristiánová et al., 2020; Nádaská, 2013).

The surroundings of the oldest sacral buildings in our country (Romanesque and Gothic buildings) had only a flat vegetation structure - a plant cover. The Renaissance brought the planting of one tree to the sacral building. In the later period, two trees were planted to frame the main entrance. Baroque brought to churches the framing of all entrances, the planting of solitary trees, groups of trees, but also avenue plantings lining the access roads. Classicism added trees around the entire perimeter of the sacral building, but at reasonable distances with sufficient living space for each tree (Fusková and Fúška, 2019; Feriancová and Tóth, 2014).

However, they were always deciduous and mainly of domestic origin, from foreign ones that resembled domestic ones. The period at the turn of the 19th and 20th centuries brought a sentimental return to nature and the thickening of stands, while conifers also appeared sporadically in plantings.

Small sacral objects were usually lined with a pair of trees or surrounded by a group of several trees resembling a small grove. Thus, they represented not only significant dominants of the cultural landscape, but also had great religious significance in popular belief. Mainly lime trees were planted near the small sacral objects. It was often a group of 4-6 trees, mostly lindens, more rarely beeches and oaks, which framed the monument, creating a kind of formation of a single pair of monuments: architecture and tree/trees (Tóth, 2015).

Small religious objects were built in landscapes as symbols of Christian culture, especially in Catholic regions (Halajová, 2019; Kyselka, 2014). The Catholic Church had the sole influence on the creation of small sacred buildings in Liptov, except for some bell towers, which were built at the initiative of the Evangelical Church. Under the auspices of the Roman Catholic Church, buildings were built by individuals, associations, municipalities, and local parishes. The quantity and rendering of objects depended on their wealth (Uličný, 2014).

In the 20th century, the Liptov region underwent the most significant change because of political-administrative organization, economic development, and social changes. This is primarily the loss of agricultural land due to the development of industry. 3 cities became the centers of Liptov: Liptovský

Mikuláš, Ružomberok, Liptovský Hrádok. Significant urbanization is taking place. The construction of water management works (Liptovská Mara, Bešeňová, Čierny Váh), which occupied an area of approximately 30 km², had a great influence on the transformation of the landscape. The large-scale construction of transport infrastructure, as well as the enlargement of municipalities, which was related to the growing number of inhabitants, also had an impact (Slivka, 1969; Uličný, 2014).

Sports and recreational activity, construction of ski resorts, and cottage areas had a significant impact on the character of the landscape. There was a transformation of the structure of the country, which was caused by a change in ownership and user rights of agricultural land. It was these interventions in the landscape that caused the disappearance of some compositional relationships, the views and views from the small sacral objects that stood in exposed places were degraded. Now, one of the most significant processes involved in the transformation of the landscape is, on the other hand, suburbanization, which, under the influence of the spatial expansion of the city, brings about the transformation of Liptov's rural landscape (Bartl, 1985; Slivka, 1969; Uličný, 2014).

Material and methods

The small sacral architecture mapping took place in the region of Liptov, in the north of Slovakia. It occupies the territory bordered on the east by the villages of Štrba and Liptovská Teplička and on the west by the village of Stankovany. Currently, the Liptov region corresponds to the Ružomberok and Liptovský Mikuláš districts. From a geomorphological point of view, the Liptovská Kotlina is bordered from the north by the Western Tatras, the Chočské vrchy, from the southwest by Veľká Fatra, and from the south by the Low Tatras.

In the Liptov region, 98 small sacral objects were mapped. The objects were mapped in the Liptovský Mikuláš and Ružomberok districts during the years 2019-2021.

The following data were evaluated:

- Serial number
- Cultural region
- Cadastral area
- Municipality, street/road
- GPS
- Spatial context – rural zone/ town residential area
- Type of a monument: cross, wayside shrine, chapel, statue, bell tower
- Accompanying greenery: specification: deciduous trees, coniferous trees, number of accompanying trees, composition, taxon, trunk, circumference (cm), age defined by Šimek (2001), crown width (m), height of tree (m), landscape-architectural value (Machovec, 1987), health condition and degree of damage (Juhásová, 1999), notes (the accompanying greenery was inventoried according to the methodology of Machovec (1982), Juhásova (1990) and Pejchal (1997) published in Supuka, Feriancová et al. (2008))
- Object's dimensional parameters, the material the small sacral object was made of was specified
- The year of origin
- Current state of the monument: range of damage was determined by the visual analysis in the following scale: (0. well maintained / reconstruction, damage 0%; 1. damage 1–10%; 2. damage 11–25%; 3. damage 26–60%; 4. damage 60–69%; 5. objects significantly damaged 70–100%).
- Photo documentation, general view of the object, surrounding woody plants and spatial context with interesting views and perspectives

Results

Trees and greenery are often an integral part of small sacral architecture. The existence of small sacred buildings is often pointed out from a distance by tall trees that are naturally connected to small sacred buildings. Part of the assessment of the small sacral objects was a detailed inventory of the vegetation around the buildings. Trees were evaluated at 29 small sacral objects, where the vegetation was directly related to the small sacral object and a direct relationship was observed between greenery and an element of small sacral architecture. Fifty-five trees of eight species were identified by the inventory (Tab. 1, Tab. 2). Roadside crosses are the most common small sacral objects in the observed area of Liptov region which included trees. Trees were found near 15 crosses, 12 chapels and 2 bell towers.



Fig. 1: A chapel with *Tilia cordata* in cadastral area Kvačany (Photo by Marek Hus, 2020).

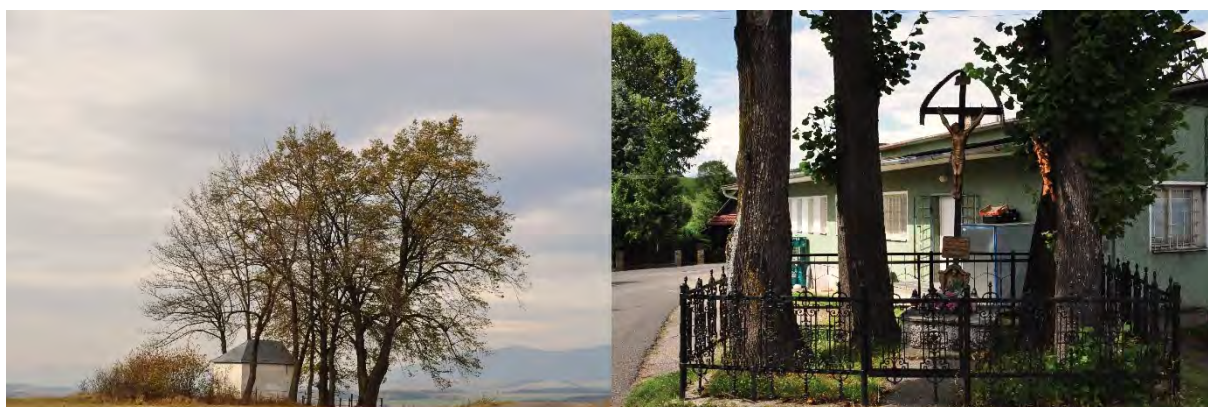


Fig. 2: A group of trees near the small sacral objects in Liptovský Hrádok (rural area) and in Liptovské Kľačany (town residential area) (Photo by Marek Hus, 2020).

Tab. 1: List of tree species found near elements of small sacral architecture and their location within the cadastral territory.

taxón	number of trees	town residential area	rural area
<i>Acer pseudoplatanus</i> L.	1	1	
<i>Betula pendula</i> Roth	2	2	
<i>Fraxinus excelsior</i> L.	5		5
<i>Picea pungens</i> Engelm.	2	2	
<i>Populus nigra</i> L.	2		2
<i>Thuja occidentalis</i> L.	6	6	
<i>Tilia cordata</i> Mill.	37	23	14

At 69 objects of small sacral architecture, the trees were not identified, which would be directly related to small sacral architecture. No trees were planted near the objects, but bushes or herbaceous vegetation were identified for some. The reason for the absence of vegetation management could be that trees were never planted near them, or small sacral architecture did not require adjustment (Matáková, 2011). In another case, the object was part of the existing growth and further modification would be unjustified, or the trees were cut down due to their unsatisfactory condition.

56 objects without vegetation management were identified in town residential area. However, even at these objects, the lawn was modified, or regularly removed overgrown trees. It is interesting to note that there is no vegetation near the bell towers. Trees did not fulfil a symbolic function with bell towers,

as they were often purpose-built structures whose main task was to announce events. 13 small sacral objects are already situated in existing vegetation, the object has become part of vegetation management (alleys, accompanying road vegetation, trees in municipal parks). Of these, 4 objects were in the forest.

Deciduous tree species predominate in the case of small sacral objects - 47 trees, 8 conifers were inventoried (Fig. 4). The most frequently occurring taxon is *Tilia cordata* (38%) (Fig. 1). In the range of species used, mainly autochthonous tree species are used (85%).



Fig. 3: Solitary trees (*Tilia cordata*) in the vicinity of the chapels in Ľubel'a and Liptovská Štiavnica (Photo by Marek Hus, 2020).

As part of the tree inventory, the landscape-architectural value of the trees was determined. It equally considers the overall health and vitality of the trees, its spatial-compositional value. Of the 55 inventoried trees, 23 individuals have a value of 4 (42%), a value of 3 - 25 trees (45%), a value of 2 - 7 trees (13%). The analysis shows that 47 trees growing near Small sacral objects are very valuable or of average value, healthy, only slightly damaged, free of diseases and pests. As part of the inventory, the age stage of the trees was also determined (Paganová, 2019). From the point of view of the representation of the individual age stages in the assessed trees, the age stage is dominated by mature trees - 42 trees, young trees - 12 trees and senescent trees - 1 piece.

The health status of the trees was evaluated according to the methodology of Juhásová (1990). 2 trees were identified without damage. 11 trees were evaluated in category 1 (damage in the range of 1-10%). 31 trees were classified in category 2 (damage in the range of 11-25%). 9 trees were identified with moderate damage - category 3 (damage in the range of 26-60%), 2 trees were with severe damage (damage in the range of 61-69%) - category 4.

Species with symbolic value (linden, ash, birch, maple, poplar) were found in some of the mapped elements of the small sacral architecture (Sobotka, 1879). The most frequently occurring linden (*Tilia cordata*) was planted at 22 objects. Important factors that were observed during mapping were the number and compositional location of trees in the vicinity of the small sacral architecture. At 4 objects, trees were in groups (3 or more trees) (Fig. 2). At the chapel in Dovalovo (Liptovský Hrádok), three trees *Tilia cordata*, five trees *Fraxinus excelsior*, which frame the chapel on two sides, were inventoried. Woods form the forecourt of the chapel. At the cross in Liptovský Kľačany, we recorded four trees *Tilia cordata* Mill., which are in the corners of the metal fence. Near the bell tower in Liptovský Kľačany, there are 3 *Tilia cordata* trees, which together with the bell tower and the church of St. Elizabeth's compositional and cultural-historical connection. Group of two trees of *Populus nigra* and 1 individual of *Tilia cordata* is in the vicinity of the cross in Liptovské Matiašovce at the border of three cadastres, the place is called the triple boundary. Each tree is in a different cadastre - Liptovské Matiašovce, Liptovská Sielnica, Beňušovce. There are a pair of trees near 12 objects, mostly crosses. In this case, trees line the object from both sides, or are placed behind it. There is one tree at 13 objects (Fig. 3).

no.	municipality	district	localization	object type	material	current state of the monument	<i>Tilia cordata</i>	<i>Thuja occidentalis</i>	<i>Fraxinus excelsior</i>	<i>Betula pendula</i>	<i>Picea pungens</i>	<i>Populus nigra</i>	<i>Acer pseudoplatan us</i>
1	Bešeňová	RK	town residential area	cross	wood	1		1					
2	Dúbrava	LM	town residential area	chapel	brick	1	2						
3	Kvačany	LM	rural area	cross	wood	1	2						
4	Kvačany	LM	rural area	chapel	brick	1	1						
5	Liptovské Kľačany	LM	town residential area	bell tower	brick	1	3						
6	Liptovské Kľačany	LM	rural area	chapel	brick	1	2						
7	Liptovské Kľačany	LM	town residential area	cross	wood	1			2				
8	Liptovské Kľačany	LM	town residential area	cross	metal	2	4						
9	Liptovské Matiašovce	LM	town residential area	chapel	brick	2	1						
10	Liptovské Matiašovce	LM	rural area	cross	wood	0	1					2	
11	Liptovské Sliache	RK	town residential area	chapel	brick	1	1						
12	Liptovské Sliache	RK	town residential area	cross	wood	1	2						
13	Liptovské Sliache	RK	town residential area	cross	wood	0				2			
14	Liptovské Sliache	RK	town residential area	cross	concrete	2	2						
15	Liptovský Hrádok	LM	rural area	chapel	brick	3	3		5				
16	Liptovský Hrádok	LM	town residential area	chapel	brick	1							1
17	Liptovský Hrádok	LM	town residential area	cross	wood	1	1						
18	Liptovský Hrádok	LM	town residential area	chapel	brick	2		1					
19	Liptovský Ján	LM	town residential area	cross	wood	1	1						
20	Liptovský Trnovec	LM	town residential area	chapel	brick	3	1						
21	Lisková	RK	town residential area	chapel	brick	1	2						

22	l'ubeľa	LM	rural area	chapel	brick	1	1	
23	Lučky	RK	town residential area	cross	wood	0	2	
24	Lučky	RK	town residential area	chapel	stone	3		2
25	Partizánska Ľupča	LM	town residential area	cross	wood	1	2	
26	Podtureň	LM	town residential area	bell tower	brick	0	1	
27	Štiavnička	RK	town residential area	cross	wood	0	1	
28	Turk	RK	town residential area	cross	wood	0	1	
29	Východná	LM	rural area	cross	wood	3	2	

Tab. 2: Inventory of small sacral architecture and trees



Fig. 4: Roadside crosses with deciduous and coniferous trees in Východná, Turík and Štiavnička, Liptovský Mikuláš and Ružomberok district (Photo by Marek Hus, 2020).

Conclusion

Trees are a natural part of some small sacral architecture objects in the municipality or in the country. The research was focused on the evaluation of these trees near the objects. A total of 7 types of trees were represented. The most represented species is the small-leaved linden (*Tilia cordata*), especially in the adult and senescence trees. Other autochthonous tree species were rarely represented (*Betula pendula*, *Acer pseudoplatanus*). In some cases, unsuitable species were planted (*Thuja occidentalis*, *Picea pungens*). It is necessary to consider the planting of non-native species, they negatively affect the traditional cultural landscape, its visual character, and aesthetic values. When planting trees in rural areas, especially open landscapes, native tree species should always be preferred.

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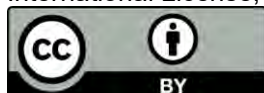
Souhrn

Prvky drobné sakrální architektury, jako jsou boží muka, kapličky, zvonice, sochy světců, ale i kříže, představují významné prvky kulturní krajiny Slovenska. Článek podává přehled o vzniku, historickém vývoji, typologii a významu prvků drobné sakrální architektury se zvláštním zřetelem na jejich funkční a symbolické vazby na dřeviny, zejména na stromy, které je doprovázejí. Stromy jsou doprovodným prvkem sakrálních památek a stejně jako v minulosti, tak i dnes se podílejí na vzhledu těchto kulturních památek v urbanizovaném území nebo v krajině. Na obecní či regionální úrovni vytvářejí celý soubor drobných kulturních a přírodních památek, který má jako systém vysokou hodnotu a význam pro místní společenství a potenciál pro místní cestovní ruch a rekreaci i pro ochranu přírody a krajiny. Příspěvek prezentuje nové a originální výsledky a poznatky získané terénním výzkumem drobné sakrální architektury a dřevin, které jsou její součástí, v regionu Liptov, který se nachází v severní části Slovenska. Mapování stromů v blízkosti objektů drobné sakrální architektury na Liptově probíhalo v letech 2019-2021 na území 37 liptovských obcí.

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URBAN PARK AS A LANDSCAPE ARCHITECT'S LABORATORY; THE IMPORTANCE OF OPEN EDUCATION AND POPULARIZATION IN THE CONTEXT OF CURRENT ENVIRONMENTAL SOCIAL DEMANDS

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Abstract

For the past five years, the Warsaw University of Life Sciences—SGGW has been hosting popular science tours, offering a unique opportunity to explore Warsaw's parks through the eyes of landscape architects who are both scientists and practitioners. These tours are not just educational outings; they are immersive experiences that allow participants to see the parks in a new light. Each walk is led by a team of tour guides, the landscape architect, and the dendrologist, who deeply understand parks' design principles and maintenance issues. The dynamic interactions between guides and participants foster community and active engagement in preserving and appreciating the city's park spaces. During each walk, the unique features of the selected park's composition are highlighted, and noteworthy tree and shrub species are identified, emphasizing their unique characteristics and historical significance. Tours are thoughtfully scheduled on non-working days (Sundays) to ensure better public access and a non-profit open walk format is used. The 2024 walks, planned for May, June, and July, introduce two new routes connecting exciting locations, such as the Gardens of the Royal Castle, Vistula Boulevards, and the University of Warsaw Library, enhancing the program's dynamism. The experience gathered from past years allows us to continually improve the idea, making it more accessible and enjoyable for all (e.g. video-relations). This publication is intended to present the implementation and the social meaning of landscape walks in urban parks and gardens.

Keywords: dendroflora, landscape architecture, open social education, spatial composition, urban parks and gardens, trees

Introduction

Landscape is not just a physical space but a concept observed and experienced with many senses. It plays a crucial role in the quality of social life, shaping our experiences and interactions. The European Landscape Convention recognizes this, treating landscape as an essential element of people's lives everywhere: in cities and villages, in degraded and common areas, as well as in areas of exceptional beauty - therefore, it covers the entire territory of Europe [Europe Landscape Convention. On-line]⁹. In October 2023, at the initiative of Poland, International Landscape Day was celebrated for the seventh time. This holiday reflects on the condition of the places we live. It raises awareness of the need to appreciate and protect the space around us [International Landscape Day of the Council of Europe. On-line]¹⁰.

Landscape is the subject of research in the scientific discipline of landscape architecture. It is a vast, interdisciplinary field combining natural sciences, agriculture, humanities, technology and art. Historically, contemporary landscape architecture was born at the turn of the 19th and 20th centuries with the development of modern theories in urban planning (e.g. Howard, 1902; Le Corbusier, 1923;

⁹The Europe Landscape Convention was drawn up in Florence on October 20, 2000. The Europe Landscape Convention was drawn up in Florence on October 20, 2000. It is part of the Council of Europe's activities to protect natural and cultural heritage, as well as spatial planning and environmental management. The Convention was ratified by Poland on September 27, 2004, and entered into force on January 1, 2005. The primary objective of the Convention is to promote protection, management, and landscape planning, as well as to organize European cooperation in this area based on the exchange of experiences and specialists and the creation of good landscape practices.

¹⁰The Council of Europe established the **International Landscape Day of the Council of Europe** on the initiative of Poland, specifically the Polish General Directorate for Environmental Protection (GDOŚ). It is celebrated on October 20 to commemorate the signing of the European Landscape Convention. Landscape Day aims to build public awareness of exemplary landscape practices and inspire various entities to take action to ensure the highest quality of landscapes - urban, agricultural or natural.

Tolwiński, 1937, 1939, 1963; Lynch, 1960; Schultz, 1971) in many countries around the world - especially in the USA and Europe. The pioneer of this versatile field and the author of its very name (landscape architecture) was Frederick Law Olmsted, an outstanding park designer in the USA in the second half of the 19th century (e.g. Central Park, New York, USA).

The emergence of Polish landscape architecture in the interwar period of the 20th century is related explicitly to the rebirth of the Polish State after a long period of 123 years of partition (Poland regained independence in November 1918) and the great need to have specialists professionally dealing with the native landscape - urbanized and open - often neglected and even devastated by the predatory economy of the invaders. Polish landscape architecture, initially called park science, grew out of the centuries-old tradition of planning gardens and parks cultivated in Poland - places intended for relaxation and contemplation of natural beauty. WULS-SGGW in Warsaw has become a precursor of teaching at the higher level and educating students of this profession. It should be mentioned that the Landscape Architecture course at the Warsaw University of Life Sciences (currently at the Institute of Environmental Engineering of the Warsaw University of Life Sciences) is the oldest centre for educating landscape architects at the higher level in Poland and the third in Europe - it has been operating continuously for over 90 years! [Łukaszkiwicz et al. 2019a, 2019b].

The Warsaw School of Landscape Architecture profile was shaped by several generations of outstanding artists who contributed to the development of landscape architecture in our country. These undisputed personalities left behind several excellent projects (parks, gardens, etc.) representing the highest standards. These facilities still function today, effectively enriching the landscape and urban natural systems. In turn, their numerous theoretical studies constitute the foundation for further investigations within the discipline of landscape architecture [Łukaszkiwicz et al. 2019a, 2019b].

Parks and gardens are an essential part of city landscapes- their natural values significantly impact the quality of the urban environment [Fortuna-Antoszkiewicz 2019, Łukaszkiwicz 2019]. Without a doubt, the order, beauty and harmony of park spaces positively impact the development of social attitudes [Madden 2021, Murray 2021]. Bearing the above in mind, landscape architects - scientists and practitioners from the Department of Landscape Architecture at the Warsaw University of Life Sciences - for five years (2019) have been popularizing knowledge about Warsaw's parks and gardens through tours - open walks for all interested. So far, they have been carried out as part of, for example, the Warsaw Science Festival, the European Landscape Day or a thematic series organized by the Polish Dendrological Society. The aim of outdoor meetings in selected locations in Warsaw is to popularize science - dissemination of knowledge, promotion of social attitudes, raising sensitivity, etc. in shaping parks and city gardens as "laboratories of landscape architects". In 2024, a series of walks disseminating knowledge about shaping the space of parks and urban gardens will be implemented as part of a project financed by the Polish Ministry of Education and Science entitled "Popularization of Science".

Goals and Methods

The project conducted in 2024 entitled "Shaping parks and urban greenery in the historical context and current social needs" (no. POPUL/SP/0272/2023/01) is a continuation and synthesis of the previous activities of landscape architects from WULS-SGGW, included under the working title "Urban park as a landscape architect's laboratory. The project received the patronage of the Polish Dendrological Society (PTD) and the Association of Polish Architects (SARP). The main idea of the project is the social popularization of the art of parks and gardens carried out in the form of a series of walks in May, June and July 2024 in selected facilities in Warsaw and Mazovia and their presentation through the prism of the achievements of the so-called Warsaw School of Landscape Architecture SGGW.

Walks conducted at convenient times (e.g. Sundays) will allow guides to interact directly with the participants. Each time, thematic threads regarding garden art, dendrology and contemporary environmental challenges will be discussed. The meetings will be conducted so that their topics are tailored to the needs and perceptions of the participants. The goals we want to achieve through the walks with lectures formula are:

1. education, promotion of knowledge about the history of buildings and the city, landscape composition and good-quality space;
2. developing sensitivity to the beauty of nature;
3. popularizing what a park is in urban space, indicating good patterns and how to shape greenery in the city; what urban greenery looks like when it is properly composed, carefully

selected, properly arranged, adequately cared for and protected against the impact of unfavourable urban conditions;

4. promoting the achievements of graduates and employees (designers and scientists) related to the Landscape Architecture of SGGW, with emphasis on their achievements (shaping and protecting urban greenery, designing parks, revalorization of historic buildings, etc.);
5. influencing the natural and social sensitivity of the participants of the walks so that, over time, they will skillfully evaluate the actions of local governments in the field of a better visual city landscape, which should provide people with balanced living conditions in the mental and health sphere.

The dissemination of information about the project is based on digital accessibility. Each time, informing participants and disseminating knowledge about the project will be carried out via the website "www.parkoznawstwo.sggw.edu.pl" established for this purpose. The website will be compatible and functional. It will have a defined language, consistent navigation, identification, more straightforward text perception and appropriately adapted content presentation. An FB account will be supplementary in informing public opinion about the project with the same name and announcements on local media portals.

The walks will be open to anyone interested - without registration. Previous experience shows that to enable the participation of as many participants as possible, the days of excursions should be Sundays in May, June and July at noon, and the optimal duration of each walk should be approximately 2 hours. The formula of the walks is so flexible that it can be easily adapted to the needs of different people (including disabled people, seniors, and children). Therefore, meeting points will be designated near public transport stops. Moreover, for better recognition and communication, lecturers and all colleagues will be appropriately marked (e.g. badges, reflective shirts, etc.), and a portable sound system will be provided during walks. The walks will run along selected routes to best present the specificity of selected landscape architecture objects.

Results and Conclusions

Our experience indicates an apparent social demand for education on shaping the space of urban parks and gardens and the resulting popularity of such a formula for transmitting knowledge about landscape architecture. Previous events held in 2019 - 2023 were attended by over 60 people each time, up to a maximum of approximately 120, which indicates significant interest in the topic regardless of the weather conditions [figures 1. - 4.].

By default, each trip is led by two experts: **a landscape architect and a dendrologist**. The landscape architect presents, among others, observed greenery arrangements, principles of composing spatial forms, sequences of interiors and viewing openings. Its task is to present interesting facts about specific parks - typically "workshop" - and historical ones, e.g. stylistic trends in particular eras. Field meetings facilitate the presentation of the essential elements of the park program, and the principles of spatial composition are discussed using visible examples. Issues covered include shaping scenery and views, park interiors and plant arrangements, and achieving specific moods, which helps create the local identity of the place.

Without a doubt, the main component of the park's composition is vegetation, especially lush trees. Beautiful trees largely determine the attractiveness of city parks and gardens, which enable effective recreation for city residents. Since each garden work achieves its full artistic and functional effects only after many years (specificity of vegetation development), special attention will be devoted to this issue in order to show the specificity of the park as opposed to works of architecture - as a delicate and dynamic system changing in time. Therefore, the task of the dendrologist expert is to present dendroflora (trees, shrubs, vines), morphological features of woody plants, their decorative values, habitat preferences, life cycle and possibilities of use in various urban conditions (e.g. parks, streets and others). Selected examples of ancient trees - witnesses of history growing in a given place for many years - will also be highlighted.

During the walks, landscape architects and dendrologists share their professional knowledge and experience in shaping landscape architecture objects in cities, explaining the essence of a city park and its traditional and contemporary functions. Indeed, the initiative of landscape and dendrological walks in parks and gardens in Warsaw helps to increase social sensitivity to landscape, beauty, and harmony of space and vegetation, which are the primary materials of landscape architecture objects. In this way, the activities carried out by landscape architects from SGGW-WULS fit into the idea of popularizing the Landscape Convention and the European Landscape Day.



Fig. 1: The participants of the landscape-dendrological walk passed through a big open interior in Pole Mokotowskie Park, Warsaw, Poland. Sunday, September 05th, 2021. [photo. J. Łukasziewicz].



Fig. 2: Numerous participants in the landscape-dendrological walk in Skaryszewski Park, Warsaw, Poland. Sunday, September 19th, 2021. A vast white poplar (*Populus alba* L.) visible in the front [photo. J. Łukasziewicz].



Fig. 3: The group of ca. 120 participants gathered on the pond's bank during the landscape-dendrological walk in Ujazdowski Park, Warsaw, Poland. Sunday, October 03th, 2021. [photo. P. Wiśniewski].



Fig. 4: During walks many participants - amateurs of dendrology - keep notes, make sketches or collect leaves to learn new interesting facts about trees. In front a leaf of Warsaw linden (*Tilia tomentosa* 'Varsiaviensis'). The landscape-dendrological walk in Warsaw's Marshal Edward Rydz-Śmigły Park. Sunday, August 29th, 2021 [photo. E. Żak].

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Souhrn

Projekt "Utváření parků a městské zeleně v historickém kontextu a současných společenských potřebách" (č. POPUL/SP/0272/2023/01) realizovaný lektory SGGW je zaměřen na setkání obyvatel Varšavy s uměním parků a zahrad. Průvodci světem vytvořené krajiny jsou krajinářští architekti a dendrologové. Jedná se o sérii přednášek vedených v terénu, tj. ve speciálně vybraných parcích a zahradách ve Varšavě a na Mazovsku, které ilustrují vývoj stylu utváření parkového prostoru. Každou procházku povedou společně krajinářský architekt a dendrolog, kteří se dělí o znalosti a respekt k přírodě.

Ideou projektu je společenská popularizace umění parků a zahrad prováděná formou série procházek po vybraných objektech krajinářské architektury ve Varšavě a Mazovsku a jejich prezentace prizmatem úspěchů tzv. varšavské školy krajinářské architektury SGGW. Procházky ve vhodnou dobu (např. v neděli) umožní vedoucím přímou interakci s jejich účastníky. Během terénních vycházek budeme vždy diskutovat o zajímavých tématech týkajících se krajinářské architektury, dendrologie a

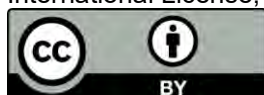
současných environmentálních výzev. Setkání budou vedena tak, aby jejich témata byla společensky zajímavá a přizpůsobená potřebám a vnímání účastníků.

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VISITORS' PERSPECTIVES ON SUSTAINABLE TOURISM: A COMPARATIVE STUDY OF NATIONAL PARKS IN KOSOVO, MONTENEGRO AND ALBANIA

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Abstract

This study investigated tourists' opinions on destination experiences within National Parks (NPs) in Kosovo, Montenegro and Albania, focusing on visitor satisfaction with the destination. Data was collected in the field through 366 surveys to assess visitor perspectives. The statistical analysis included descriptive, qualitative, and quantitative methods. The results highlight variations in visitor ratings across destinations, with Montenegro generally receiving higher (positive) ratings than Kosovo and Albania. The most valued issues by visitors are the diversity and wildness of the landscapes, food and hospitality. At the same time, the least valued (negative) are road infrastructure, orientation signs and waste management in the park. The study highlights the importance of visitor feedback in formulating sustainable tourism strategies, emphasising the need for balanced growth and environmental conservation in destination management.

Keywords : Cross-border forests, environmental and Landscape Protection, Mountain tourism, Park management, Western Balkans

Introduction

In the south of the Dinaric Mountains range, which includes the borders of Kosova, Montenegro and Albania, mountain tourism has increased during the last decades. This preceded the decision of each Western Balkan country in this border triangle to create their National Parks (NPs), motivated by a commitment to protect ecological and social-historical locations while promoting sustainable tourism practices. Four NPs and one regional park have been created within this region. Bjeshkët e Namuna is the largest NP in this region, with an area of about 63,000 ha. This park lies south and west of Kosova, along the border with Montenegro and Albania. Prokletije is a NP in Montenegro, with an area of about 16,000 ha. Valbonë and Thethi are NPs in Albania. These parks are also known as the "Albanian Alps" (Young 2008, Hasanaj and Kuqi, 2022). For residents, the creation of NPs helps not only in the protection of these areas but also in the promotion of ecological, social and cultural values (Platania & Rizzo, 2018).

After the end of the Balkan conflicts in 1999, the first cross-border cooperation materialised into initiatives promoting peace, tourism and environmental conservation. These initiatives were led by foreign organisations and local experts, activists and intellectuals. The Balkan Peace Park project, initiated in 2001, aimed to promote peace and sustainable development practices in the region through local residents' cooperation, create employment opportunities for residents, and respect the environment. These projects that continued year after year helped in the cooperation of local residents and the promotion of tourism, which is increasing every year (Young 2008, Stojkov and Nikolov 2008). Visitors' evaluation of their destination is critical in providing tourist services. Mountain tourism has its own specifics related to the terrain, logistics, safety and enjoying the scenic views during mountain visits (Nicoletta and Servidio 2012, Pomfret 2006). Considering tourists' satisfaction is important in formulating offers that match their preferences. Previous research shows a link between general life satisfaction and daily satisfaction in different areas such as health, work, family or leisure (Tokay et al., 2021, Correia et al., 2013, Doli et al., 2021, Bamwesigye et al., 2021, Bamwesigye et al. 2023). Pleasure derived from tourism experiences plays a key role in enhancing overall life and leisure satisfaction, a central tenet of individual well-being. Satisfaction is usually approached through two main perspectives: hedonic and eudaimonic (Uysal et al., 2016).

This study aims to evaluate the visitors' opinions about their destination. In the study, we presented two main Questions:

1: What is visitors' opinion about the destination they have visited?

2: Are there significant differences in the overall satisfaction levels expressed by visitors from Albania, Kosova, and Montenegro regarding the NPs they have visited?

Material and methods

This study used a structured questionnaire of 15 questions to investigate tourists' opinions on destination experiences within National Parks (NPs) in Kosova, Montenegro and Albania. The questionnaire was designed to assess various dimensions related to the evaluation of the tourist destination, including road conditions, access to local culture, maintenance of cultural sites, cleanliness of the park, availability of souvenirs, quality of cuisine, accommodation, and quality of service, environment conditions and landscape assessments. Additionally, respondents were asked about their likelihood of revisiting the destination and recommending it to others.

For this study, we calculated a sample size of approximately 350 surveys, considering the estimated population size (200,000) of individuals who lived or have visited one of the NPs mentioned in the research. The interviews were conducted in the field, trying to get access and participation from a different group of respondents from the different NPs mentioned in this study. Targeting individuals who had visited NPs at least once, the study sought to capture a representative perspective on the experiences and preferences of this specific group of visitors.

Field surveys were conducted over four months (June to September 2022) during 12 visits to the NPs. The questionnaire consisted of 27 questions. Only 16 questions about general data and visitors' opinions about the NPs were considered for this study.

Descriptive statistics were used to summarise and clarify the characteristics of the data collected. Measures such as mean, standard deviation, standard error of the mean and confidence intervals of the mean were calculated for each question in the questionnaire. These statistics provided a general overview of responses' distribution and central tendencies on the various dimensions assessed in the study. Additionally, graphical representations, particularly box plots, were used to visualise the responses' distribution and spot any distinct trends or variations across the surveyed countries. Boxplots facilitated the comparison of ratings and perceptions between visitors from Kosova, Montenegro and Albania, enabling a nuanced understanding of differences in visitor satisfaction levels across different destinations.

Overall, the methodology prioritised a robust and systematic approach to analyse visitor opinions, aiming to inform evidence-based decision-making in the formulation of sustainable tourism strategies and destination management practices in the region.

Study area

This research project focuses on four NPs located within the Western Balkans: NP Bjeshkët e Nemuna (Kosova), NP Prokletije (Montenegro), NP Valbona Valley, and NP Theth (Albania). All four parks lie within the southern region of the Dinaric Mountains, a mountain range known for its karst topography. Karst landscapes are characterised by carbonate rocks, such as limestone, which have been sculpted by water erosion over time. NP Bjeshkët e Nemuna, established in 2013, extends to the municipalities of Gjakova, Junik, Deçan, Peja and Istog in Kosova, sharing the borders with Montenegro and Albania. Known for its rich biodiversity and significant geomorphological features, park management focuses on conservation and sustainability (Institute for Spatial Planning RKS, 2020). Prokletije NP, located in the west of Montenegro, is known for its high biodiversity and contains diverse hydrographs and flora, although human activities pose challenges to the fragile ecosystem (Djordjević Milošević et al., 2014). Valbona Valley NP, located northeast of Albania, attracts tourists with picturesque landscapes and outdoor activities but faces the delicate balance between economic development and environmental conservation. Finally, the NP of Theth, created in 1966, protects the natural biodiversity and cultural heritage in Albania, with tourism mainly concentrated in the summer due to the winter snow that prevents access (Keçi and Krog, 2014).

Results and Discussion

Demographic characteristics of the respondents

The demographic characteristics of the respondents, who represent residents and visitors, include variables such as country of residence, distance of residence from NP, and frequency of NP visits. Each variable has its categories, including the number of respondents (Frequency) and the percentage (%). Regarding the country of residence, the majority of respondents are from Kosova (43.72%), followed by Albania (23.22%), Montenegro (20.22%) and others (12.84%). The largest group is 50-100 km away (27.05%), followed by >150 km (24.86%), 100-150 km (19.13%), 10 -50 km (15.3%) and 5-10 km (13.66%). The frequency of NP visits varies, with the majority visiting rarely (39.36%), followed by annually (28.57%), once a month (10.79%), twice a month (9.04%) and those who live near or within NPs (12.24%).

Visitors' opinion about national parks

The assessment of visitors regarding their vacation experience within NPs is significant in this study, and the data serves as a valuable tool for analysing visitor preferences, identifying areas of higher and lower significance, and pinpointing aspects requiring intervention to address expressed dissatisfaction. There was also information on sample size, missing data, mean, standard deviation, standard error of the mean, and confidence intervals of the mean. The data show an overall positive average value. High values of standard deviation indicate high variation in the data.

Each question is depicted in a separate Box Plot, with the data segregated based on the geographical location of the respondents (Kosova, Albania, Montenegro) when the form was filled out. Data from respondents living outside these three countries are linked to the country where the interview occurred within the NP.

The study aimed to investigate the perceptions and experiences of visitors to different national parks (NPs) in Kosova, Montenegro and Albania. The results reveal nuanced differences and similarities between the three countries, providing insights into potential areas for improvement and strategic planning in the tourism sector.

The general opinion of visitors towards the visited areas is positive, with an average value of 6.72 out of 10 units. This perception is consistent with previous research evaluating the region's natural appeal and suitability for mountain tourism (Caso 2018, Veselaj 2010). Visitor ratings of the respective tourist destinations varied slightly between NPs, with Montenegro's Prokletije NP receiving the highest average rating of 7.8 out of 10, compared to Albania's Valbona and Thehit NPs (7.2) and Kosova's Bjeshkët e Nemuna NPs (6.8). Despite the variance, it is essential to note the wider range of data in Kosova, which affects the mean value, while the mean values remain stable across the three countries. The perception of natural beauty plays a major role in destination choice, with visitors often gravitating towards places that offer sights and experiences not usually encountered in their everyday lives. Research by (Kirillova 2014) supports this notion, emphasising the importance of the beauty of the landscapes and the attractiveness of the destination. Hospitality also appears as a crucial factor affecting visitors' perceptions, making them feel comfortable during their visit (Wong & Yeh, 2009). The locals, known for their warmth and hospitality, embody traditions that have left a lasting impression on travellers. Visitors have rated Kosovo higher than the other two countries regarding hospitality. This observation is supported by literature that highlights the outstanding hospitality of the local people, deeply rooted in the community's way of life and traditions (Lajçi et al., 2022).

The appreciation of local culture and access to cultural sites showed a wide data distribution, with Montenegro showing a more positive trend. However, the challenges in maintaining cultural objects were evident, where Kosova scored the lowest average and Montenegro the highest. These findings underline the importance of cultural preservation and sustainable tourism development (Arslan & Kaymaz, 2020).

The food quality received positive reviews overall, with nuances in the distribution between the three locations. Accommodation quality showed mixed ratings, with Montenegro demonstrating more homogeneous data compared to Kosova and Albania. Visitors enjoy the originality and freshness of the local cuisine, trying to immerse themselves in the gastronomic delights of the region, which offer an authentic experience.

Service quality and staff competence were generally perceived positively, with Montenegro showing slightly higher ratings. These factors enhance visitors' experiences and satisfaction during their stay (Wong & Yeh, 2009).

Perceptions of the natural environment and landscape diversity were positive in all three countries, with some minor differences emphasising the importance of nature-based tourism. However, challenges such as infrastructure development, waste management, investments and environmental protection were identified, indicating the need for more detailed studies and strategic planning with sustainable practices.

The results illustrated visitor ratings for tourist destinations, showing little variation between national parks. Prokletije NP of Montenegro received the highest average rating (7.8 out of 10), followed by NPs Valbone Valley, Thehi (7.2) and NPs Bjeshkë e Nemuna of Kosova (6.8). More so, focusing on road conditions and directional signs, responses were uniform across countries, with Kosova showing a wider distribution of values due to a larger group of respondents but maintaining consistent averages and medians. The study on visitors' experience with local culture showed a wide range of data (2 to 10), with a positive trend in Montenegro. Kosova and Albania show positive skewness in their distributions, with Montenegro showing a more homogeneous distribution. Regarding the availability of souvenirs and handicrafts, Kosova showed a wide range of responses, Albania rated more positively, and Montenegro showed outliers but still reflected a positive rating. The food quality, in general, was very positive, and there were different distributions in the three countries.

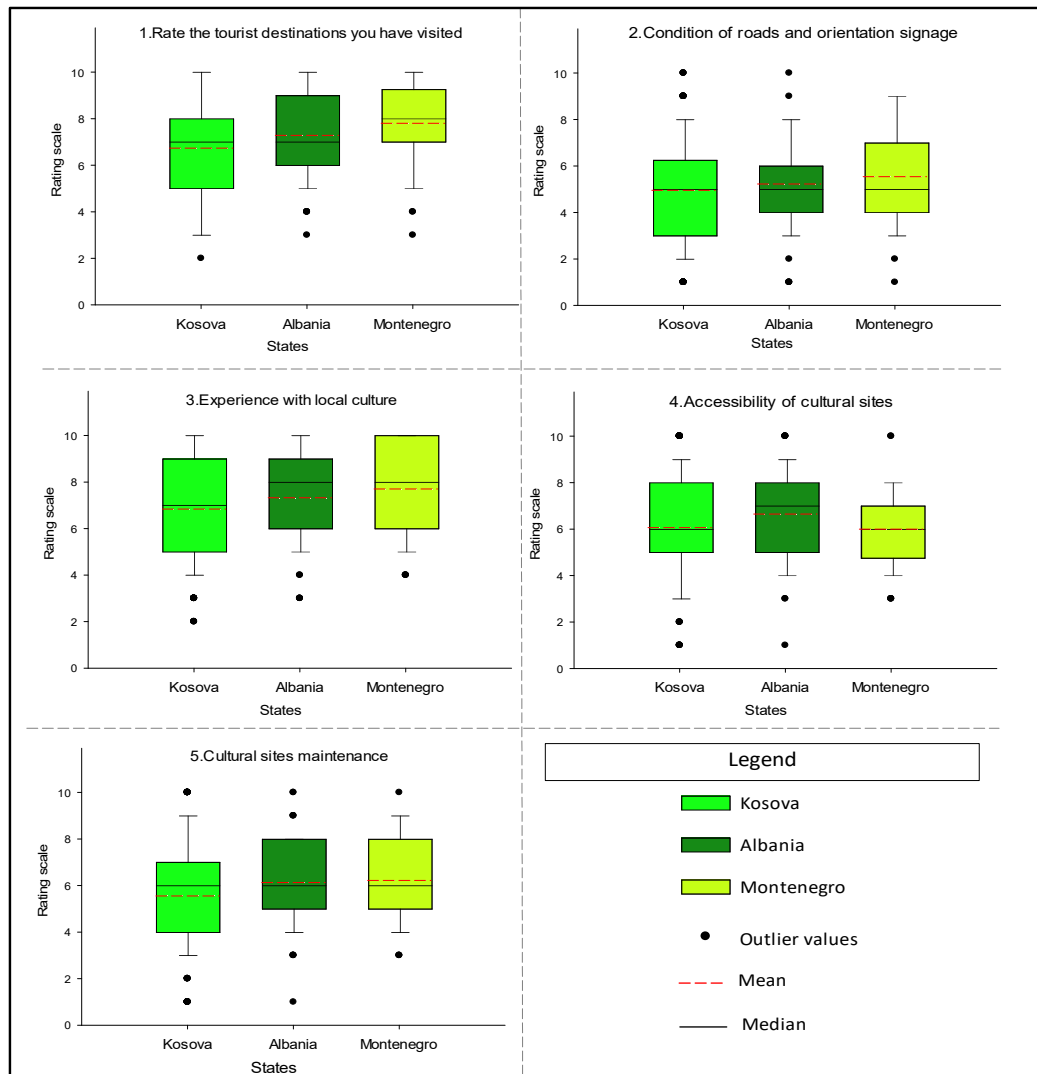


Fig. 1: Evaluation of visitors for the destination based on their country.

The quality of accommodation assessed highlights different ratings, with Kosovo showing a negatively skewed distribution, Albania showing the lowest-ranking suburbs, and Montenegro showing more homogeneous data. Opinions of the level of service in the tenth chart are primarily similar between Kosovo and Albania but differ in Montenegro, with more concentrated values. Service personnel competence and helpfulness Ratings show consistent distribution across the three countries, with Montenegro's average rating slightly higher. While Albania exhibits many outliers, they are relatively more concentrated in Kosovo and Montenegro. Evaluating perceptions of the interest and diversity of the landscape, with unanimous positive feelings in all three countries, although Kosovo shows more differences with lower values compared to Albania and Montenegro. Examining the willingness to recommend the destination to friends reflects the trends observed, with similar patterns and the addition of lower values, particularly evident in Montenegro.

Conclusion

The changes in visitors' perceptions in the surveyed areas are minimal, with Montenegro slightly surpassing Kosovo and Albania in the evaluations. Kosovo was rated higher in terms of hospitality than other countries in this study. In particular, questions that receive relatively negative feedback from visitors include questions about road infrastructure, warning signage, park cleanliness, and maintenance of cultural sites. Despite these challenges, the park's overall evaluations are positive and have minor differences. Further research efforts are essential to understand better the current state and true needs of local residents and visitors. Such studies will provide insights for informed decision-making and strategic planning in managing the national parks under consideration. This study will

serve as a basis for decision-makers to make the most accurate decisions regarding policies and effective initiatives aimed at the sustainable management of national parks.

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Souhrn

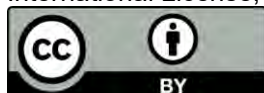
Tato studie zkoumala názory turistů na zážitky v národních parcích (NP) na Kosovu, v Černé Hoře a v Albánii a zaměřila se na spokojenost návštěvníků s destinací. Údaje byly shromážděny v terénu prostřednictvím dotazníků, jejichž cílem bylo posoudit názory návštěvníků na NP. Statistická analýza zahrnovala deskriptivní a kvantitativní metody. Výsledky poukazují na rozdíly v hodnocení destinací ze strany návštěvníků, kdy Černá Hora měla obecně o něco vyšší (pozitivní) hodnocení než Kosov a Albánie. Pokud jde o pohostinnost, návštěvníci uváděli příznivější zkušenosti s Kosovem, které hodnotili lépe než zbylé dvě země. Nejvíce návštěvníci oceňují rozmanitost a divokost krajiny, jídlo a pohostinnost. Zároveň méně (negativně) hodnotili silniční infrastrukturu, orientační značení a nakládání s odpady v parku. Studie zdůrazňuje význam zpětné vazby od návštěvníků při formulování strategií udržitelného cestovního ruchu a zdůrazňuje potřebu vyváženého růstu a ochrany životního prostředí při řízení destinace.

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VISUAL EXPOSURE OF MONUMENTS ON CYCLE ROUTES IN THE NITRA SELF-GOVERNING REGION

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Abstract

The promotion of cycling transportation (CT) and cycling tourism is pivotal for societal advancement, owing to their progressive, eco-friendly, and health-promoting attributes. This study delineates the multifaceted benefits of CT and cycling tourism, encompassing economic, ecological, health, and social dimensions. Emphasizing the importance of robust cycling infrastructure, the research aims to bolster cycling tourism, particularly in rural areas, through the establishment of functional cycling routes. Focusing on the Nitra Self-Governing Region, this work evaluates the proximity of historical landmarks to cycling routes, envisioning their integration into cultural, educational, and sightseeing excursions. Through comprehensive analysis, including the identification and characterization of historical sites and the delineation of buffer zones along cycling routes, the study reveals the potential for enriching cycling tourism experiences. The findings provide valuable insights into the spatial distribution of historical attractions, facilitating informed decision-making for the sustainable development of cycling tourism in the region.

Keywords: viewshed, monuments, tourism, cycle paths

Introduction

As Slovakia (SK) has experienced notable advancements in living standards in recent decades, there has been a corresponding rise in individual motorization, overshadowing alternative modes of transportation. This shift has been accompanied by a decline in physical activity, including pedestrian and cycling endeavours. Recognizing the detrimental effects of this trend, developed countries have increasingly advocated for eco-friendly transportation alternatives, particularly cycling, as a means to mitigate environmental impact and promote public health (www.nsrv.sk/index.php?pl=18&article=615, 2024). The development of cycling and cycle tourism is highly desirable for society. Transport by bicycle not only has no negative impact on the environment but also contributes to improving the health of the population (www.cyklotrasy.sk/buxus/docs/cyklostrategia_v2.pdf, 2024). Cycling is a non-motorized mode of transportation powered by human effort and utilizing bicycle infrastructure. Cycle tourism is a form of tourism where bicycles are used for transportation. A cycling route is a path suitable for use by cyclists. It can be located on all categories of roads. The term "cycle route" is a general term for all types of routes built or designated for cyclists (www.dedinka.sk/evt_file.php?file=5586, 2024). International and national experiences successfully demonstrate that areas that decide to promote cycling have experienced a significant increase in tourists (Pavione, E., et al., 2018).

In the conditions of SK, cultural heritage can represent one of the key developmental factors. Natural and cultural heritage constitutes the primary offering of cultural tourism and is a source of attractiveness for specific locations. In the conditions of SK, a negative effect is more likely due to insufficient, disproportionately distributed, or improperly set cultural tourism offerings (Dubská, M., 2010).

The aim of the article is to evaluate the distance and accessibility of historical objects and monuments from cycling routes in the Nitra Self-Governing Region (NSK).

Area of interest

Cycling tourism is becoming increasingly popular and beloved in Slovakia (SK) (www.slovakia.travel/co-vidiet-a-robot/sport-a-aktivny-oddych/cykloturistika, 2024). Every region in SK offers countless cycling routes of various difficulty levels. The Nitra Self-Governing Region (NSK) is a place rich in history, culture, and natural attractions. Its cultural-historical foundations date back to the times of early settlement, the first state entity, the Principality of Nitra, Great Moravia, the Middle Ages, and into modern times (Kompasová, K., 2023). The strategic vision for the development of cultural tourism in NSK is founded on the region's inherent strengths and potential. This position it to emerge as a nationwide centre for cultural tourism with a special emphasis on cultural exploration and utilization of cycling (Kramáreková, et al., 2006). NSK covers an area of 6343.7 km², accounting for

12.9% of the territory of SK. It is in the southwest part of SK, bordered by the Hungarian Republic to the south, Banská Bystrica Region to the east, Trenčín Region to the north, and Trnava Region to the west. NSK is divided into 7 districts: Komárno, Levice, Nitra, Nové Zámky, Šaľa, Topoľčany, and Zlaté Moravce (<https://slovak.statistics.sk/wps/portal/>, 2024). In NSK, there are cycling routes in lengths of 1669.85 km. The routes include red trails covering 454.3 km, blue trails covering 581.6 km, green trails covering 395 km, and yellow trails covering 238.95 km (Tab. 1). In terms of the length of cycling routes, NSK ranks 6th in SK, following Banská Bystrica (3623.27 km), Žilina (3080.74 km), Prešov (2815.5 km), Košice (1803.2 km), and Trenčín (1759.2 km) Regions.

Tab. 1: Extract from the National Register of Cycling Routes

Self-Governing Region	Color of the cycling routes				Total
	Red	Blue	Green	Yellow	
Bratislava	314.4	421.1	216.3	243.3	1195.1
Trnava	384.8	356.5	313.5	257.2	1312
Trenčín	481.7	598.1	413.5	265.9	1759.2
Nitra	454.3	581.6	395	238.95	1669.85
Žilina	781	1028.5	885.708	385.532	3080.74
Banská Bystrica	743.8	1008.6	1194.55	676.32	3623.27
Prešov	711.9	645.4	935.25	522.95	2815.5
Košice	516.8	572	485.3	229.1	1803.2
Total	4388.7	5211.8	4839.108	2819.252	17258.86

Source: <https://www.cykloklub.sk/vypis-z-narodneho-registra-cykloturistickych-tras/>, 2024

Methods

The research methodology consisted of creating cycling routes from current geodata on cycling routes in the area, extracting these routes, and then making all monuments using vector layers (Tab. 3) using the QGIS from a web source (<https://geoportal.gov.sk/gallery/datasets?q=pamiatky>) on the raster layer of the digital terrain model from a web source (<http://www.geoportal.sk/sk/zbgis/udaje-zbgis/aktualizacia-dmr-3-5.html>).

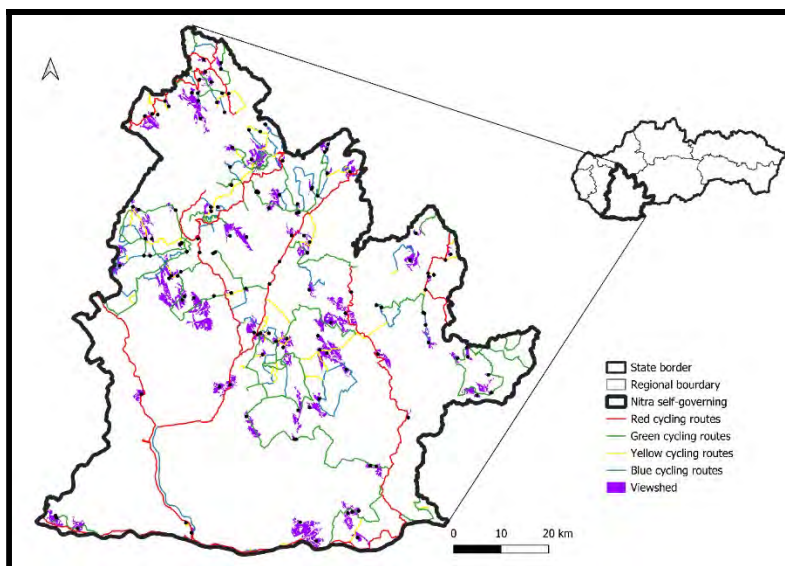
In each territory, there are areas that are highly visually exposed and, conversely, those that are hidden from the visitors' view. The most exposed places are concentrated around roads, viewpoints, hiking trails, and cycling routes (Kubinský, D., 2024). Petluš et al. 2018 use GIS software to determine the visual exposure of the area. The software offers the Visibility or Viewshed function, which can identify cells in the input raster visible from one or more observation points. By using the analytical function Visibility in GRASS GIS and with the support of programming capabilities, a tool was created. The tool, developed for creating a map of potential visual exposure with a spatial resolution of 50 m, a raster cell size of 50x50 m, observer height of 1.75 m, and a visibility limit of 50 km. The authors' methods were modified and adapted to the NSK territory focusing on the exposure of monuments to cycling routes. The observer height was standardized to 1.75 m, and the visibility was set to 2.5 km. We utilized the OpenRouteService (ORS) plugin. ORS provides access to openrouteservice.org functions based on OpenStreetMap. This toolset encompasses mapping functions with extensive attributes such as duration, length, start and end locations, configurable for output files (www.plugins.qgis.org/plugins/ORStools/#plugin-about, 2024). Taking into account bicycle accessibility, the toolset calculates the nearest routes available. Routes within a range of 5, 10, 15, 20, 25 minutes and distances of 1, 5, 10, 15 km from the cycling route were considered. We also identified cadastral territories of municipalities where the construction of cycling routes could be beneficial for complete connectivity of cycling routes within a 25-minute distance.

The methodology of creating cycling routes consists of several phases. The first phase is reconnaissance of the cycling route, the second phase is pre-negotiation. This involves consultation and subsequent approval of the proposal with relevant entities. The next step is register the route and its integration into the nationwide cycling network (Žebenský, M., 2010). Cycling routes are marked in the field according to the technical standard STN 01 8028. Routes are divided by color, type, purpose, difficulty, or surface. Red denotes EuroVelo routes and long-distance routes. Blue indicates parallel routes to EuroVelo routes, longer or more challenging regional cycling routes. It represents moderately challenging routes. Yellow signifies easy cycling routes and connections between routes (www.cykloportal.sk/legenda, 2024), short detours to various natural, historical, cultural, and technical points of interest (www.visitnitra.eu/wp-content/uploads/2021/01/Strategia-rozvoja-cyklotras-v-NSK-na-roky-2021-2027.pdf, 2024).

The next step is the processing of simplified documentation. The documents consist of a map and a textual part. The subsequent step is the legalization of the cycling route (territorial decision). The final step is recording cycling routes into maps (Žebenský, M., 2010).

Results

In map number 1, we can observe the potential exposure of objects relative to cycling routes within a visibility range of 2.5 km. There are a total of 198 visible objects from the cycling routes, with a standardized observer height of 1.75 m, covering a total length of 1669.85 km, which matches the total length of cycling routes in NSK.



Map number 1: Exposure of monuments in NSK relative to cycling routes
Source: <https://nr.cykloportal.sk/>, 2024; processed using QGIS 3.34.0-Prizren

Within a 5-minute accessibility range, we observe the highest number of monuments on the green route, with 41 and the lowest on the red route, with 24 (Tab. 2). When considering accessibility to all monuments regardless of exposure, we observe the highest number on the yellow route, with 308 and the lowest on the red route, with 128. In terms of distance (km), we observe the highest number of monuments within approximately 1 km on the green route, with 53, and the lowest on the red route, with 26. Within a 15 km distance, regardless of exposure, we observe the highest number of monuments on the green route, with 335, and the lowest on the blue route, with 316.

Tab. 2: Number of objects in buffer zones

Cycling routes	Availability in min					All available	Availability in km				All availability
	5	10	15	20	25	To 25 min	1	5	10	15	To 15 km
Green	41	50	55	58	60	190	53	69	71	71	335
Yellow	34	37	41	42	43	308	32	45	46	46	319
Red	24	26	26	28	29	128	26	33	34	35	324
Blue	32	36	37	38	40	170	35	45	46	46	316

Source: <https://nr.cykloportal.sk/>, <https://plugins.qgis.org/plugins/QuickOSM/>, 2024; processed using QGIS 3.34.0-Prizren

Of the total 198 object, the majority, comprising 87 (43.93%), are monuments of religious architecture, historical sites and art. Monuments of fortification architecture and archaeology constitute 58 (29.30%) of the total, while monuments of secular architecture, castles, and historic greenery make up 21 (10.60%). Monuments of folk architecture and technical structures amount to 20 (10.10%). The categories of monument conservation fund represent 6 (3.03%), settlements with historical monuments and technical monuments each account for 3 (1.52%).

Conclusion

One of the characteristic features of the present time is the effort to promote the principles of sustainable development, balancing economic, social, and environmental development (Oremusová, D., et al., 2021). Similarly, the Cycling Route Development Strategy in NSK for the years 2021 – 2027 speaks of connecting cycle routes with historically significant areas. The main goal is to establish a functional, hierarchically organized continuous system of cycling routes, connecting locations with recreational or cultural-historical potential (www.visitnitra.eu/wp-content/uploads/2021/01/Strategia-rozvoja-cyklotras-v-NSK-na-roky-2021-2027.pdf, 2024).

The aim was to analyse the accessibility of historical sites in relation to cycling routes in NSK. The best accessibility of objects in minutes and km was found on the green route. The lowest number of objects is accessible from the red route. The best accessibility from the green and red routes is to landmarks of sacred architecture, history, and fine arts. From the green route, there are 29 such landmarks, and from the red route, there are 15. The yellow route offers the best accessibility to landmarks of fortification architecture and archaeology. From the blue route, the most accessible landmarks are those of secular architecture and castles.

In the comprehensive assessment of object accessibility from cycling routes, we find that object within a 25-minutes and 15-kilometer radius are highly accessible. Out of the total 354 municipalities surveyed, only 41 were found to be inaccessible within these distance. Looking ahead, a potential improvement could involve establishing the proposed cycling route. This route would connect 14 monuments and traverse 23 municipalities. However within the specified distance, accessibility to monuments was found to be lacking in 12 of these municipalities.

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Souhrn

Rozvoj cykloturistiky a cyklistické dopravy je pro společnost velmi žádoucí. Doprava na kole nejenže negativně neovlivňuje životní prostředí, ale také přispívá ke zlepšení zdravotního stavu obyvatel a podporuje kvalitu jejich života. Ve srovnání s ostatními zeměmi v rámci Evropské unie patří Slovensko mezi ty, které nedostatečně reagují na trend intenzivního zavádění této problematiky. CD je velmi citlivá na image země a velmi účinně a efektivně ji podporuje. Přírodní a kulturní dědictví představuje hlavní nabídku CD a je zdrojem atraktivity konkrétních lokalit.

Dostupnost objektů a plánování nových cyklistických tras v blízkosti historických památek může zvýšit atraktivitu a rekreační potenciál daného území. Cílem bylo zjistit dostupnost historických objektů v různých vzdálenostech od cyklostezek v Národním parku Slovenský kras (NSK). Zjistili jsme, že nejlepší dostupnost památek je zelenou cyklostezkou, a to v době 5 minut až 41 objektů, nejhorší dostupnost je na červené trase, kde je pouze 24 objektů.

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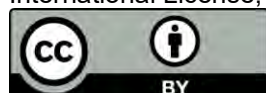
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VISUAL POLLUTION AND ITS IMPACT ON THE URBAN LANDSCAPE: A CASE STUDY OF BUCHAREST'S CITY CENTER

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Abstract

The downtown areas of major cities, through their rich cultural offerings represented by imposing buildings and long-lasting activities, are tourist attractions. However, the presence of billboards displaying content less suitable for all age groups or colorful graffiti with messages bordering on obscenity can compromise tourists' perception of the area. This study investigates the phenomenon of visual pollution and its implications on the urban landscape, focusing on the central area of Bucharest, Romania. Visual pollution encompasses various forms of unaesthetic elements in the urban landscape, not limited to litter, graffiti, large and aggressive billboards, and architectural degradation. The analysis method is empirical through interviews, with 98 Romanian and foreign tourists participating. The study's results highlight the influence of aesthetics/visual pollution on urban and cultural tourism in the Municipality of Bucharest. The measures proposed by the study are mostly suggestions from the interviewed tourists. They include sanitation and limiting advertising content, both in terms of billboard size and careful analysis of the exposed content.

Keywords: aggressive advertising, vandalism, street graffiti, urban environment

Introduction

Advertising represents an economic advantage, an image booster in the awareness of a product or service, and this drives businesses to increasingly engage in it on a larger scale (Dumitrescu, 2000). The benefits of advertising are well-known. It is a necessary phenomenon both for businesses and consumers (Grecu et al., 2018). Cities, especially large ones, where the population is dense (population density is also high), billboards represent means of advertising a product or service. Many of these billboards are placed in highly visible locations so that many passersby or residents come into visual contact with them. However, what attracts attention is the number of these billboards, their placement, and the accompanying text.

Street art also brings a burst of color and represents an artistic expression in the urban environment (Teodorescu et al., 2019). Large cities have a material cultural heritage represented by important buildings, whose cultural value deserves attention (Teodorescu et al., 2016; Szemkovics et al., 2018). This is precisely why the urban aspect is a concern for the quality of life. Attention must be directed towards the maintenance of constructions, avoiding deterioration in all aspects (Zeľňáková et al., 2017). Unfortunately, here too, the unpleasant interventions of those who vandalize building walls with graffiti are visible. It is necessary to establish a limit between advertising and aggressive advertising and street art and graffiti with inappropriate text or borderline obscene drawings.

Materials and methods

The methodology primarily relied on observation, involving the visual inspection of several such billboards, considering their placement and content. Additionally, the study is based on the descriptive method for the central area of Bucharest, which is currently the place with the highest visual population. Here, besides billboards and graffiti, there are also old buildings, many of them with unrehabilitated facades and others in an advanced stage of deterioration.

The empirical method of interviewing was applied to a total of 98 individuals. The questions addressed how much negative influence the billboards have in terms of size, content, and placement, as well as the graffiti on important buildings in the central area of the capital city, Bucharest.

Results

The visual aspect of historical areas can be preserved intact through the harmonization of urban environmental elements and advertisements with the visual identity of the area. Once again, the issue arises of competent approval of advertising projects for products and services.

Many of the iconic buildings located in the central area of Bucharest are vandalized with graffiti, which detracts from the overall urban appearance. "Hanul cu Tei" is one such construction, a meeting place for artists of yesteryear. It was built in 1833 and still maintains its initial aspect, displaying the visible "seal" of the first owners, along with other ornaments specific to the construction period (Image 1).

Today, wall vandalism has unpleasant visual effects (Image 3). The positive effects and historical significance of this beautiful place with stories that can enchant any tourist, passerby, or resident are diminished (Image 2). It is a place where many students from the University of Architecture and the University of Bucharest (Faculty of Letters, Faculty of Mathematics, and Faculty of Geography) meet, relax, and socialize.



Image 1. "The seal" of the first owners and the year of construction - 1833



Image 2. "Hanul cu Tei" Street - commercial area



Image 3. Vandalism in the central area of Bucharest - "Hanul cu Tei"

Another iconic building in Bucharest is the central headquarters of Banca Comercială Română. The walls at the lower level are continuously vandalized with graffiti, diminishing the beauty of the historical area and the urban landscape. Additionally, obscenity finds its way into the phrases written in an area where children and many tourists or residents find a place to relax or simply sit down (Images 4&5).



Images 4&5. Vandalism with graffiti in the central area of Bucharest - the headquarters of Banca Comercială Română

The history of this building is very important from a tourist perspective for those who want to discover the heritage values of Bucharest. It is known as the Palace of the Insurance Society, designed by the

German architect Oscar Maugsch. In this construction (palace), one of the first insurance companies in Romania operated (General Insurance Society). However, it was disbanded in 1948 following the adoption of the Nationalization Law. It then operated as Banca Comercială Română and hosted a series of cultural events over time, becoming one of the most famous and attractive buildings in Bucharest. Vandalizing it with graffiti and installing billboards whose content is not related to the temporary activities taking place inside diminishes its cultural value.

An attempt to vandalize with graffiti was also recorded at one of the most attractive and important heritage buildings in Bucharest: the Romanian Athenaeum (Images 6-8). This has outraged many who love art, culture, and urban beauty. The Romanian Athenaeum is one of the most beautiful buildings in Bucharest and has a cultural value that is hard to match. It is precisely for these reasons that vandalizing it with inscriptions or just drawings is an act of cultural immorality.



Images. 6-8. Vandalism with graffiti at the Romanian Athenaeum – Bucharest

The aggressiveness of advertisements, the multitude of billboards, and their content can have negative effects on traffic by attracting attention or obstructing traffic signs (Images 9&10). Additionally, the installation of billboards must consider their placement, as it is not suitable to have billboards advertising intimate clothing near schools or kindergartens. The content of these billboards must be constantly monitored by authorized individuals.



Images 9&10. Billboards and banners with aggressive advertising

Discussion

Vandalism predominantly manifests visually through graffiti, which can serve one or more purposes, including: obscene messages, offensive to the public. Many of these are positioned in plain sight. It is

discomforting for people of all ages, but particularly unpleasant for children and tourists, as guides or group leaders are forced to avoid these areas laden with graffiti containing inappropriate messages.

Taking these into account, among the 98 individuals with whom discussions were held, many referred to these messages with inappropriate content:

"It's embarrassing for us, the ones accompanying tourists from other European cities, to see such messages. Unfortunately, they are written in a way that can be understood since they are also in English. We try to avoid such areas, which, unfortunately, would be very attractive for the history of the place."

- Mihaela Crăciun, touristic guide, 53 years old

"Bucharest has buildings of rare beauty. It's no wonder it was called 'Little Paris'. The history of each building is particularly attractive! Each one has something to say and show. Unfortunately, many of them are drawn and written with inappropriate words exactly in the most important areas. Some consider it art, but they are the most grotesque expressions of incivility, recklessness, or simply lack of education."

- Cristian Georgescu, architect, 49 years old

Another form of expression is created for the advertising of anti-social activities. Many of the messages are written in this way on the walls of buildings. Although some voices discover artistic aspects in these manifestations, most of them are unpleasant due to their content (the message conveyed), form, and positioning.

Conclusion

Visual pollution exists and has effects that should not be overlooked. Visual pollution is generated by various sources and takes many forms of expression. People have become aware of the extent of this phenomenon and have taken action to counteract it. Unfortunately, many of these actions to reduce or intervene against graffiti vandalism or other forms of manifestation do not have a very clear legal framework. Those who suffer are heritage buildings and beyond, as their appearance can negatively affect both tourism and local economy. Additionally, it creates discomfort for residents and passersby.

Billboards, through their placement or their number, can have even more serious effects, such as on orientation and circulation. Clear measures need to be taken to stop this negative phenomenon of visual overcrowding.

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Souhrn

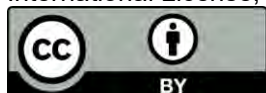
Hmotné kulturní dědictví a kvalita městského života představují pro moderní město orientační body. Vizualní znečištění má na tyto hodnoty stále větší vliv, což je třeba brát v úvahu. Agresivita zásahů prostřednictvím graffiti a nadměrné reklamy, prostřednictvím velikosti a umístění billboardů nebo jiných reklamních prostředků vytváří vizuální nepohodlí, které se promítá do psychické nepohody. Příliš mnoho reklamy může vyvolat odpor.

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VISUAL POLLUTION PROVIDED BY BUILDINGS WITH A HIGH DEGREE OF DECAY AND ITS IMPACT ON THE URBAN LANDSCAPE: A CASE STUDY OF BRĂILA CITY CENTER

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Abstract

The Danube's cities have a long history, a specific culture and an architecture capable of expressing their entire past. Braila is one of these cities, whose commercial history is visually described by a series of buildings whose functionality has ceased, remaining only a message immortalized in walls and ornamental details on the facades. The study tries to show the contrast between the importance that many buildings in the Braila harbour had, their multicultural expressiveness and the unpleasant aspect of their current state of decay. The method of analysis is the empirical one of the questionnaire, applied on a number of 137 respondents regarding the visual pollution and the unpleasant aspect offered by them. The results of the study confirm the role played by these buildings, some of them considered "symbol" by the residents, the unpleasant appearance and the need for rehabilitation. The shortcomings mentioned are the lack of local government funds and the legislation related to their form of ownership, many being privately owned.

Keywords: historical buildings, Danube trade, neoclassical style, stucco, rehabilitation

Introduction

The urban cultural landscape of Braila is a symbol of multiculturalism, through the generous offer of buildings that have been presenting the history of this city for centuries (Merciu et al., 2022; Teodorescu et al., 2016). The city of Braila is a port city on the Danube, with a rich history, and the urban landscape is represented in particular by the numerous elements of architectural style of the buildings, but also by specific elements captured in the masonry, of certain ethnicities or as a result of the functionality that these buildings have had (fig. 1).

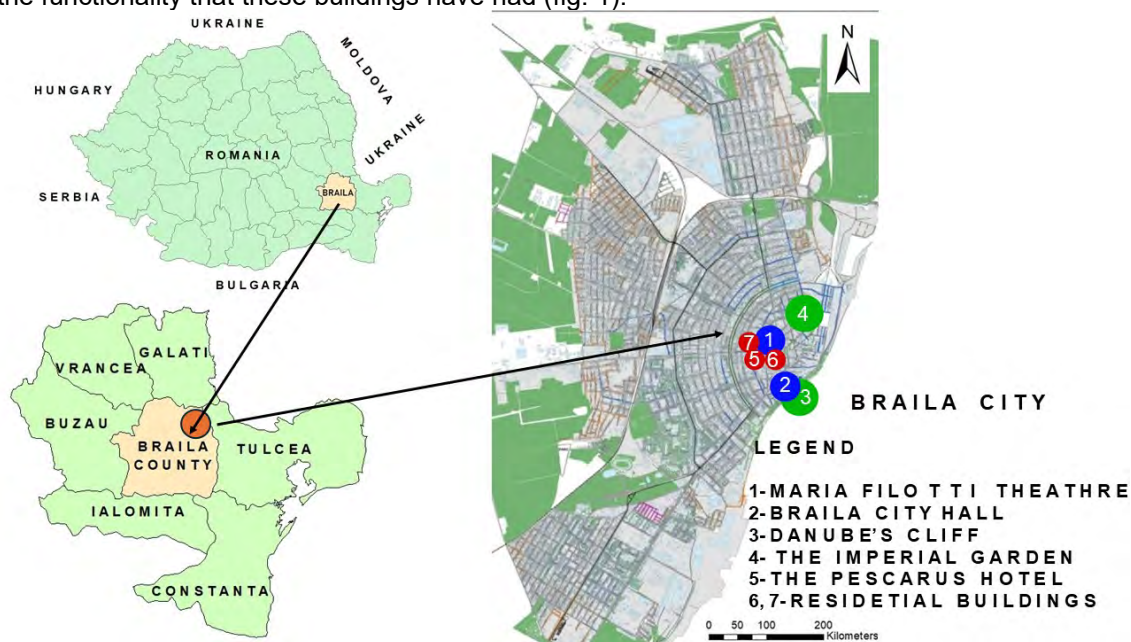


Fig. 1: Braila Location

Through the urban cultural offer conferred by buildings with an intricate history, the city of Braila could develop an impressive tourist offer (Teodorescu et al., 2013). People are more and more eager to discover new places, most of them with messages coming from the past (Szemkovics et al., 2018; Mazilu et al., 2023). These old buildings, over time, have suffered major deterioration, insusceptibly due to humidity (Zeľeňáková et al., 2017) and human negligence through irrational use and lack of consolidation.

Material and methods

The methodology has several components.

First of all, the study is based on the descriptive method, which is a simple one, combined with the observation method for two symbol buildings in Braila, which today are a major factor of visual popularity. The study is in an early stage, in which we only tried to highlight some heritage buildings in the Braila county, which are in an advanced stage of degradation and represent a real danger for the local population.

The urban landscape dissatisfaction offered by these buildings - a symbol for the Braila city, was empirically analysed through a survey-interview with the inhabitants of Braila and carried out through a word cloud. A total of 137 respondents participated in the survey.

Following the discussions held and the statements told about the role these buildings play for the city and how they are perceived by the inhabitants today, "clouds of words" were made. Each of these "word clouds" comes with two important mentions:

- these buildings should not be demolished, they should not be removed from the landscape, but on the contrary they should be consolidated and rehabilitated;

- the visual pollution offered by the landscape created by these iconic buildings is a major discomfort factor for important areas of the city, especially for the central area, where the park or the theatre could be major attractions.

Results

The appearance of a city is very important in attracting tourists, but also for its inhabitants. The city of Braila is one of the oldest cities - port on the Danube, where commercial activity has been practiced for centuries. Every administration, every wealthy merchant or merchant with considerable income, has left behind buildings with an important architectural and cultural value. The history of these buildings can be a tourist attraction, but they can also convey important messages about the economic, political and administrative development of this urban locality.

Unfortunately, many of these buildings have deteriorated due to inappropriate use and have not been consolidated and maintained. How did it get to this stage? Several factors have contributed to their deterioration. Firstly, the political regime. The establishment of the communist regime meant the confiscation of these buildings and their inclusion in state property. Later use was diverse, with commercial use, including hotel (fig. 3 and fig. 4), administrative use or social use (used by families with many children or by low-income families). The interior structures have been altered and the exterior has not been maintained.

Hotel Pescarus-former Hotel Bristol was built in 1892 by the merchant H. Hirschhorn, on Regala Street (today Mihai Eminescu Street), according to the plans of the architect Paul M. Mihail (fig. 2 and fig. 3). Hotel Bristol is the first hotel in Braila that inaugurates a new form of architecture for this functionality, that of hotel. Originally it was the fashion house of the Geavide brothers. Later, it was bought by the wealthy merchant Hirschhorn, who decided to convert it into a hotel. The Hotel Bristol was decorated by Sibalis & Rabner with furniture imported from Berlin. On the ground floor were the "Lover cloth shop", the "London City", where models wore English costumes; the "Lucky" lottery and a currency exchange office. The building has long been an emblem of the city, featured on many old postcards.

Renamed Hotel "Pescarus" by the communists, sold in the 1990s by O.J.T. The hotel is claimed by the former owner in dispute with the current owner. The only certainty is the physical condition of the building, which looks pitiful and from which, from time to time, bricks fall. The former hotel is not guarded by anyone, its windows are destroyed, the touching is damaged and most of the time it is missing, it has been ripped out and the ironwork destroyed. The general condition of the building is deplorable and could collapse at any moment.

Braila's old housing stock is badly affected by the passing time. The owners have changed hands, but none of them has rehabilitated or consolidated these dwellings, which have become ruins. The badly cracked fronts or balconies that are barely holding on to a few rusty wires, as well as the facades masked by a broken mesh, are also a danger for the inhabitants passing through the area (fig. 4).

The old residential area, where once there was an active life, a commercial flow and a cultural animation, is now just a place where the urban landscape shows only the bricks and the risk of their weight in possible free fall.



Fig. 2: Pescarus Hotel building - former Bristol Hotel, facade



Fig. 3: Pescarus Hotel building, framed in - central urban ensemble

Discussion

In the analysis of the perception of the population of the town of Braila regarding the visual population and the importance of the buildings (today ruins), two different aspects are recorded:

a. The perception of the inhabitants regarding the security degree or that related to the general appearance or visual pollution is summarized by the cloud of words showing the obvious danger that these buildings offer. The term "danger" is frequently mentioned along with "discomfort", "ugly" and others (fig. 5).

b. On the other hand, many of the inhabitants are aware of this negative from landscape point of view, but are equally convinced that the Historic Centre of Braila has remarkable architectural features, which give it a unique position in the Romanian national cultural heritage. The old historical centre of Braila is of outstanding value from an urban and architectural point of view. Braila has a complete set of historical buildings and monuments, heritage assets, and a historic centre full of ups and downs history. That is why it considers that there is not too high a cost for the rehabilitation of these buildings considered by most "symbols of local culture". "Local culture" and "symbol", to which are added the links with Greek, Armenian and Jewish culture, are terms mentioned by those who supported the rehabilitation of these buildings (fig. 6)

Conclusion

The visual pollution of the old buildings in the urban centre of Braila is a discomfort for those who live here and for those who visit the city. The cultural importance of these ruined buildings should be taken into account, especially by the local authorities and by those who have acquired them as property. The legislative framework unfortunately prevents many of the owners from doing so. There are disputes between former and current owners, but the ones who really suffer are the residents and tourists or visitors, who unfortunately "benefit" from this unpleasant aspect and the risk of being hit by materials that may come off.



Fig. 4: Facades of residential buildings in the investigation area



Fig. 5: Interview result - visual pollution of dilapidated buildings



Fig. 6: Interview result - the importance of decaying buildings in the view of residents

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Souhrn

Město lze oživit tím, že se odhalí jeho minulost a představí se všem, ale až po obnově budov. Formou cestovního ruchu, která by mohla nabídnout další šanci, je ten vzdělávací, který prostřednictvím workshopů může podnítit touhu po poznání minulosti tohoto města. Většina poznatků a informací se uchovává prostřednictvím vizualizace. Když jejich vzhled zanechává stopy a hrozí nebezpečí zřícení, stává se z emblematické a atraktivní budovy pro kolemjdoucí odpuzující. vzhledem k historii a architektuře tohoto města si zaslouží dostat šanci.

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WALK WITHOUT DESTROYING, PROTECT WITHOUT PROHIBITING ; NATURE : ACCESS UNDER CONDITIONS

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Abstract

Public policies and local administrations are faced with an unavoidable paradox: how to make nature accessible to as many people as possible, while protecting the environment and biodiversity from the excesses of over-frequentation? The growth of tourism in most national GDPs makes this activity a key sector of development. Pressure exerted on the territory by facilities and the presence of the public act directly as threats to nature. Depending on their interests, different social categories take different positions on the measures to be adopted to prevent and remedy the damage caused. Local balances of power directly determine how regulations are accepted and how they are received by those working in the field (farmers, hunters, members of associations, politicians, technicians, etc.). We will be guided by an anthropological approach that examines the relationship between man and nature, and the implementation of environmental protection policies. We will illustrate our remarks based on our field experiences: Corsica (France), Brittany (France), and Eastern Siberia (Republic of Sakha/Russian Federation).

Keywords: Biodiversity, Environmental policy, Mass tourism, Environmental management

Introduction

Since the development in Europe of a formal capitalist system, supported by liberal ideology and politics, the idea of continuous economic progress has been equated with the ability to control nature. Long ago, Marx established the link between the endless accumulation of capital, the exploitation of nature and human physiology, and the absence of moral limits (Marx 1993). Far from being a pure consequence of technical development, it is a deliberate implementation of free trade based on individual freedoms (Manent 2012). The liberation of land from the old rights and customs, of which communal landholdings were an essential category for the survival of the poorest peasant groups, will enable the commercialisation of land, particularly uncultivated and mountainous land, which is especially affected by current tourist flows and environmental protection. Tourism is one of the world's leading economic sectors, accounting for 7.6% of GDP in 2023. In terms of employment, the World Tourism and Travel Council estimates that 295 million people worldwide work in tourism-related jobs. At present, tourism can be seen as a major economic challenge for all countries, either by maintaining an already prosperous business in a highly competitive sector, or by the prospects for development it promises. We will first look at the issues linked to this unlimited economic potential, before analysing the consequences of overtourism on regions and policy management.

The apeiron¹¹ as an economic and ideological principle

In 1972, a report by the Club of Rome (financed by the Volkswagen group)¹² sounded like a thunderclap in the world of economists: it linked exponential economic growth to the depletion of natural resources. For the authors of the text, the human ecological footprint was becoming increasingly problematic, jeopardising not only the economic future of populations but also the ability of eco-systems to renew themselves. Since then, calls for degrowth have multiplied, arguing that the Earth's resources are limited (Latouche 2012) and that the notion of unlimitedness is dangerous (Garcia 2018), echoing Husserlian warnings about the disguise of the life-world (Husserl 1989).

Tourism between over-visitation and heritage development

¹¹ For more about the notion of apeiron (unbounded), see Detienne M. and Vernant J.-P., (1974), *Les ruses de l'intelligence ; La mètis des Grecs*, Paris, Flammarion ; '...in the mythical thought of the Greeks, there is a space similar to the expanse of the sea, where the boundless, the apeiron, oscillates between fetters that no one can untie and paths along which no one can travel. It is Tartarus... inhabited by furious winds, traversed by whirlpools, a place of total confusion, an undirected space, deprived of fixed directions and regular landmarks.' (pp. 278)

¹² Also known as the Meadows Review.

While it is easy to understand that tourist pressure on certain areas, already saturated by the resident population, has a strong impact on the environment, it is less easy to understand that all areas can be affected if they are already weakened by a polluting economy. Let's take a specific example.

The Republic of Sakha (Yakutia) in the Russian Federation covers an area of 3.103 million km² and has a population close to 950,000 inhabitants, almost 40 times the size of the Czech Republic. The economy is essentially based on mining, with the Republic's subsoil being particularly rich in materials of all kinds: gold, silver, diamonds, gas, oil, coal, etc. At first glance, it might seem that abundance and profusion characterise this region, opening up an unlimited economic future. Successive field trips have shown me the importance of nature in all its components (animals, plants, elements, etc.), including the supernatural (spirits), in the discourse of the inhabitants, particularly the Yakuts, but also the indigenous populations. Nowadays, this inclination is activated by an awareness of the damage caused by industry and mining, and an expression (freer than in Soviet times) of animist and shamanist representations and practices. Therefore, despite the vastness of the territory, it appears to be increasingly threatened by pollution, resulting in the destruction of fragile natural resources. From nuclear testing to the dumping of heavy metals in rivers and agricultural pollution (Maj 2006), we are witnessing a deterioration in the health of the local population and their health in general.

At present, almost a quarter of Yakutia has protected area status, and initiatives are being developed to try and make a breakthrough in the field of extreme tourism, based on showcasing an incomparable natural environment and even a specific gastronomy (Pestil 2021). The Amossov University in Yakutsk created a 'Heritage and Tourism' degree (Cultural Engineering) in 2008. While epidemics and international tensions are having a negative impact on the expansion of tourism in Russia, it is likely that tourism will continue to spread to areas that have been little affected until now. In this way, groups that have long been left out of economic development are being given a new role in line with the most globalised industry: that of tourism. The creation of heritage sites is an essential step in making an inventory of unexploited wealth and making it available to an extroverted society. In this way, the link between the globalised economy and local identity can be made. As Marie-Françoise Lanfant points out: '... on the one hand, the spread of tourism in the global economy is generating extroversion, de-territorialisation and globalisation; on the other hand, it is helping to re-root identities, in a territory, a system of filiation, a heritage, a great ancestor acting as points of support... as has often been pointed out, tourists, through their travels, are looking for what they feel they have lost in their own society: nature, purity, wisdom, childhood and origin, freedom' (Lanfant 1994: 438-439). Will this call for identity and authentic traditions find a favourable echo in Yakutia? Will the vastness of this territory be no more than a backdrop designed to guarantee the precarious survival of traditions that have long been discredited and are now being exploited?

A glance at the websites of the main tourism bodies, such as the World Travel & Tourism Council, is enough to convince us that the impact of tourism on the environment needs to be taken into account: dossiers on sustainable development, decarbonisation of transport, the virtuous use of water, etc. feature prominently in all the media (<https://wtcc.org/>). But, as Jean-Louis Caccomo puts it: 'It's obvious that what can contribute to the charm of a tourist destination can disappear under the very effect of tourist numbers. The same applies to tourism as to all human activities: we must be careful not to kill the goose that lays the golden egg' (Caccomo 2007: 205).

The result is the appearance of a strange figure, the tourist/anti-tourist, the bearer of '... the ultimate form of contempt: paradoxical contempt - that which the tourist holds for himself... Driven in turn by an anti-tourist hatred identical to that of the traveller or the xenophobic native, this state of mind leads the tourist to the worst excesses. They come to fear their own visit.' (Urbain 2002: 121-122). Agencies and the advertising industry, having confirmed this dimension of self-destruction, have been able to develop campaigns focused on promoting areas without tourists, aimed at... tourists: 'advertising... tells tourists that the land belongs to them, as long as they come there or over there before the 'others' come' (....). Sometimes, more mischievously, it tells them to come and see why others have already come, thus establishing the tourist in another role, that of a transcendent judge... Here, the tourist is led down the path of a pre-tourist illusion... There, he is led down the path of a meta-tourist illusion, another mirage, where he will be a superior tourist situated above the holiday crowd (Urbain 2002: 127).

We can see here that taking GDP alone as a measure of any economic activity leads to a simplistic view of the phenomenon as a whole¹³. We must take the ideological dimensions and their legal development into account.

¹³ As Bob Kennedy pointed out on 18 March 1968: "In a word, GDP measures everything except what makes life worth living".

Everyone's right to everything

In 1999, the UNWTO (World Tourism Organisation) adopted a Global Code of Ethics for Tourism (GCET) recognising the globalised dimension of tourism and its decisive role in the development of the Global South. Its preamble affirms: '... the right to tourism and freedom of movement for tourists' and the 'wish to promote an equitable, responsible and sustainable tourism order, whose benefits will be shared by all sectors of society in the context of an open and liberalised international economy'.

Article 7 states: 'The prospect of direct and personal access to the discovery and enjoyment of the planet constitutes a right equally open to all the world's inhabitants'. (<https://www.unwto.org/global-code-of-ethics-for-tourism>).

As Marie-Françoise Lanfant points out, the transition from the word charter to the word code is not insignificant; its normative objective is binding on the signatories, and we are moving from an asserted ethic to future legalism. The author sums up the process: 'Over the last few decades, tourism has gradually become a major phenomenon in contemporary societies. Tourism has become an integral part of the global landscape. All countries are affected, rich and poor alike' (Lanfant 2004: 368). The deleterious impacts of this globalised and globalising industry are becoming increasingly apparent to researchers, local populations and tourists themselves. The unbridled exercise of these rights is bound to clash with the ancient rights of indigenous groups to control and manage their territory. They also come up against measures designed to protect fragile environments. We can see that the multiplication of rights conceived individually and guaranteed by supranational institutions is coming up against measures designed to manage and protect biodiversity that have international value.

The proliferation of rights corresponds to the spread of liberal ideology and the capitalist economy throughout the world. This concept apparently contradicts the new focus in Western countries on a holistic analysis of the environment. Water rights were proclaimed, animal rights were strengthened, and the Rheinauer theses evoked the rights and dignity of plants. As Brewster Kneen points out, the 'Rights of Nature' embody a legal conception of the relationship between man and nature that is typical of Western anthropocentric culture (Kneen 2014). According to the philosopher Donna Haraway, 'since the Enlightenment, the obsession with the difference that separates what is human from what is not has been human exceptionalism' (Haraway 2008), which prevents us from building an 'alterglobalisation' (Haraway 2021: 9).

This exponential propensity has been pointed out by Jean-Claude Michéa: 'This right of all to everything ('take your desires for realities') obviously has as its logical correlate - no one being prepared to give in on his own desire - the right of all to complain about all. This is why the project of a world in which everyone would have the right to 'live without time out and enjoy without hindrance' inevitably carries with it its practical complement: the war of all against all through lawyers, a war that is still in its infancy but is already not just American.' (Michéa 2019: 76). The rhetorical and syntactic mastery of a double language consisting of campaigning for measures to protect nature and moving around without constraints belongs to what this author calls the green bourgeoisie (Michéa 2023: 19). Characterised as a new urban middle class, they assert their ideological specificity while seeking to approximate to the lifestyle of the upper classes, for whom mobility (along with economic and educational capital), cultural openness and mastery of foreign languages are the determining attributes (Hugrée, Penissat, Spire 2017). Let us now take a closer look at how biodiversity protection measures are put in place.

Problematic land management

In this context of the opening up of spaces and the disappearance of communities, the State intervenes to carry out a management process that is referred to in technical terms as land-use planning. In parallel with the expansion of the urban and peri-urban world, protected areas are being created in an increasingly wide range of nuances: National and Regional Parks, ZNIEFF, Natura 2000 zones, Man and Biosphere, etc. Each administrative and legal sphere is associated with measures designed to limit (or conditionally authorise) the actions of local populations and tourists. These restrictions have met with a lukewarm reception from local residents, as well as from temporary residents and tourists.

Examples of human/animal cohabitation

A paradigmatic example of the issues of cohabitation and conflicting interests is the reintroduction of species. The arrival of 'Italian' wolves in France via the Alps and the reintroduction of Slovenian bears in the Pyrenees have not failed to cause problems for farmers, hunters and hikers... Each human/animal encounter raises a controversy in which the legitimacy of the approach undertaken and supported by environmental associations is questioned. As Sergio dalla Bernardina states on his blog:

'I often say that, in the name of biodiversity, sheepfolds, including in Alpine pastures, will soon resemble the concentration camps for chickens so well illustrated in the animated film *Chicken Run*'¹⁴. The attacks by a bear in Liptovsky Mikulas (Slovakia) in March 2024 and the ensuing confinement of the population prove that cities are now concerned, and that animal excesses have an impact on human traffic.

We are even witnessing the reappearance of species that were thought to be extinct, and with them the emergence of problems that have not arisen before: for example, Winton's golden mole (*Cryptochloris Wintoni*), which has not been seen since 1936, has reappeared in South Africa near diamond mines. While there is no reason to fear attacks by this subterranean animal, industrialists may be apprehensive about the protective measures that could be taken. Calls for the preservation of biodiversity have their corollaries in management measures, a less controversial term than limitation or restriction. Let's give a few concrete examples of this governance.

Tourism accounts for 3.1% of global GDP. This average varies from country to country. In France, it was 7.5% in 2022, making France one of the world's leading tourist destinations (<https://www.campusfrance.org/>). A closer look reveals major regional variations: Brittany's share of GDP rises to 8.1% (<https://pro.tourismebretagne.bzh/etudes-chiffres-cles/>), while Corsica, the country's top destination, reaches 31% (<https://www.insee.fr/fr/statistiques/>). For the island, the economic take-off based on tourism (and agricultural monoculture) was a government decision designed to remedy the absence of industry, the rural exodus and the loss of jobs provided by the colonial Empire. At the peak of the tourist season, the island's population doubled (from approximately 340,000 to 700,000), although its distribution was not uniform. Regions renowned for the beauty of their sites were particularly popular. The Restonica valley, the Aiguilles de Bavella and the Calanques de Piana, which are particularly popular and recommended by all the tourist guides, are the most popular areas. The Environment Office has suggested that certain sensitive sites should be subject to visitor quotas. For example, the Scandola reserve (a UNESCO World Heritage site)¹⁵, which is a must for visitors to the island, sees an influx of tourists from all over the world. As a result, the osprey (*Pandion haliaëtus*), an endangered species and a tourist attraction on boat tours, has become a bone of contention between local stakeholders. Incessant visits and engine noise are disrupting nesting and bird numbers are stagnating. Tourism professionals have spoken out against the planned measures, calling them economic assassination. The fact that the restrictions would not apply to Corsican residents was denounced by the French media, which spoke of discrimination. In reality, it's all just talk, and on the ground it's proving very difficult to decide on and enforce measures that risk turning away large numbers of tourists from certain sectors. Caught between the desire and the obligation to protect nature and the need not to hinder the tourist windfall, politicians are prevaricating and the phenomena of congestion remain unresolved.

Overcrowding also affects Brittany's coastline. Access to certain beaches on the Crozon peninsula in Finistère (Kerséguinou, Goulien, La Palue, etc.) has been restricted. Unauthorised camping, the large number of vehicles and car parks and the inconvenience caused to residents led the mayor of the commune to take restrictive measures. Restrictions on access, use and visitor numbers are rapidly coming under attack in France as being contrary to freedom of movement, or even an infringement of human rights. Surfers, as a sporting and practising population, are particularly mobilised against what they see as discrimination. Conciliation meetings, demonstrations and rallies, petitions and the creation of associations are the most frequent consequences of these processes. Understandably, situations are becoming increasingly intractable both administratively and politically, giving rise to inter-group conflict.

Local tensions

While the tourism industry is largely in the hands of the private sector, it is up to governments, public administrations and local institutions to take and enforce measures to protect the environment. But insofar as tourism and the free movement of citizens have become rights, we are witnessing an increasingly flagrant contradiction between the guarantees granted to tourists and the policies restricting the exercise of these rights. In other words, it is up to the public authorities to put in place sustainable tourism (sustainable, green, etc.) to protect natural resources that are non-renewable or difficult to renew. Local authorities, and mayors in particular, are on the front line when it comes to enforcing and respecting decisions designed to protect biodiversity, while at the same time linking them to sustainable tourism.

¹⁴ The anthropologist is keen to emphasise that the pressure to defend biodiversity must not be restricted in any way: 'Need I say that I, too, care enormously about biodiversity? The problem is not biodiversity, of course, but the misuse, the instrumental use, that can be made of this notion'. <http://lanimalcommepretexte.blogspot.com/search/label/biodiversite>

¹⁵ <http://www.ecase-pnrc.fr/reserve-naturelle-de-scandola/>

Among the tools designed to reduce the effects of overtourism on the environment as far as possible, we might briefly mention the following, without claiming to be exhaustive¹⁶:

- Quotas: set a *numerus clausus* of visitors that must not be exceeded, and prohibit access to excess visitors.
- Dispersal: offer visitors the chance to discover other sites that are less frequented because they are less famous but of equivalent interest
- Extensions: stagger the season to avoid overcrowding in summer and winter
- Demarketing: inform tourists of the number of visitors per day and per hour, so that they can spread their visits out more evenly.
- Raise awareness of good practice among local players and site users

Objective documents or DOCOBs (of the Natura 2000 type, for example) set out the issues and objectives for sustainable development on protected sites: they 'are based on a balance between environmental issues, determined by the specific aims of the Natura 2000 network, and local socioeconomic issues, defined by the local characteristics of human activities on the Natura 2000 site'. Their aim: 'is to contribute to halting, on a European scale, the loss of biodiversity observed in recent decades, on the basis of a list of habitats and species to be preserved' (Ragot, 2014 for the Glénans archipelago in Brittany). The documents, which are produced by experts (biologists, ecologists, etc.), include scientific analyses of the environment, economic and social data and recommended management measures. We will confine our observations to the work of Francesco de Castri and his reservations about measures of carrying capacity for sustainable tourism, as well as his insistence on taking social factors into consideration rather than purely technical or mathematical ones: the primary role of local entrepreneurship, the cultural homogeneity of the population, the maintenance of diversified activities, the ability to adapt to change, etc. (De Castri 2002).

Since preservation measures have been taken, it is not difficult to observe the development of a feeling of dispossession among rural populations and resident professionals. Peasants, now farmers, have become a minority and are struggling to gain recognition for their active role in nature conservation following campaigns denouncing the use of inputs¹⁷. Hunting and gathering, marginal and symbolically disinvested economies, considered economically irrational, are being downgraded by part of the urban bourgeoisie. Even projects that combine ecology, tourism and the economy do not automatically meet with local approval.

An example of this is the old but very significant project to create the Ariège National Park, which was rejected by the local population in 1974 and again in 1979. Faced with its general decline (rural exodus, decline in agro-pastoralism), mountain society reacted unfavourably to what it interpreted as a form of guardianship. The specialisation of areas (zoning), the transfer of power (from the local level to the Park Authorities) and the increased regulation of the territory and of activities were often rejected by livestock farmers. Traders were more nuanced depending on their geographical location: those belonging to the most 'integrated' communes were more conciliatory, while those located in marginal areas were more reserved. The refusal in 1979 led to a slow process of associative work in favour of the creation of a park, highlighting the fact that behind the general reactions there were divergent interests. As Guy Deiller puts it: 'The Haute-Ariège, a privileged scene of confrontation between urban society and rural mountain society, has seen the development of a capacity for resistance that varies according to the adaptability and integration of the various social groups that make it up (livestock farmers, small traders, the commercial bourgeoisie, notables, local elected representatives, etc.) and at the same time has seen the emergence of internal conflicts within its own organisation, the first signs of the break-up of a traditional society in difficulty' (Deiller 1982: 164). In 2009, the Ariège Pyrenees Regional Nature Park took over from these unsuccessful attempts.

The set of measures, briefly outlined, is accelerating the development of a nature policy outside its traditional players: the new function of nature as a space for leisure and recreation contrasts with the investment of rural communities in the territory as a productive space. Regulations governing access to land, the fruit of power relations between rural elites and communities, gave way to standards that

¹⁶ According to an Evaneos survey carried out by OpinionWay in January 2024: 'Three quarters [of French people] say they are looking for holiday destinations with few tourists (75%) and itineraries off the beaten track (72%). Many travellers (52%) even go so far as to support the introduction of quotas to limit over-visiting of sites.' <https://www.lechotouristique.com/article/surtourisme-ce-que-pensent-les-francais>

¹⁷ In agriculture, the term 'inputs' is used to describe the various products that are added to land and crops and that do not originate on the farm or nearby. Inputs are not naturally present in the soil, but are added to it to improve crop yields, the main ones being: fertilisers: fertilisers and soil improvers, pesticides: products used to eradicate crop pests, growth promoters or retardants, seeds and seedlings. <https://agriculture-de-conservation.com>

were seen as being imposed from outside and limiting old rights, thus creating traditional offences (Jamin 1982).

Conclusion

The natural environment has long been a strategic site of confrontation between the citizen and the powers that be (Bromberger, Lenclud 1982), and is also becoming the intersection between new rights (granted to tourists, but also to animals and even to nature itself) and systems of control dictated by the imperatives of protection orchestrated by supranational bodies. In 1972, the sociologist Michel Clouscard used his well-known phrase 'anything goes, nothing is possible' to highlight the aporias of the liberal/libertarian ideology. By dialectically articulating economic liberalism and cultural libertarianism in their fundamental unity, he called for apparent oppositions to be overcome. In this way, the mechanisms for protecting Nature (largo sensu) that correspond to the ideology of cultural libertarianism are integrated into the destructive processes that ultimately determine and control them in the interests of economic liberalism. In other words, we need to give back to the market (of which tourism is a part) the culture it generates (i.e. the culture of environmental protection). The role of the law here is that of an intersection between its abstract declensions (the right to tourism, the right to free movement, etc.) and its corrective readjustments, the latter intended to compensate for the damage caused by the extension of the former.

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Souhrn

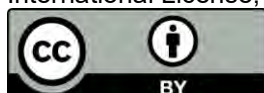
Veřejné politiky a místní správy čelí nevyhnutelnému paradoxu: jak zpřístupnit přírodu co největšímu počtu lidí a zároveň chránit životní prostředí a biologickou rozmanitost před nadměrnou frekvencí? Růst cestovního ruchu ve většině národních HDP činí z této činnosti klíčové odvětví rozvoje. Tlak, který na území vyvíjejí zařízení a přítomnost veřejnosti, působí na přírodu přímo jako hrozba. Různé společenské kategorie zaujímají v závislosti na svých zájmech různé postoje k opatřením, která je třeba přijmout k prevenci a nápravě způsobených škod. Místní rozložení sil přímo určuje, jak jsou předpisy přijímány a jak jsou přijímány těmi, kteří pracují v terénu (zemědělci, myslivci, členové sdružení, politici, technici atd.). Budeme se řídit antropologickým přístupem, který zkoumá vztah mezi člověkem a přírodou a provádění politiky ochrany životního prostředí. Své poznámky budeme ilustrovat na základě zkušeností z terénu: Korsiku (Francie), Bretaň (Francie) a východní Sibiř (Republika Sacha/Ruská federace).

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WAYS OF BUILDING A RECIPROCAL RELATIONSHIP BETWEEN THE INTERVENTION AND ITS HOST STRUCTURE

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Abstract

The presented article deals with the observation of the reciprocal relationship at the level of architecture - landscape - recipient, in the environment of white spaces. The definition of reciprocity is commonly understood as mutual exchange and dependence. The term for the purposes of this paper describes the mutually beneficial two-way processes between the environment and intervention in the landscape. The unused space in the form of an urban void is perceived as a host structure that serves as a background and a territory for the intervention. As intervention benefits from what the environment can offer — landscape, location, greenery, views, axes, connections, openness, intimacy, operation, background, colour, materiality and many other attributes that deliver quality, then the white space, on the contrary, benefits from the new form, which draws attention to the location, attracts recipients who begin to use and occupy the place, provides connectivity to the site and the transit function turns into a residential function. The paper presents a situation of introducing an intervention — a wooden installation called "AMFI", into the white space environment. It is an anti-amphitheatre, or a house that cannot be entered, an object that cannot be inhabited. Using the example of this specific reciprocal relationship, the article further describes the individual aspects of the issue.

Keywords: architecture of reciprocity, intervention, recipient, host structure, landscape

Introduction

Research of the reciprocal relationships between architecture and landscape is a long-term process studied in time. On the other hand, every intervention in the environment requires a set of detailed spatial analyses, within which the composition of the site is investigated. In the design process, these mutual compositional relationships must be translated into the design. If this connection does not work in the initial steps of the design process, it is very likely that even the mutual symbiosis will not arise over time. The architecture of reciprocity takes an interest in the impact of its own existence. It creates space for reciprocal relations between recipients, in society, between people and nature, and forms them on its own (Melková & Cikán, 2020). From the point of view of landscape architecture, public space is mostly open and harmoniously integrates a certain work, an idea with the phenomenon of the place of origin. Therefore, the naturalness of the intervention is important for the space – host structure, where even a small design object can enhance the overall open-space quality. 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). Sometimes an interesting small architectural element or a site furniture can revive non-functional open spaces and make users stop, think, relax, interact, and socialise (Tóth, 2022), (Prochnow & Čibík, 2022). Small-scale invasive short-term interventions are the opposite of ignoring the problem or perceiving only obstacles to potential solutions (Čibík, 2023).

Materials

The images presented in this article are of the ephemeral intervention designed by using research methods based on visual thinking. The wooden installation called "AMFI" is a free-standing space-creating object - an element of small-scale architecture that opens up to different interpretations. The name derives from the ancient Greek ἀμφιθέατρον (amphitheatron), where the ἀμφί (amphi), means "on both sides" or "around" and θέατρον (théatron), means "place for viewing". However, its primary function is not, as it appears, residential. It functions as a detail in the landscape and as an intermedial exhibition object that allows the installation of various works of art and the realisation of performative acts outdoors. Unlike a regular amphitheatre or tribune, the object does not serve the recipient to better observe art (place for viewing), but the art is the object itself.

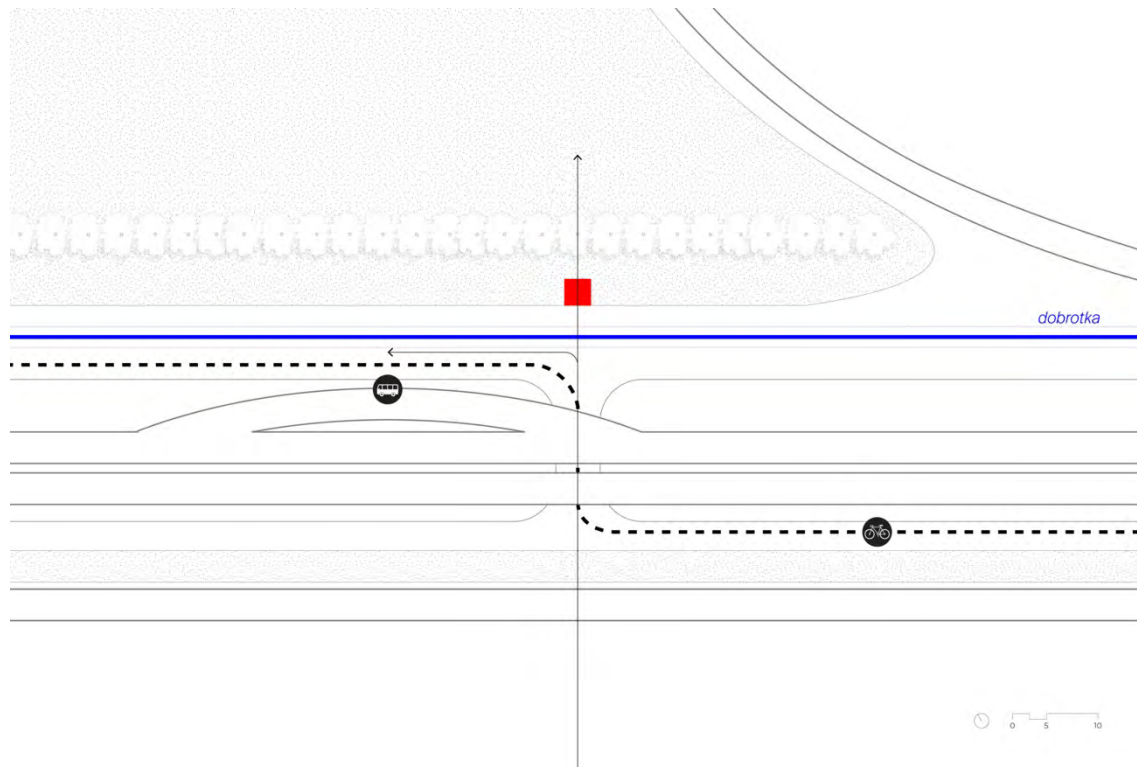


Fig. 1: The installation is located on the frequent cycle route from Nitra to Dražovce. It appears to cyclists and pedestrians after exiting the tunnel as a “jewel” located at the end of this axis. The meandering cycle path is accompanied by the local stream, which acts here as a physical (not optical) barrier to entering the immediate vicinity of the architecture. The result of which is the prevention of the residence function and the underlining of the viewing function. The installation is accessible from the opposite side and a relatively long route leads to it. Source: author

It is located on the border of the town residential area and the rural area of the regional capital Nitra, Slovakia in the city district Dražovce. In recent years, this territory is gradually being replaced by massive industrial production, which is slowly occupying even the last remnants of open land (Fig 1.). That is why the research in its initial stages focused on this peri-urban area, and the result is not only a well-thought-out and functioning architecture, but also a sensitive perception of the wider context. The intention of presented short-term installation is to invasively occupy the space of the lost land and offer an alternative solution for its future use.

Results

The presented intervention is just one element of an ongoing research project. The project deals with the possibilities of restoration and reintegration of forgotten and lost places through invasive small-scale interventions of a multimedia nature. Such undemanding impulses are an effective tool to reintegrate residual dysfunctional structures into the urban fabric. The term “invasive”, which the presented research introduces in connection with urban or peri-urban interventions, is perceived mostly negatively. 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 objects appear within urban or peri-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. Despite the semantic meaning of 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 or peri-urban spaces, activities or impulses stimulating their beginning.

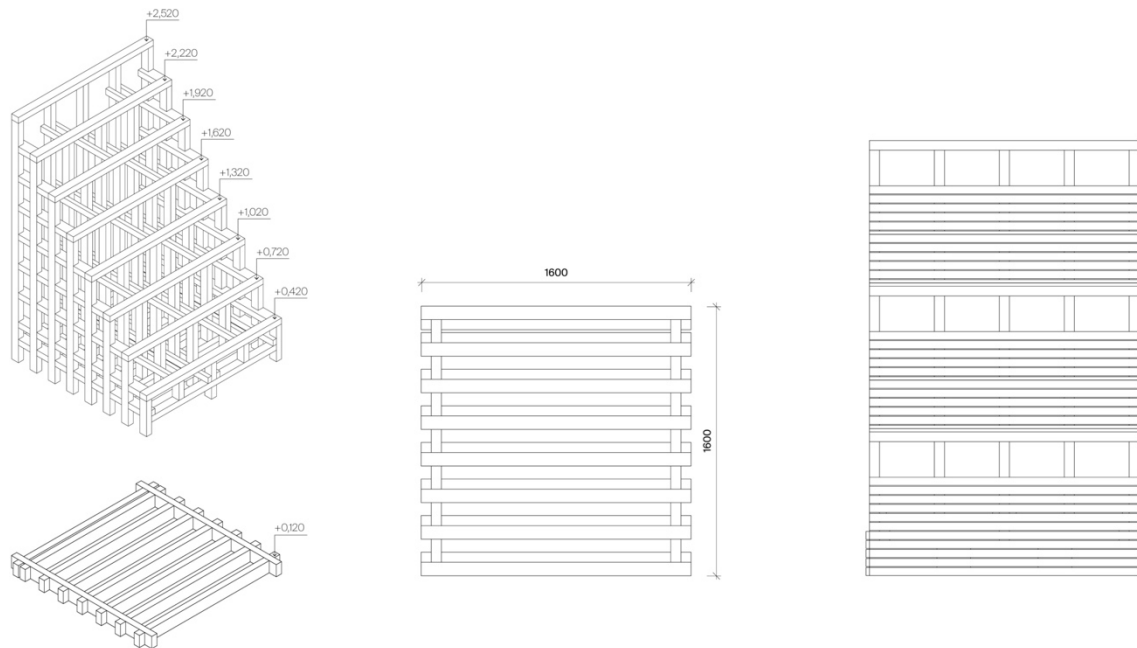


Fig. 2: AMFI consists of eight frames at different heights, which are intertwined with a relatively dense structure of support profiles. This secondary mass creates atypical "stairs" from the frames. Gaps in the cladding on the individual steps indicate that users should not sit on them. Source: author



Fig. 3: The object is not an amphitheatre, stage, or a grandstand. It is an exhibition area that interacts with the surrounding environment. It is a wonder that began to inhabit an empty space without a function. On the stream banks, aquatic plant communities (herbaceous vegetation) grow up to the height of the first level of the installation, which together with the background creates a pleasant gradient. The grass around the object is regularly mowed by the landowners. Source: Peter Bednár



Fig. 4: From the front view, the surface timbers create a wall - an exhibition area. This area is intended for the own interpretation of everyone who interacts with it. Source: Peter Bednár



Fig. 5: The object creates a symbiosis with the surrounding greenery, which fulfils an important role in the space of the installation. The line of greenery formed by the alley of lime trees in the background acts as a scenery and at the same time borders the space visually and physically. Source: Peter Bednár



Fig. 6: The result after the first day of the construction. Axial connection to the tunnel for cyclists.
Source: Peter Bednár

Conclusion

The presented intervention into an open landscape is an example of a reciprocal relationship, where the object benefits from the attributes of the location (views, axes, connections, openness, intimacy, operation, background, colour, materiality) and, conversely, the environment benefits from the new installation as a new form. AMFI is a contextual contribution to the silent landscape. The unused place in the peripheral area received a new dimension, function, and character after the installation of the exhibition object.

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Souhrn

Předkládaný článek prezentuje reciproční vztah mezi intervencí a krajinou na příkladu dřevěné instalace s názvem AMFI. Objekt je umístěn na periférii města Nitra, v její industriální části v rámci průmyslového parku. Výběr lokality se stal v rámci této příměstské oblasti klíčovým, výsledkem čehož

je nejen promyšlená a fungující architektura, ale také citlivé vnímání širších souvislostí s ohledem na symbiózní vztah mezi intervencí a hostitelskou strukturou.

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WILL THE GLOBAL CLIMATE CHANGE-INDUCED CHANGES IN THE STRUCTURE OF OUR FORESTS BRING ABOUT A SIGNIFICANT CHANGE IN THE REPRESENTATION OF ALLERGENIC TREE SPECIES?

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<https://doi.org/10.11118/978-80-7509-963-1-0399>

Abstract

The dominant negative effect of forests, or forest trees not only for recreation in forests and their surroundings but also for the health of the population is caused by pollen allergies of some trees. In the territory of Central Europe, it is mainly hornbeam (*Carpinus betulus*), birches (*Betula sp.*), and alders, especially common alder (*Alnus glutinosa*). Climate development scenarios published by the International Panel on Climate Change (IPCC) until the year 2100 indicate that with the trend of increasing air temperature, there will be a significant change in the habitat conditions of our forests and thus probably also a change in their structure. It can be assumed that a change in the structure of forests will mean, among other things, an increase in the proportion of deciduous trees. The article indicates the possible development of the representation of allergenic tree species on the territory of the Czech Republic and the influence of this development on the recreational and health-hygienic potential of forests in the near future.

Keywords: Allergic tree species, recreational forest function, health-hygienic forest function

Introduction

Climate development scenarios published by the International Panel on Climate Change (IPCC, 2021) until the year 2100 indicate that with the trend of increasing air temperature, there will be a significant change in the habitat conditions of our forests and thus probably also a change in their structure. This change will extend the growing season, which will cause long-term stress to forest trees. This stress will lead not only to functional changes in forests, such as their hydrological shift (Kupec et al., 2021), affecting their water use efficiency (Kupec et al., 2018), but also to a change in the distribution of altitudinal forests zones (AFZ) and drought (e.g. Vahalík, 2012).

In this context, significant changes can also be expected in the woody composition of forests and non-forest tree vegetation. In view of the expected increase in the proportion of lower AFZs, an increase in the proportion of woody species that are bound to these AFZs can also be expected. Because the main allergenic trees in the Czech Republic are hornbeam (*Carpinus betulus*), birches (*Betula sp.*), and alders, especially common alder (*Alnus glutinosa*), i.e. trees of lower AFZ, an increase in the proportion of these tree species can also be expected. This can negatively affect the allergen load of vacationers in the forests and the landscape as such.

Material and methods

IPCC has published several scenarios of the changes in surface temperature until the year 2100 (IPCC, 2021), see Figure 1. Excluding the most extreme ones there is a real expectation of the surface temperature increment between 1.4 to 4.4°C until the year 2100 in Central Europe.

Current forests in the Czech Republic consist of a mix of coniferous and broadleaf tree species with slightly prevailing coniferous ones. The proportion of allergenic tree species is low in general (see Table 1 – allergenic tree species in bold).

The results presented below were obtained by modeling the changes in AFZ proportions due to changes in the average surface temperature by 1 - 3°C according to Vahalík (2012). In connection with this, conclusions were formulated for forecasting the likely spread of allergenic wood species. Valid calculation is done for the hornbeam.

a) Global surface temperature change relative to 1850-19

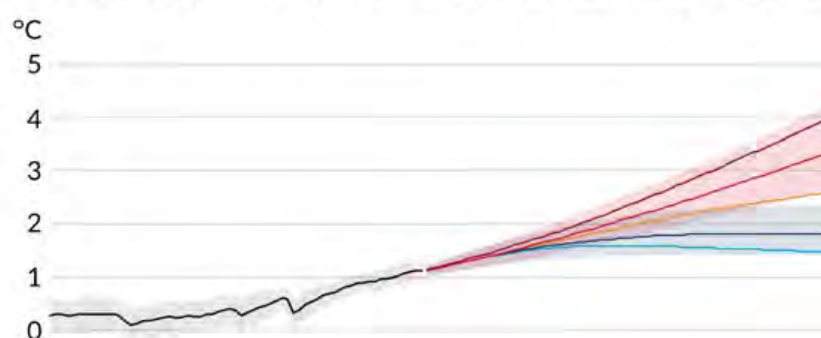


Fig. 1: Scenarios of the changes in surface temperature until the year 2100

Source: Summary Report on the Sixth Assessment Report of the Intergovernmental Panel on Climate Change

Tab. 1: Current proportion of tree species in the Czech Republic in %

Jehličnany	57,8	Listnáče				42,2
Smrk ztepilý	43,1	Buk lesní	10,5	Olše		2,4
Jedle bělokorá	0,9	Duby	8,2	Břízy		4,2
Borovice lesní	9,6	Habr obecný	2,4	Ostatní list. tvrdé		3,9
Modřín evropský	3,2	Javory	4,1	Ostatní list. měkké		4,9
Ostatní jehličnaté	0,9	Jasany	1,6			

Source: Czech forest think tank: NIL II 2011 - 2015

Notes: Jehličnany	Coniferous	Listnáče	Broadleaf
Smrk ztepilý	Norway spruce	Buk lesní	Beech
Jedle bělokorá	White fir	Duby	Oaks
Borovice lesní	Scotch pine	Habr obecný	Hornbeam
Modřín evrop.	European larch	Javory	Maples
Ostatní jehl.	Other coniferous	Jasany	Ash trees
		Olše	Alders
		Břízy	Birches
Ostatní list. tvrdé/měkké		Other broadleaves hardwoods/softwoods	

Results

The impacts of global climate change (GCCCH) mean in Czech forests (with a change in average temperature of approx. 0.8°C over the last 20 years):

- Extension of the growing season by about 3 to 4 weeks
- Mild winters (less snow, the ground does not freeze, or only a little)
- Reduced dormancy (winter rest)
- Prolongation of physiological activity in the season
- Extending the time of transpiration in the season
- Loss of available water in the soil
- Long-term stress of forest trees

All of this can (and probably will) result in a change in the distribution of altitudinal forest zones (AFZ) (e.g. Vahalík, 2012) so that the proportion of lower AFZs and the tree species occurring in them will increase dramatically. This will also be related to an increase in the share of allergenic wood species, which are mostly linked to lower AFZ. Table 2 gives a possible prediction of the development of the distribution of AFZ at different increases in the average annual temperature and a prediction of changes in the spread of hornbeam.

Tab. 2: Model changes in the proportion of altitudinal forest zones in CR according to different GCCH scenarios with special regard to lowland and lower upland AFZ

Altitudinal forest zone	Proportion in forests in CR (%)				Proportion in landscape in CR (%)			
	Current	+ 1°C	+ 2°C	+ 3°C	Current	+ 1°C	+ 2°C	+ 3°C
1. Oak	8.3	11.3	24.9	32.9	12.5	17.0	37.5	49.5
2. Beech-oak	14.9	24.8	16.4	21.9	15.0	25.0	16.5	22.0
3. Oak-beech	18.4	20.2	19.9	12.9	30.0	33.0	32.5	21.0
4. Beech	5.7	4.6	2.1	1.4	16.0	13.0	6.0	4.0
5. Fir-beech	30.0	11.8	7.9	4.7	19.0	7.5	5.0	3.0
6. Spruce-beech	12.0	8.0	5.3	1.3	4.5	3.0	2.0	0.5
7. Beech-spruce	5.0	3.0	1.3	0.0	2.0	1.2	0.5	0.0
8. Spruce	1.7	0.7	0.0	0.0	0.7	0.3	0.0	0.0
9. Dwarf pine	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0
1 - 4 AFZ	47.3	61.0	63.4	69.0	73.5	88.0	92.5	96.5
Hornbeam (%)	1.3	1.7	1.7	1.9	2.4	2.9	3.0	3.2

Table 2 shows the potential dramatic increment of lowland and lower upland AFZ proportions when specific climatic scenarios come true. In line with the changes in the AFZ proportions will come an increment of the hornbeam proportion.

Discussion and conclusion

Climate change will certainly cause fundamental changes in the composition of the forests of the Czech Republic, or in the distribution of tree species in general (but that is for another and longer lecture). These changes will not only be in the species composition but also in the spatial structure of the forests, including geographical changes in the distribution of altitudinal forest zones. Social changes will be reflected in this change, not only in connection with the effects of GCCH.

The prediction of the development of the representation of the main allergenic tree species in connection with the impacts of GCCH in Czech forests can be as follows:

- The concept of "natural forests" will be replaced by the concept of "adapted forests".
- The representation of birch in forests will not change in the long-term time scale (2.8%)
- The representation of alder (1.7%) will probably decrease due to the general drying out of forests, the prediction of 0.6% is realistic in a horizon of about 20 years.
- The representation of hornbeam (1.3%) will probably increase as a result of the application of adapted forests, changes in the scope of LVS and as a result of its resistance to the impacts of GKZ, the total proportion may be up to 3% in the next 20 years.
- A significant change in the composition of allergenic pollen can thus be expected in about 40 years.

Outside of lands purposed for the fulfillment of forest functions, the following can be expected:

- Significant increase in the proportion of hornbeams in the so-called scattered landscape greenery up to altitudes of around 450 m above sea level (5% maybe more).
- Preservation of the proportion of alder as especially the basic type of vegetation accompanying watercourses (2.4%).
- Reduction in the proportion of birch (4.2%).

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Souhrn

Článek se zabývá potenciální změnou proporcí zastoupení alergenních dřevin jakžto driveru negativního vlivu lesů na rekreaci, resp. zdraví obyvatelstva obecně, v důsledku změny průměrných teplot jakžto důsledek klimatické změny.

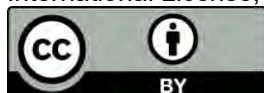
Na území střední Evropy lze za významné alergenní dřeviny považovat především habr obecný (*Carpinus betulus*), břízu (*Betula sp.*) a olše, zejména olši lepkavou (*Alnus glutinosa*). Scénáře vývoje klimatu publikované Mezinárodním panelem pro změnu klimatu (IPCC) do roku 2100 naznačují, že s trendem zvyšování teploty vzduchu dojde k výrazné změně stanovištních podmínek našich lesů a tím pravděpodobně i ke změně jejich struktury. Lze předpokládat, že změna struktury lesů bude znamenat mimo jiné i zvýšení podílu listnáčů. Článek naznačuje možný vývoj zastoupení alergenních dřevin na území ČR a vliv tohoto vývoje na rekreační a zdravotně-hygienický potenciál lesů v blízké budoucnosti v tom smyslu, že koncept „přirozených lesů“ bude nahrazen konceptem „adaptovaných lesů“, zastoupení břízy v lesích se v dlouhodobém časovém měřítku nezmění (2,8%), zastoupení olše (1,7%) se pravděpodobně sníží v důsledku obecného vysychání lesů a zastoupení habru (1,3%) pravděpodobně vzroste v důsledku aplikace adaptovaných lesů, změny rozsahu LVS a v důsledku jeho odolnosti proti dopadům GKZ. Signifikanční změnu složení alergenních pylů z lesů (PUPFLu) lze očekávat za cca 40 let. Mimo pozemky určené k plnění funkcí lesa lze očekávat výrazný nárůst proporce habru v tzv. rozptýlené krajinné zeleni, a to až do nadmořských výšek kolem 450 m n. m. (5% možná více), zachování proporce olše jako zejména základního druhu vegetačních doprovodů vodních toků (2,4 %) a snížení proporce břízy (4,2 %).

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YOUTHS PERCEPTIONS OF AGROFORESTRY IN UGANDA: MOTIVATIONS AND WILLINGNESS TO PARTICIPATE IN HIGHLAND AGROFORESTRY TREE PLANTING AND LANDSCAPE PROTECTION

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Abstract

This study investigates public (youths) willingness to participate in highland agroforestry tree planting initiatives and perceptions of agroforestry in Uganda. Through a questionnaire survey (N= 1138), data were collected on respondents' willingness to engage in agroforestry activities, motivations for participation, preferred methods of participation, and perceptions of agroforestry effectiveness. Results indicate a strong overall willingness among respondents to participate in highland agroforestry tree planting, with 89.3% expressing willingness. Primary motivations for participation include environmental conservation, water regulation, and soil conservation. Younger respondents and those with higher education levels demonstrated a greater willingness to participate, suggesting that demographic factors influence attitudes towards agroforestry. Planting tree strips emerged as the preferred method of participation, followed by planting indigenous tree species and practising sustainable agriculture methods. While respondents generally rated agroforestry effectiveness moderately, they perceived land and forest degradation in Uganda as significant issues. These findings underscore the potential for expanding agroforestry practices in Uganda's highlands and highlight the importance of targeted outreach and education to engage diverse demographic groups in environmental conservation efforts and support for Eco-Tourism. Future research should focus on optimizing agroforestry interventions to address perceived barriers and enhance their effectiveness in mitigating land and forest degradation, and possible impact on Eco-Tourism in the region.

Keywords : Agroforestry, Eco-Tourism, Environmental conservation, Landscape Protection, Ugandan Highland

Introduction

Agroforestry, the integrated management of trees, crops, or livestock on the same land area, has gained recognition as a sustainable land use practice that can contribute to environmental conservation, food security, and rural livelihood improvement such as on Eco-Tourism incomes (Nair, 2012; Garrity et al., 2010). In Uganda, a country characterized by diverse ecosystems and high land and forest degradation levels, agroforestry holds significant potential for addressing environmental challenges while supporting rural development (Nkonya et al., 2011; Mbow et al., 2014). However, the successful adoption and implementation of agroforestry initiatives depend on the willingness of local communities to engage in tree-planting activities and their perceptions of agroforestry's benefits and challenges.

This study aims to investigate the public's willingness to participate in highland agroforestry tree-planting initiatives in Uganda and assess their perceptions of agroforestry practices in both local and general contexts. Through the analysis of survey responses, the study aims to determine the factors influencing individuals' willingness to engage in agroforestry activities and to evaluate the overall perception of agroforestry's effectiveness in addressing land and forest degradation in Uganda's highlands.

Agroforestry has been recognized as a multifunctional land use system that can contribute to a range of environmental, social, and economic benefits (Jose, 2009) especially at the time of deforestation and high wood fuel demand in the country (Bamwesigye & Hlavackova, 2018; Bamwesigye et al.,

2020a; Bamwesigye et al., 2020b; Bamwesigye et al., 2020c, Bamwesigye, 2023). By integrating trees into agricultural landscapes, agroforestry practices can enhance soil fertility, improve water management, mitigate climate change, and provide additional sources of income and nutrition for farmers (Garritty et al., 2010; Kiptot et al., 2014). In Uganda's highlands, where land degradation and deforestation are significant challenges, agroforestry offers a promising approach to restoring degraded ecosystems and promoting sustainable land management (Nkonya et al., 2011; Mbow et al., 2014).

Understanding the factors influencing individuals' willingness to engage in agroforestry activities is essential for designing effective extension programs and policy interventions to promote agroforestry adoption (Franzel et al., 2004). Moreover, assessing public perceptions of agroforestry's benefits and challenges can help identify barriers to adoption and inform communication strategies to promote greater acceptance and uptake of agroforestry practices (Snapp et al., 2002; Mercer et al., 2012).

This study utilizes survey data collected from individuals residing in Uganda's highland regions to address these research objectives. By analyzing survey responses, the study aims to identify key determinants of willingness to participate in agroforestry tree planting initiatives and to explore public attitudes towards agroforestry as a sustainable land use practice. The findings of this study are expected to provide valuable insights for policymakers, practitioners, and researchers seeking to promote agroforestry adoption and sustainable land management in Uganda and similar contexts.

Material and methods

The study was conducted across Uganda, and East Africa. The survey was shared nationally on major online/social media such as WhatsApp, LinkedIn, and Twitter, among others. Most responses were from the youth, who also happen to be the primary users of such media. Social media has been widely used in data collection by survey software because of its advantages over traditional face-to-face data collection techniques. The advantages include time and labour savings in data collection and more diverse responses from different districts, regions, religions, and age groups. However, the online questionnaires also have shortcomings, such as not considering non-internet users, limited follow-up questioning and probing where necessary.

The qualitative part of the online questionnaire included structured and semi-structured questions. The questionnaire was pretested and shared with experts for professional and technical consideration. For example, the study consulted the professional gender body (Non-Governmental) in Prague, the Czech Republic, for their opinions and advice about questions to deal with women regarding climate change and energy. This is because the questionnaire included questions ranging from climate change, energy at the household level, and the role of women in solving the related problems to these variables.

Software settings that limited responses from one individual to another avoided online data collection limitations, such as multiple responses/duplications. This not only builds confidence in the data collected but also helps obtain the desired data for the study. More so, all control measures were observed to facilitate quality output.

The questionnaire was launched online on 18/01/2023 and closed on 02/04/2023. Although 1844 respondents visited the questionnaire link, only 1138 completed it, accounting for approximately 62% of the total respondents.

The collected data were checked for accuracy, and simple description graphs and tables were made to illustrate the data.

The links to the raw data are also available: osf.io/qathv.

The data characteristics include the genders of 64% (728) males, 35.9 (408) females, and 0.2% (2) others.

The age results of the respondents are as follows: the majority of the respondents were youth, composed of 92%. 18-25 were 60.4%, and 26-35 were 31.6%. More so, the age group 36-45 accounted for 7%, leaving the other age groups less than 0.5% of the respondents.

The employment data showed that 30.5% (347) of the respondents were working. The largest number, 52.4% (596), were students. 16.7% (190) were unemployed, while others were 0.4%.

Results

The research discovered that a significant number of people are eager to take part in planting trees for highland agroforestry projects, with 89.3% showing interest in getting involved (Figure 1).

Reasons cited for their willingness include the desire to protect nature (81.2%), support water management and conservation (32.9%), and preserve soil health (44.7%). Some participants were also motivated by financial incentives, with 30.1% indicating they would participate for monetary reasons (Figure 2).

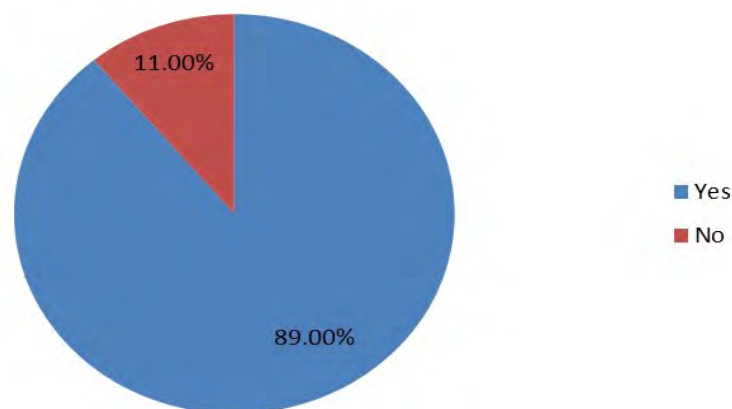


Fig. 7: Willingness to Participate in Agroforestry in Uganda

When it comes to how they prefer to participate, most respondents (73.0%) favoured planting tree strips, followed by choosing indigenous tree species (47.5%) and adopting sustainable agricultural practices (42.2%). On the other hand, fewer individuals were willing to contribute financially (13.2%) or regulate livestock numbers (24.1%) (Figure 3).

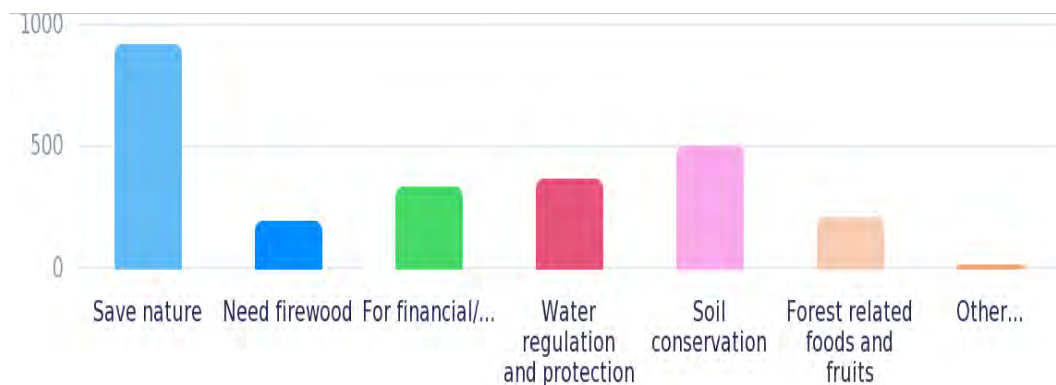


Fig. 8: Reasons cited for their willingness to participate in Agroforestry

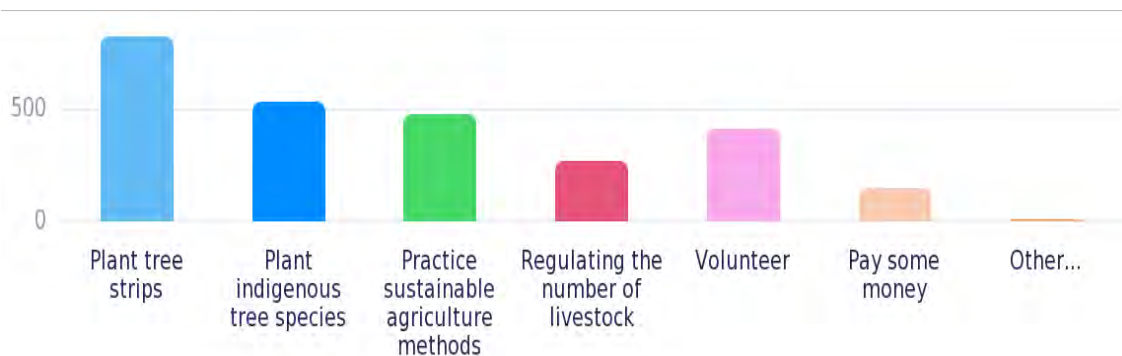


Fig. 9: How to participate in agroforestry in Uganda's highlands

The study highlighted differences in willingness to participate based on demographics. Younger individuals and those with higher education levels showed more readiness than their older or less educated counterparts. Interestingly, urban dwellers exhibited greater willingness than rural residents. Regarding how people view agroforestry, most respondents tended to give a moderate rating for agroforestry in Uganda's highlands and overall, with average scores of 5.8 and 6.2 out of 10, respectively. Respondents expressed concerns about land and forest degradation in Uganda, rating it as a significant problem with an average score of 8.1 out of 10.

Discussion

The study results emphasize the need to understand how people in Uganda's highland areas view and feel about agroforestry methods in tackling environmental issues. The significant willingness shown by survey participants to engage in agroforestry projects indicates a promising opportunity for expanding such practices in the region. Reasons given by respondents, such as environmental protection and financial rewards, underscore the various advantages of agroforestry.

Variations in willingness to participate based on demographic factors suggest the importance of tailored outreach and educational efforts to involve different parts of the population in agroforestry endeavours. Promoting agroforestry should consider the preferences and challenges unique to each demographic group for inclusive participation.

The moderate ratings on the effectiveness of agroforestry in addressing land and forest degradation show an acknowledgement of its potential benefits while indicating room for improvement. Future studies could explore ways to enhance the impact of agroforestry initiatives and overcome perceived obstacles to adoption.

Overall, this discussion sheds light on key findings and implications for agroforestry practices in Uganda's highland regions. Respondents' strong interest in participating in such initiatives is a sign of the growth potential for these practices.

This discovery supports previous studies that show a growing interest in agroforestry as a sustainable land management method (Nair et al., 2018). Moreover, the reasons mentioned by survey participants, such as environmental conservation and financial incentives, highlight the diverse advantages of agroforestry, which align with findings from research in different settings (Asare et al., 2019).

Nevertheless, the differences in willingness to participate based on demographic factors underscore the significance of targeted outreach and educational efforts to engage various segments of society. This result is backed by earlier research highlighting how demographic factors influence attitudes towards agroforestry (van Noordwijk et al., 2018). Initiatives promoting agroforestry should consider the preferences and challenges faced by different demographic groups to ensure inclusivity and increase participation, as emphasized by studies emphasizing the importance of customized engagement approaches (Carrasco et al., 2020).

The moderate ratings given for agroforestry's effectiveness in combating land and forest degradation suggest an understanding of the potential benefits of these practices while also indicating room for enhancement and optimization. Future studies could explore methods to improve the effectiveness of agroforestry interventions and overcome perceived obstacles to adoption, drawing on insights from research examining both the socioeconomic and environmental impacts of agroforestry projects such as on Eco-Tourism incomes, wood products, fire wood/wood fuel, fruits and food (Lasco et al., 2014).

Conclusion

The research offers valuable insights into how the public in Uganda views and participates in planting trees for agroforestry in highland areas. The results indicate a strong potential for expanding agroforestry in the region, fueled by environmental concerns and financial incentives. To encourage more people to get involved in agroforestry, targeted outreach and educational campaigns are essential to reach a broader range of individuals. Moving forward, it is crucial to address perceived obstacles and improve the impact of these practices on combating land and forest degradation in Uganda's highlands. Our findings underscore the potential for expanding agroforestry practices in Uganda's highlands and highlight the importance of targeted outreach and education to engage diverse demographic groups in environmental conservation efforts and support for Eco-Tourism. Future research should focus on optimizing agroforestry interventions to address perceived barriers and enhance their effectiveness in mitigating land and forest degradation, and possible impact on Eco-Tourism in the region.

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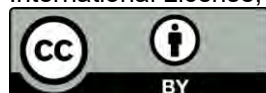
Souhrn

Náš výzkum nabízí cenné poznatky o tom, jak veřejnost (mládež) v Ugandě vnímá výsadbu stromů pro agrolesnictví ve vysokohorských oblastech a jak se na ní podílí. Výsledky naznačují silný potenciál pro rozšíření agrolesnictví a ochrany půdy v regionu, který je podporován jak zájmem o životní prostředí, tak finančními pobídkami včetně příjmů z ekoturistiky. Pro povzbuzení většího počtu lidí k zapojení do agrolesnictví jsou nezbytné cílené osvětové a vzdělávací kampaně, které osloví širší okruh osob. V budoucnu je důležité řešit vnímané překážky a zlepšit dopad těchto postupů na boj proti degradaci půdy a lesů a na ochranu krajiny v Ugandské vysočině. Tato zjištění podtrhují potenciál pro rozšíření agrolesnických postupů na ugandské vysočině a zdůrazňují význam cíleného oslovování a vzdělávání pro zapojení různých demografických skupin do úsilí o ochranu životního prostředí a podporu ekoturismu. Budoucí výzkum by se měl zaměřit na optimalizaci agrolesnických zásahů s cílem odstranit vnímané překážky a zvýšit jejich účinnost při zmírňování degradace půdy a lesů a možný dopad na ekoturistiku v regionu.

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Jsme mladá, česká firma, která vymýšlí a vyrábí interaktivní vzdělávací prvky a hry o přírodě. Prostřednictvím značky „Lesní svět,“ kterou vymyslel zakladatel společnosti Miloš Tomek, se snažíme děti i dospělé naučit poznávat přírodu názorně a hravě. Od roku 2015 máme za sebou stovky realizací naučných stezek, spoustu zábavných her a učebních pomůcek.

- Výrobky z Lesního světa vyrábíme z ekologicky certifikovaného dřeva a papíru PEFC a balíme je do přírodních lněných nebo dřevěných obalů.
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- Disponujeme databází 4 tisíc originálních obrázků, na které máme autorská práva. Každý měsíc přibývají další ilustrace.
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- Máme vlastní grafické studio = jsme schopni pružně reagovat na zadání klienta.
- Texty a obsah tvoříme spolupráci s přírodovědci, lesníky a ekology.
- Máme zkušenosti. Od roku 2015 jsme instalovali stovky naučných panelů po celé ČR a SR.

ABOUT US - WHO WE ARE

We are a young, Czech company that invents and produces interactive educational elements and games about nature. Through the brand "Lesní svět," invented by the company's founder Miloš Tomek, we try to teach children and adults to learn about nature in a visual and playful way. Since 2015, we have implemented hundreds of nature trails, many fun games and teaching aids.

- We make Forest World products from PEFC-certified wood and paper and pack them in natural linen or wooden packaging.
- All products are manufactured in the Czech Republic. We assemble in our production facility in Hradec Králové (Czech hands).
- We have professional printing machines that allow us flexibility and creativity (no outsourcing).
- We have a database of 4 thousand original images, for which we have copyrights. More illustrations are added every month.
- The images are painted for us by Czech illustrators according to our and client's specifications.
- We have our own graphic studio = we are able to react flexibly to the client's assignment.
- We create texts and content in cooperation with naturalists, foresters and ecologists.
- We have experience. Since 2015 we have installed hundreds of educational panels across the Czech Republic and Slovakia.





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