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the 4th Joint Congress of the Czech and Slovak
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Geography in the Changing World

Košice, 7 – 10 September 2026

Marián Kulla – Ladislav Novotný
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Book of Abstracts: the 4th Joint Congress of the Czech and Slovak Geographical Societies – Geography in the Changing World

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PREFACE

It is our great pleasure to welcome you to the 4th Joint Congress of the Czech and Slovak Geographical Societies, held at Pavol Jozef Šafárik University in Košice, Slovakia, from 7 to 10 September 2026. The event also represents the 26th Congress of the Czech Geographical Society and the 19th Congress of the Slovak Geographical Society, continuing a long tradition of scientific cooperation and professional exchange between the Czech and Slovak geographical communities.

The main theme of the Congress, “Geography in the Changing World”, reflects the profound environmental, social, economic and technological transformations that are reshaping contemporary societies and landscapes. Climate change, environmental risks, urbanisation, demographic shifts, migration, geopolitical tensions, growing socio-spatial inequalities and rapid advances in geospatial technologies all require a deeper understanding of spatial relationships and processes. Geography, with its capacity to connect natural and social sciences and to integrate perspectives ranging from the local to the global scale, has an essential role in addressing these challenges.

The abstracts collected in this volume demonstrate the thematic and methodological breadth of contemporary geographical research. They cover physical and human geography, regional development, urban studies and spatial planning, geoinformatics, remote sensing, environmental modelling, landscape ecology, health geography, natural hazards, political geography, participatory approaches, and geography education. The contributions also illustrate the increasing importance of interdisciplinary research, advanced spatial analysis, Earth observation, artificial intelligence and innovative forms of geovisualisation. At the same time, they reaffirm the continuing value of field research, regional knowledge and critical geographical thinking.

The scientific programme combines paper and poster presentations, panel discussions, workshops, keynote lectures and field excursions. We are particularly honoured to welcome distinguished keynote speakers whose lectures address major dimensions of geography in a changing world: globalisation, consumption and recycling; the challenges of sustainable cities; and the transformation of geography and the work of geographers through new technologies and artificial intelligence. We hope that these contributions, together with the broad range of presentations included in this volume, will stimulate fruitful discussion, inspire new research questions and create opportunities for future collaboration.

A joint congress provides more than a forum for presenting scientific results. It is also an opportunity to renew professional relationships, establish new partnerships, support early-career researchers and discuss the future development of geography as a scientific discipline and as a field of education. We believe that the diversity of perspectives represented at the Congress will encourage dialogue across disciplinary, institutional and national boundaries.

We would like to express our sincere appreciation to all authors for submitting their work and sharing their research with the geographical community. We are grateful to the reviewers, session organisers, members of the Scientific and Organising Committees, supporting institutions and everyone who contributed to the preparation of the Congress and this Book of Abstracts.

We hope that the Congress will provide an inspiring environment for scientific exchange and that participants will also enjoy the historical, cultural and geographical character of Košice and eastern Slovakia.

On behalf of the Organising and Scientific Committees,

Ladislav Novotný
Chair of the Organising Committee

Jaroslav Hofierka
Chair of the Scientific Committee

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A multidisciplinary approach to fault zone detection: geological mapping, geophysical surveys, and gas emission measurements – a case study of the Podhale Basin, southern Poland

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Keywords: faults detection, conductivity, gas emissions

Fault detection is challenging, particularly in regions characterized by gently dipping strata, dense vegetation, and landscapes extensively modified by agriculture. Under such conditions, geophysical and geochemical surveys aimed at locating fault zones have a low probability of success unless preceded by detailed geological reconnaissance. Therefore, preliminary structural mapping integrating field observations with remote sensing analyses is essential for constraining the location of potential fault zones.

The objective of this study was to identify permeable faults that may act as conduits for deep fluid migration. Interpretation of tectonic lineaments from a 1 m LiDAR-derived Digital Elevation Model (DEM) across the Podhale Basin revealed the regional trend of the best visible brittle structures (340–350°), representing the fault set with the highest potential to remain hydraulically open. The Gliczarowski Stream was selected for detailed structural investigations because the highest helium concentration in soil gas (64.4 ppm) from a previous regional geochemical survey of the Podhale Basin was recorded along a profile following the Biały Dunajec River in its vicinity. Field mapping focused on fault slickensides (in situ and within colluvial debris; N = 6) and fracture patterns indicative of fault kinematics, including horsetail splays associated with strike-slip fault terminations. The mapped structures are dominated by normal faults striking approximately 340°, with some representing reactivated strike-slip faults. The DEM revealed a subtle ~1 km long lineament expressed by a topographic scarp approximately 15 m high over a horizontal distance of about 30 m, striking 342°. Thirteen localities within the talus slope below the scarp contained clasts bearing normal-fault slickensides, demonstrating that the mapped lineament corresponds to a fault. To verify the structural interpretation, two 2-km-long profiles perpendicular to the lineament were surveyed using electrical conductivity measurements. Conductivity anomalies coincide with the interpreted fault trace, providing independent geophysical evidence for the fault.

Soil gas surveys evaluated geogenic CO₂ and CH₄ fluxes as indicators of fault-zone permeability. Gas fluxes were determined at 19 sites using the accumulation chamber method. Carbon dioxide fluxes displayed pronounced spatial variability, ranging from background values to more than 57 g/m²/day. The highest CO₂ fluxes coincide with locations where field mapping identified fault-related structures. In contrast, methane fluxes remained negligible at most sites, with only isolated positive anomalies (up to 0.26 g/m²/day) and occasional negative fluxes, indicating that CH₄ is of limited value as a fault tracer in the investigated area. The spatial distribution of CO₂ fluxes suggests that migration of deep-seated gases is controlled by fractured and permeable fault zones.

The combined results demonstrate that structural mapping supported by LiDAR interpretation provides an effective framework for locating previously unrecognized faults, whereas geophysical surveys and soil gas measurements provide independent validation of their occurrence. CO₂ fluxes serve as a reliable proxy for fault-zone permeability. A repeat survey is planned for the autumn season to investigate seasonal variability in CO₂ and CH₄ emissions and to evaluate the environmental factors controlling fault-related gas migration.

This research project (soil gas sampling) was supported by program "Excellence initiative - research university" IDUB for the AGH University of Krakow (project number 12671). Soil gas emission measurements were conducted with funding from the "Grant Rektora 2026" for the AGH University of Krakow (No. 52). Gratitude goes to Dr. Twaróg and Dr. Cygal for their support, patience, and extensive knowledge throughout all the research and data analysis. Special thanks to all KIWON members who supported the research and contributed to the completion of this project.

The external Schengen border as a factor influencing quality of life: evidence from the Slovak-Ukrainian borderland

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Keywords: quality of life, Schengen border, border regions, political geography, Slovak–Ukrainian borderland

State borders remain one of the most important geopolitical factors influencing the everyday life and quality of life of populations living in border regions. Although the Schengen integration process has substantially reduced the barrier function of internal European borders, the external border of the Schengen Area continues to represent a unique socio-spatial environment where political, economic, security and social processes interact. Recent geopolitical developments in Eastern Europe have further reinforced the strategic importance of the Slovak–Ukrainian border and renewed interest in understanding the role of borders in shaping the quality of life of borderland communities.

This paper presents a continuation of long-term research focused on the relationship between the external Schengen border and quality of life in the Slovak–Ukrainian borderland. It builds upon a previously developed methodological framework (Angelovič, 2013; Angelovič, Ištók, 2016) integrating objective socio-economic indicators with subjective assessments of life satisfaction, place attachment and perceived border effects. Particular attention is devoted to the importance of geographical scale in quality-of-life research and to the application of qualitative methods at the local level.

Previous empirical research, complemented by a recent case study in the municipality of Lekárovce (2024), suggests that perceptions of subjective quality of life continue to evolve despite the unchanged external Schengen border regime. In Lekárovce, life satisfaction increased from 5.1 to 6.4 points (10-point scale), while the share of residents perceiving the border as directly affecting their quality of life declined from 41.4% (2012) to 13.9% (2024). Conversely, the proportion associating quality-of-life changes with the Schengen border regime increased from 19.1% to 39.0%, suggesting that the border is increasingly perceived as an indirect rather than a direct factor. These findings provide the basis for extending the longitudinal comparative research to additional municipalities along the Slovak–Ukrainian border.

The expected contribution lies in improving the understanding of the evolving role of the external Schengen border as a factor influencing subjective quality of life in peripheral border regions. At the same time, the paper contributes to the further development of a methodological framework for assessing quality of life in cross-border environments and offers a geographical perspective on the changing significance of external European borders in contemporary society.

References:

- ANGELOVIČ, M. 2013: *Vplyv hranice na kvalitu života obyvateľov prihraničných regiónov na príklade slovensko-ukrajinského pohraničia* (Doctoral dissertation). Prešov: Prešovská univerzita v Prešove, Fakulta humanitných a prírodných vied.
- ANGELOVIČ, M., IŠTOK, R. 2016: How to Assess Quality of Life: Theoretical and Methodological Research Aspects in Cross-Border Regions. *Bulletin of Geography. Socio-economic Series*, 32, 19–32.
- MARTINEZ, O. J. 1994: *The Dynamics of Border Interaction*. In C. H. Schofield (Ed.), *Global Boundaries: World Boundaries*, London: Routledge, Vol. 1, pp. 1–15.
- NEWMAN, D. 2006: Borders and bordering: Towards an interdisciplinary dialogue. *European Journal of Social Theory*, 9(2), 171–186.

- PAASI, A. 2011: *A Border Theory: An Unattainable Dream or a Realistic Aim for Border Scholars?*
In D. Wastl-Walter (Ed.), *A Research Companion to Border Studies*. Farnham: Ashgate.
- TAUBENBÖCK, H., OTTO, C., GÜLZAU, F., MAU, S. 2023: Border Regions Across the
Globe: Analyzing Border Typologies, Economic and Political Disparities, and
Development Dynamics. *Applied Geography*, 151, 102866.
- VEGA commission for historical and social sciences (philosophy, sociology, politology,
theology) No. 1/0271/25 *The Impact of Global Environmental Problems on the Political-
Spatial Structure of a State and its Participation in Environmental Governance* PRINCIPAL
INVESTIGATOR doc. RNDr. Vladimír Čech, PhD. 2015-2017.

Who lived where? Distribution and concentration of socio-professional groups in interwar Poznań's city centre

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Keywords: socio-spatial structure, spatial inequalities, interwar period, Poznań, Poland, clustering

This study looks at how different socio-professional groups were distributed across the city centre of Poznań in 1933, and whether their presence formed recognisable spatial patterns. The main source is the Address Book of the Capital City of Poznań for 1933, which lists residents together with their occupations and, in many cases, gender, assigned to specific addresses. After digitisation, the dataset included nearly 13,000 individual records. These were grouped into socio-professional categories based on an adapted classification, drawing on earlier typologies but modified to better reflect the structure of the material.

In order to analyse these data spatially, the addresses had to be located within the historical layout of the city. This was done using interwar plans from the State Archives and the CYRYL digital collection. A grid of 150 × 150 metres was then applied in a GIS environment, providing a common spatial frame. Several analytical steps followed, including basic statistical description, mapping, correlation analysis and hierarchical clustering.

The overall socio-professional structure of the city centre appears relatively balanced. No single group clearly dominates, although a few are more numerous than others. Artisans (23%), unskilled workers (18%), widows and pensioners (15%), and traders (13%) form the largest segments. The biggest groups tend to be distributed quite evenly, especially in the central part of the study area. Smaller or more specialised professions are less regular in this respect and more often form visible concentrations, particularly around the Old Market Square and along major commercial streets.

The clustering results make it possible to distinguish four broader groupings. The first, and largest, includes artisans, workers, clerical employees and economically inactive residents. Taken together, these groups largely represent the lower and lower-middle strata of the urban population, often characterised by limited resources and more constrained residential choices. This is also reflected in their relatively even spatial distribution across the study area. A second grouping consists of higher-status professions – such as lawyers, doctors, engineers or managers – whose residential patterns are noticeably more selective and tend to cluster along prestigious streets or near key institutions. The third group, made up of educational and academic professions, shows a more focused pattern, associated with specific residential locations. Finally, clergy form a distinct category, concentrated almost exclusively around churches and religious institutions.

What emerges from this is fairly straightforward. The size of a group clearly matters, but so does its internal composition. More heterogeneous categories tend to be more evenly spread, whereas specialised ones are more spatially concentrated. At the same time, these patterns do not exist in isolation. They are embedded in the longer-term development of the city itself, which shaped both its functional structure and its social geography.

Waste ice management at ice arenas in Czechia as an issue of sustainable sports infrastructure

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Keywords: ice arenas, waste ice, sustainable sports infrastructure, water filtration, water reuse

This presentation focuses on the management of waste ice generated during ice resurfacing at ice arenas in Czechia. Given the popularity of ice hockey and the existence of approximately 170 ice arenas in Czechia, this topic represents a specific but widely relevant issue of sustainable sports infrastructure. Ice arenas form part of urban and municipal facilities, and their operation is associated with water and energy consumption as well as the production of waste ice.

Theoretically, the presentation is situated within discussions on sustainable water management, water reuse, the possible occurrence of micropollutants in the aquatic environment, and the social acceptance of water-management innovations. Waste ice management is therefore understood not only as a technical issue, but also as a problem related to ownership, financing, infrastructure age, and the decision-making of operators and owners. The empirical part is based on a questionnaire survey among Czech ice arenas and on the broader context of water quality monitoring in relation to ice arena operation. The results show that waste ice management practices are not uniform. Approximately half of the surveyed arenas report filtering water after the ice has melted. Filtration also appears to be an important factor associated with further water reuse.

The findings may contribute to discussions on more efficient water use, methodological support for operators, and the more sustainable operation of ice arenas as part of sports and municipal infrastructure.

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Can graduates return without universities? Re-attraction factors in a transforming region

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Key words: graduates, peripheral region, brain drain, graduates return, Karlovy Vary Region

This paper examines the factors and possible measures that may encourage university students and graduates to return to a peripheral region without a university. The research focuses on the Karlovy Vary Region in Czechia, a structurally disadvantaged region where the absence of a public university represents an important challenge for the retention and return of highly educated people. The study is based on a stated-opinion questionnaire survey among university students originating from the Karlovy Vary Region who are currently studying at universities across Czechia. Consequently, the survey captures respondents' stated expectations, preferences, and return intentions rather than their revealed migration behaviour. In total, 503 responses were collected and analysed using descriptive statistics.

The findings show that remaining in the university city and its surrounding area appears to be the most likely option immediately after graduation. However, when asked about their anticipated place of residence in 15 years, respondents most often expect to live in the municipality in the Karlovy Vary Region where they currently have permanent residence. This longer-term expectation should be interpreted with caution, as it may partly reflect the framing of the questionnaire rather than a stable long-term migration plan. Job opportunities emerge as the most important push and pull factor shaping stated return intentions. Other relevant pull factors include family and social ties, as well as the region's natural environment, particularly the Ore Mountains. Conversely, the combination of relatively high living costs and low wages represents a significant push factor discouraging return. Among the potential motivational benefits of remaining in the region, the guarantee of a stable job position plays the strongest role.

How AI tools can cultivate high-order thinking in geography education: a systematic review

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Keywords: high-order thinking skills, artificial intelligence, Bloom taxonomy, enquiry

The use of artificial intelligence (AI) within geography and environmental education is an emerging field with growing relevance. This study aims to identify AI tools applied specifically in these domains and to critically assess the nature of their educational use with special emphasis on the cognitive demands. Through a systematic review (PRISMA statement methodology) of peer-reviewed articles published in geography and environmental education journals, we compiled a dataset of studies that incorporate AI into teaching and learning practices. A data-driven synthesis was conducted in the selected literature to uncover dominant patterns in how AI is being utilized. In addition, each identified application was examined in terms of its cognitive demand, classified according to Bloom's taxonomy and an enquiry-based learning framework. This approach made it possible to evaluate whether current uses of AI in geography and environmental education promote only surface-level knowledge acquisition or foster high-order thinking skills. The outcomes offer a categorized overview of AI-supported educational practices, organized by their cognitive complexity. The findings contribute to a clearer understanding of how AI is currently integrated into geography and environmental education and provide a conceptual basis for guiding future implementations that support high-order thinking in geography education.

This study has been supported by the Student Grant Competition of the Technical University of Liberec, Project n. SGS-2025-4524: Fostering Geographical Thinking with the Use of AI Technologies.

Temporal and spatial variability of soil organic carbon in precision agriculture

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Keywords: precision agriculture, soil organic carbon, soil organic matter balance, soil sampling, organic fertilisation

Soil organic carbon (SOC) is one of the most valuable indicators within precision agriculture, as its spatial variability directly informs site-specific decisions on tillage intensity, fertilisation, and crop input management across individual zones of a field. By integrating SOC data into precision agriculture workflows, farmers and researchers can move beyond uniform, field-wide treatment toward targeted interventions that improve resource efficiency, protect soil fertility, and support long-term agricultural sustainability.

Our study analyses soil organic matter balance in an agricultural landscape in southwestern Slovakia using principles of precision agriculture. The balance was calculated according to the methodology of Jurčová and Bielek (1997), based on the relationship between organic carbon inputs from crop residues and organic fertilisation, and annual losses linked to soil productive potential and crop type. The study covered two agricultural localities in the Nové Zámky district over the period 2020–2025.

Results show considerable temporal and spatial variability in the balance, with interannual differences driven mainly by fluctuations in yields and crop structure. Multi-year evaluation revealed both areas with a stable positive trend and parcels with persistent deficits. Crop yield and organic fertilisation proved to be the most influential factors, with higher yields and regular manure application associated with more favourable balance values. Geographic factors such as slope and soil type played a secondary, more indirect role, with steeper and less fertile areas showing less favourable outcomes, likely due to erosion-related losses.

Comparing two calculation approaches, using the dominant soil unit versus a weighted average of all units per parcel, showed only minor differences, confirming the reliability of the standard methodology. Spatially deficient areas were identified as at risk of long-term organic matter decline, and these findings were broadly supported by field-measured soil carbon data from 2022. The results underline the value of spatially differentiated management within precision agriculture and highlight the importance of regular organic matter replenishment for maintaining soil fertility and supporting sustainable agriculture.

Reference:

JURČOVÁ, O., BIELEK, P. 1997: Metodika bilancie pôdnej organickej hmoty a stanovenia potreby organického hnojenia. Bratislava: Výskumný ústav pôdnej úrodnosti Bratislava.

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Demography and geography of longevity. Will half of the people from generation Alpha be centenarians?

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Keywords: longevity, life expectancy, diseases, centenarians, forecasts

Although mortality has been one of the flagship topics in demography for centuries, one of the newer, particularly interesting topics is demography of longevity. The issues of maximum life span play a very important role in modelling life tables and predicting life expectancy in contemporary demography. Answering the question of where the biological limits of human lifespan are is perhaps one of the most interdisciplinary questions in science today. Human geography also plays an important role here. In this contribution, we address some questions about longevity from the viewpoint of demography and human geography as well. We present and discuss basic research ideas regarding barriers to an extremely long human life as postulated in the literature. We summarize sources of optimism and pessimism in the assumptions of increasing life expectancy. We briefly discuss technological, biological, societal and some geographical factors and sources of increasing life expectancy and barriers which possibly would decelerate its growth. We show what the contribution of chronic and infectious diseases has been, and how their share has changed over time and how it is likely to change in the future.

We show how different institutions see and predict a potential for longer human life span in their population forecasts. Using the example of Slovakia, we demonstrate how the projected progress in the life expectancy will affect the age composition and number of centenarians. The increase in their number will be literally rapid in all (more or less) realistic scenarios of forecasts published recently.

In addition to the standard demographic indicators such as life expectancy, health life expectancy has been gaining prominence for some time. The relationship between life expectancy and happiness is also being discussed. We present some interesting findings from studies published on this topic, along with a critical look at some possible simplifications. Based on the previous attempts in literature including Czech ones, we also tried to find "blue zones" within Slovakia, clusters of municipalities with a significantly higher share of oldest-old residents. However, the results are not significant, spatial patterns are not very clear. This is a potentially interesting further research direction in health demography and geodemography.

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Map of victims of communism in Slovakia

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Key words: map, communism, victims, history

This contribution presents the *Map of Victims of Communism in Slovakia* as a unique tool bridging geography, history, and collective memory. It introduces the map not only as a cartographic product, but also as a means of visualizing historical events that allows for the examination of the communist regime's repressions within their spatial and temporal contexts. It is built on the premise that space and time form the common intersection of geography and history, with the map serving as the most suitable medium for their joint representation.

Special attention is paid to the process of creating the thematic map, which is grounded in extensive archival research. The contribution highlights the challenges associated with incomplete and fragmented sources, their insufficient digitization, and the totalitarian regime's deliberate attempts to cover up traces of repression. Furthermore, it also presents the cartographic representation of the various forms of persecution through the map legend. It explains the meaning of the symbols used and highlights the possibilities for interpreting the spatial distribution of the different forms of repression.

The conclusion emphasizes the importance of both the analog and interactive versions of the map as modern tools for education, research, and remembrance. The map connects national history with local personal stories, makes research findings accessible to the general public, and simultaneously serves as a symbolic memorial to the victims of the communist regime. By spatially localizing specific human fates, it contributes to the preservation of historical memory and fosters a deeper understanding of the true extent of totalitarian repressions in Slovakia.

Pluvial flood potential assessment using a multi-criteria approach: a case study of the Kamenec basin, Eastern Slovakia

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Keywords: pluvial flood potential, high-resolution spatial analysis, multi-criteria weighting, geographic information systems, Eastern Slovakia

This study aims to assess the spatial distribution of pluvial flood potential in the Kamenec River Basin using geographic information system (GIS)-based high-resolution spatial analysis and multi-criteria weighting, specifically the Analytic Hierarchy Process (AHP). Seven physical-geographical factors were analyzed to create the pluvial flood potential index (PFPI) and thus determine its spatial distribution throughout the studied basin. Selected factors either possess influence on the surface water accumulation and represent morphometric features (topographic wetness index - TWI, curvature, and sediment transport index - STI), or influence surface water infiltration (soil texture, land use/land cover, normalized difference vegetation index – NDVI, and lithology). All datasets were resampled to a spatial resolution of 1 m to ensure consistency with the high-resolution digital elevation model (DEM) after hydrological correction (DMR 5.0). The resulting factors were then standardized in a GIS environment to represent their relative contribution to pluvial flooding. Categorical variables were reclassified into five classes based on their propensity for surface water accumulation, while continuous variables were normalized to a scale ranging from 1 to 5. Each factor was then assigned a weight using the AHP approach, resulting in a PFHI map of the basin divided into five classes. Multi-criteria weighting was based on the hypothesis that areas characterized by high TWI values, low infiltration-capacity soils, and low vegetation cover are more susceptible to pluvial flooding than areas with opposite characteristics. To assess the importance of weighting each factor and for comparison purposes, we also computed PFPI using equal weights and validated the results against data from previous pluvial flood events within the study area. The results of this assessment can support the Preliminary Flood Risk Assessment process in Slovakia, where pluvial flooding is gaining recognition as a hazard of comparable importance to fluvial flooding.

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Innovativeness of the Polish industry against the background of changes in the spatial structure of industrial innovativeness in the new EU Member States

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Keywords: change of spatial structure, industry; innovativeness, new EU member states, Poland, spatial differentiation, vector calculus

The study examines the spatial differentiation of industrial innovativeness in the new EU Member States between 2005 and 2024, with particular emphasis on Poland. Its main objective is to identify the characteristics and scale of changes in the spatial structure of industrial innovativeness and to determine Poland's position relative to the other EU-13 countries using vector calculus (Parysek, 1976).

The development of a knowledge-based economy largely depends on the innovativeness of enterprises introducing new or significantly improved products, advanced technologies, and more efficient organizational solutions. Innovative industrial firms contribute to strengthening the competitive position of national economies by facilitating a more effective use of available resources. The level of innovativeness is conditioned by numerous factors, including expenditures on research and development (R&D), innovative activities undertaken by enterprises, and the availability of highly qualified human resources.

Innovation activity encompasses scientific, technical, organizational, financial, and commercial activities that lead, or are intended to lead, to the implementation of innovations. It also includes R&D activities that may not directly result in specific innovations but create favourable conditions for their development. R&D expenditure is widely recognized as one of the key determinants of a country's capacity to generate innovation (Furman, Porter & Stern, 2002; Ulku, 2007), providing a supportive environment for innovative solutions within the industrial sector. The analysis focuses on innovation activities of industrial enterprises in Poland and the new EU Member States. Industrial innovativeness was assessed using indicators related to expenditures on innovation and R&D activities, as well as human resources engaged in R&D within manufacturing. The analysis was complemented by indicators reflecting the share of high-technology exports in total exports and the share of revenues from products new to the market or the enterprise in total turnover. These measures provided the basis for assessing and comparing the relative competitiveness of industrial enterprises operating at different levels of technological intensity.

The results confirm considerable spatial disparities in industrial innovativeness across the countries examined. A key outcome of the study was the identification of the scale and direction of changes in the spatial structure of industrial innovativeness in the new EU Member States during 2005–2024 through the application of vector calculus. The findings indicate substantial transformations in the spatial configuration of industrial innovativeness over the study period, both in Poland and across the EU-13. These changes reflect the evolving role of innovation-related resources and activities in shaping the competitive potential of industrial sectors within the new Member States of the European Union.

References:

- FURMAN, J. L., PORTER, M. E., STERN, S. 2002: The determinants of national capacity. *Research Policy*, 31, 899–933.
- PARYSEK, J. 1976: Zmiany struktury przestrzennej przemysłu Polski w latach 1960–1973. Próba miernika syntetycznego. „*Przegląd Geograficzny*”, XLVIII, 2, 253–268.
- ULKU, H. 2007: R&D, innovation, and growth: evidence from four manufacturing sectors in OECD countries. *Oxford Economic Papers* 59, 513–535.

What makes real housing estates (un)interesting? Case study of Ostrava-Poruba

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Keywords: perception of geographical space, mental map, public place, (un)interesting place, panel houses

This study evaluates the perception of residential areas in terms of the interestingness and uninterestingness of places, using Ostrava-Poruba as a case study. Data were collected through an analysis of preferential mental maps and further complemented by phenomenological field research with a focus group. The general aim of this thesis is to contribute to the existing theoretical discussion on the phenomenon of interesting and uninteresting places in residential spaces. To achieve this aim, the study addresses five research questions and tests two hypotheses concerning the homogeneity of Poruba districts in terms of the concentration of interesting and uninteresting places, using statistical tests of independence. In addition to the above, typologies of interesting and uninteresting places will also be developed based on their function and the reasons for their (un)interestingness, which summarize and systematize some of the information obtained about these phenomena.

The results suggest that uninteresting places tend to reflect the character of predominantly residential areas of the housing estate, whereas interesting places tend to be specific places or features distinguished by their particular significance or by the specific activities that take place there. Topoambivalent places, for which it is not possible to determine whether they are interesting or uninteresting, generally combine, at least to some extent, both of these characteristics. The findings further indicate that the residents of Ostrava-Poruba perceive aesthetically valuable places as interesting. The successive architectural and urban planning approaches that shaped the development of Ostrava-Poruba resulted in a heterogeneous urban landscape, which is also reflected in the spatial distribution of interesting and uninteresting places across the housing estate.

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Geography teachers' perception of curricular changes

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Keywords: geography, curriculum, reform, state educational programme, lower secondary education

Starting in the school year 2026/2027, the State Educational Programme for Primary and Lower Secondary Education (ME 2023) is being implemented in Slovakia, bringing changes to geography education. These changes affect not only the educational content but also the professional role of a teacher. Teachers are given the opportunity for greater autonomy in deciding how to structure the curriculum, select subject content, and organize instruction – ideally with support of digital technologies and artificial intelligence. The implementation of the reform depends not merely on the quality of the curriculum itself, but it is teachers who understand and engage the new curriculum and who transform it into their daily pedagogical practice. Studies (Hargreaves 2005; Pešková et al. 2017; Kayir, Toraman 2021; Lomba-Portela et al. 2022; Aytac 2023) confirm that teachers' perceptions of curricular changes are a decisive factor for the success of curricular reform. Several studies conducted in Slovakia (Fridrichová, Poliach 2018; Kosová, Trnka 2018; Mentel et al. 2023a, Mentel et al. 2023b) address teachers' perceptions of curricular reforms and confirm that the success of a reform goes hand in hand with teachers' mindsets and attitudes.

The paper aims to evaluate how geography teachers in Slovakia perceive curricular changes in relation to the newly implemented geography curriculum. The research focuses on how teachers understand the intended changes, their preparedness for its implementation, positives, negatives, opportunities, and concerns. It includes the analysis of the relationships between the perceptions and selected respondents' characteristics (age, sex, length of teaching practice, career stage, and school location). The study analyses a questionnaire survey (25 items) addressing geography teachers in Slovakia (N=67). Collected data are analysed with descriptive and inferential statistics, and open-ended responses are processed using thematic content analysis. Particular attention is paid to whether it is likely true among geography teachers that greater autonomy is accompanied by a higher degree of uncertainty when making decisions about instruction, lesson content and organization. Preliminary results indicate that geography teachers do not perceive the reform as either positive or negative. Their responses reflect expectations of greater professional autonomy alongside uncertainty stemming from anticipated demands (regarding lesson planning and the selection of educational content, teaching methods, and organizational forms). Open-ended responses show teachers' perceptions of need for support (regarding high-quality teaching resources, examples of good practice, and professional development programs). The findings can contribute to more targeted support for the implementation of the new geography curriculum in schools, the design of professional development programs, and methodological materials.

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Beyond functional-spatial assessment: Landscape indicators in the Age-Friendly Residential Areas (AFRA) methodology and their contribution to sustainable development goals

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Keywords: older adults, age-friendly residential areas, landscape, sight-aesthetic value, GIS

The concept of age-friendly cities is usually operationalised through spatio-functional characteristics such as accessibility, infrastructure, safety, and service provision. However, much less attention has been paid to the role of landscape quality and sight-aesthetic values in shaping residential environments that support healthy and active ageing. This study addresses that gap by discussing the Age-Friendly Residential Areas (AFRA) methodology with particular emphasis on landscape indicators and their contribution to the assessment of urban residential estates.

The methodology, based on an in-depth analysis of international research, guidelines and policies, integrates spatio-functional and landscape dimensions into a single diagnostic framework supported by GIS tools. The weighting assigned to the developed set of indicators reflects the preferences of older residents and the perceived importance of particular environmental features, as identified through an international survey.

The study shows that landscape indicators (including greenery, water presence, spatial order, view corridors, harmonious infrastructure, cleanliness, and the visual quality of buildings and public open spaces) significantly complement conventional diagnostic approaches. Their inclusion allows for a more comprehensive recognition of residential areas that are supportive not only for older people, but also for wider urban communities. The AFRA methodology may serve as a practical tool for evidence-based urban policy and planning, aligning with the Sustainable Development Goals (especially SDG 3, SDG 11, and SDG 15) by supporting healthier, more inclusive, and environmentally responsible urban environments.

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Spaces of everyday food: strengthening food resilience through networks of care

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Keywords: food resilience, household food networks, everyday practices, relational space, care

Most studies of food resilience adopt a ‘macro’ perspective and consider the functioning of the food system at the national or even international scale. At the centre of these studies typically lies the capacity of the food system to withstand or adapt to the effects of external disturbances and its ability to restore the status quo. The key question is the degree of the food system’s resilience, not whether it is or is not resilient. In the context of the Global North, a resilient food system is usually associated with policy interventions aimed at enhancing resilience, these interventions are confined to the market food system and understood as a result of organised groups’ lobbying and campaigning. In this paper, we take a profoundly different approach to studying food system resilience. First, instead of the macroscale perspective, we are concerned with the food system at the micro-level perspective of individual households and their interactions with other households. Second, rather than considering the degree of resilience that arises from political activism and policy actions, we focus on everyday behaviour that is rarely motivated politically. Third, and most importantly, we do not limit our analysis to the commercial food sector but explore how households navigate the complex terrain of market-, alternative market and non-market food sources. The underlying idea is that households combining these three sources of food have a good chance of being more resilient than those that have to rely solely on the mainstream market sector. The results of the twelve focus groups we conducted with different types of households in different geographic contexts do not show the households as seeking to maintain or restore the status quo. Instead, the multiplicity of resources enables them to creatively explore food securing options, considering individual values and local conditions. We combine this qualitative data with the results of a representative survey of Czech households, determining the share of households involved in non-market food production and sharing, and the amount of food produced in these networks. We pay special attention to households that increase the share of non-market food sources in their consumption. The results show that home food provisioning is driven by taste and quality of food, or is a hobby, rather than economic reasons. They also show a surprisingly significant share of non-market food sources on the tables of households without access to land.

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Pedestrian barrier-free accessibility and passability in the Bratislava–Devínska Nová Ves city district for marginalised population groups

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Keywords: accessibility, walkability, passability, persons with limited mobility and orientation, OOSPO

Walking is an integral part of everyday life and is essential for all population groups. However, urban environments often contain various obstacles and barriers that may hinder pedestrian movement along pedestrian infrastructure, particularly sidewalks. These barriers can significantly affect several population groups, including older adults whose mobility may be limited by age or health conditions, wheelchair users, people with physical disabilities who are able to walk, and parents with young children using strollers. Collectively, these groups are referred to in Slovakia as persons with limited mobility and orientation (OOSPO; persons with limited mobility and orientation). Barrier-free accessibility is an important aspect of urban planning and is closely linked to social inclusion, with these marginalised population groups being its primary beneficiaries.

The aim of this paper is to analyse the Bratislava city district of Devínska Nová Ves in terms of pedestrian barrier-free accessibility, passability, walkability and continuity of movement for persons with limited mobility and orientation. Devínska Nová Ves is an outer district of Bratislava that was formerly an independent rural municipality before being incorporated into the capital city in the 1970s. As a result, the area comprises a diverse urban structure, ranging from older detached and multi-generational family houses to prefabricated housing estates and newly built family houses and apartment buildings. The road and pedestrian infrastructure reflect this diversity. Depending on its age and level of use, it may or may not meet current accessibility standards, including the requirements of persons with limited mobility and orientation.

The city district was assessed at the street level. Individual streets were analysed at both the macro and micro levels. The macro-level assessment focused on their location in relation to key public amenities and public transport stops, while the micro-level assessment was based on eight criteria documenting various barriers and obstacles affecting persons with limited mobility and orientation. The results provide a comprehensive assessment of the pedestrian infrastructure in Devínska Nová Ves and may serve as a valuable basis for planning and decision-making. They make it possible to identify problematic locations within the district, implement appropriate improvements, and ultimately contribute to enhancing the quality of the urban environment and the mobility of persons with limited mobility and orientation.

References:

- ALONZO, M. A. 2005: To walk or not to walk? The hierarchy of walking needs. *Environment and Behavior*, 37(6), 808–836. DOI: <https://doi.org/10.1177/0013916504274016>.
- HUANG, X., ZENG, L., LIANG, H., LI, D., YANG, X., ZHANG, B. 2024: Comprehensive walkability assessment of urban pedestrian environments using big data and deep learning techniques. *Scientific Reports*, 14, 26993. DOI: <https://doi.org/10.1038/s41598-024-78041-x>.
- HOSSEINI, R., LIM, S., TONG, D., SOHN, G. SEYEDABRISHAMI. S. 2024: A specialized inclusive road dataset with elevation profiles for realistic pedestrian navigation using open geospatial data and deep learning. *Computers. Environment and Urban System*. 114, 102199.
- LO, R. H. 2012: Walkability: what is it? *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, 2(2), 145-166. DOI: <http://dx.doi.org/10.1080/17549170903092867>.

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Localization and expansion of grocery stores of selected retail chains in the Czech Republic and Slovakia

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Keywords: food markets, penetration index, foreign food retail chains, Czech Republic Slovakia

After the political and social changes in 1989, practically all sectors of the economy in many post-socialist countries, including Slovakia and the Czech Republic, underwent a significant transformation. One of the economic sectors that was particularly affected was the retail one. After the phase of restitution and privatization, which significantly changed mainly the ownership structure of retail, one of the main factors influencing the distribution, but also the size structure of retail establishments, was the arrival of foreign retail chains. Shopping centers, hypermarkets, supermarkets and large specialized stores around the world are gaining an ever-increasing share of the retail market. In both countries under review, they have increasingly begun to expand alongside the existing network of stores, thus affecting the sale of both food and non-food goods. On the one hand, they have caused the demise of many smaller stores, but on the other hand, they have also brought about new sales concepts. The commercial success of retail establishments is largely influenced by their location. Our contribution evaluates the expansion of five selected food retail chains: COOP Jednota, Tesco, Billa, Lidl and Kaufland in 2024, which have become established in Slovakia and the Czech Republic. The rate of their occurrence at different levels of settlement is assessed using the so-called penetration index (PEX and PEXo), which expresses the degree of saturation with large-scale stores in a given area. Given the greater concentration of the population in urban areas, we focused on the expansion of these stores primarily in cities. After large cities, the chains gradually become established in smaller urban units, but they do not always take into account the population size of settlements. In both countries, regional differences in the distribution of stores of the studied chains are evident, resulting from various factors. In Slovak and Czech cities and larger municipalities, COOP Jednota stores (Jednota in the Czech Republic), which benefit from their monopoly position during the socialist period, are still established. Despite the fact that in some regions some of the stores of this chain have passed into the hands of new owners, from the point of view of both PEX and PEXo indices, the penetration of COOP Jednota can be assessed as the most successful compared to other chains operating in both countries. The penetration values in both countries are comparable, in the Czech Republic they are slightly lower. This is due to the fact that, unlike Slovakia, two other chains operate in the Czech Republic with an almost nationwide scope and number of stores (Penny Market and Albert). Other chains also operate in Slovakia, but they do not have such a penetration as the two mentioned chains in the Czech Republic. According to these indices, the stores of the Kaufland and Lidl chains in both countries have the most similar expansion.

References:

- DANIELOVÁ, K., TREMBOŠOVÁ, M. 2025: Localization and expansion of grocery stores of selected retail chains in the Czech Republic and Slovakia. *Cities*, 167(106377), 1–13.
- SIKOS, T. T., KOVÁCS, C. J. 2022: The Competition Between Discount Stores and COOP in Northern Hungary: A Case Study. *Geographica Pannonica*, 26(4), 373–384.
- TINER, T. 2010: *Kereskedelmi nagylétesítmények telephelyválasztási kritériumai Magyarországon*. Fenntartható fogyasztás és növekedés határai – új trendek a kereske. 69–86.

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Comparative flash flood modelling in contrasting urban environments

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Keywords: flash flood modelling, r.sim.water, urban drainage infrastructure, retention ponds, GRASS GIS

Flash floods represent an increasing risk in urban environments, where their development is influenced not only by rainfall intensity but also by the condition of water management infrastructure and landscape characteristics. This contribution presents the results of flash flood modelling in two contrasting locations within the city of Košice – the Račí potok catchment and the Terasa residential area. The simulations were performed in the GRASS GIS environment using the r.sim.water module, incorporating digital elevation models derived from airborne and terrestrial laser scanning data, RTK GNSS measurements, and land cover classification. The modelling included multiple scenarios with rainfall intensities ranging from 30 to 100 mm/h and varying conditions of retention ponds, embankments, stream channels, and stormwater drainage systems.

The results reveal significant differences in flash flood behaviour between the two study areas. In the Račí potok catchment, terrain morphology and the retention capacity of ponds play a decisive role, whereas in the Terasa residential area, flood extent is primarily controlled by the functionality of the stormwater drainage system and local microrelief. The simulations also demonstrated that the reconstruction of damaged water management structures and regular maintenance of drainage systems can significantly reduce flood extent and water depth. The results confirm that the technical condition of infrastructure can have a comparable impact on flash flood dynamics as rainfall intensity itself. The proposed approach represents a practical tool for flood risk assessment and supports the planning of adaptation measures in urban environments.

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Quantification and standardization of environmental indicators at the level of basic settlement units: A case study of the Ústí nad Labem Region

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Key words: environmental quality, ecosystem services, environmental stressors, spatial analysis quality of life

Environmental quality is a key determinant of residents' health and well-being, and its objective assessment is particularly crucial in old industrial regions facing a synergy of historical ecological burdens and current environmental challenges. This paper presents a comprehensive methodological framework and spatial data analysis for assessing environmental conditions and quality of life at the detailed level of basic settlement units (BSUs), focusing on municipalities in the Ústí nad Labem Region.

The proposed methodology innovatively integrates two established approaches: the assessment of ecosystem services (provisioning, regulating, supporting, and cultural ecosystem functions) and the analysis of environmental stressors (natural hazards, anthropogenic pollution, landscape transformation, and built-up areas). The research relies on extensive spatial and statistical datasets obtained from publicly available and regularly updated sources (including the Copernicus programme, the Czech Statistical Office, the Czech Hydrometeorological Institute, LPIS, DIBAVOD, and ZABAGED), covering the period from 2011 to the present. Key monitored indicators include the proportion of ecologically active areas expressed by the BAF (Biotope Area Factor) index, the proportion of impervious and water surfaces, the degree of erosion threat, the extent of flood zones, five-year averages of particulate matter emissions, and the median accessibility of urban greenery.

The analytical procedure utilizes advanced spatial processing methods, including raster and geostatistical analyses. A fundamental methodological step is the standardization of highly heterogeneous input data. This conversion allows not only the comparison of the intensity of stressors against the provided ecosystem services but also the subsequent aggregation of results and their visualization. Emphasis is placed on the long-term updating of datasets, whereby the methodology shifts from a mere static description of the state to the dynamic identification of key environmental trends and developmental trajectories.

The main output of this research is the foundation of a publicly accessible geodatabase and the pilot verification of an aggregated index of environmental quality in municipalities. The presented results provide local governments, public administration authorities, and other stakeholders with an exact, data-driven, and fully replicable tool for informed spatial decision-making, strategic planning, and the prioritization of regeneration projects, thereby actively contributing to enhancing the long-term sustainability of the region.

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Assessment of residential attractiveness at the local level

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Keywords: residential attractiveness, perception, sketch map, local scale, neighbourhood

Assessing the residential attractiveness of a given area is a complex process that encompasses both an objective dimension (a wide range of hard data) and a subjective dimension (personal perceptions of various factors influencing our feelings about a given area). At the same time, it is very important to realise that other factors, such as the scale of the area or the sociodemographic structure of the evaluators, also play a crucial role in such an assessment (Jansen, 2020). While certain factors may be highly significant at the macroregional level (see, e.g., Doležal et al., 2026), they may become less prominent at the meso- or microregional level, as the significance of the reasons for assessing residential attractiveness may also change with varying scales. And the same can be said for various population groups (Doležal et al., 2022). This contribution focuses on presenting the results of assessing the subjective dimension of residential attractiveness, using the example of Inglewood, an established urban neighbourhood in Edmonton (Canada), that has been undergoing a dynamic transformation in recent years, consisting primarily of increased residential development density. The aim is not only to highlight the spatial distribution of (un)attractive areas, but above all to examine the reasons behind the reported assessments. Methodologically, the study builds on a pen and paper questionnaire survey of the neighborhood's residents (n=116) – a method traditionally used for such purposes in geography (see e.g., Korec & Smatanová, 1999) – supplemented by sketch mapping (see e.g., Doležal et al., 2022). The survey was conducted during autumn 2025 and spring 2026. The results reveal that environmental factors dominate, while social factors play role in only partial extent (mainly in negative context). Economic factors are less accentuated by the residents. The group of other factors is mainly represented through geographic perspective (e.g. proximity to amenities), which was also partially reflected in slightly higher preference of traditional small-scale residential zones (blocks of single-family houses) rather than zones with larger forms (apartment housing). These results indicate that, compared to macro-regional level (Doležal et al., 2026), the overarching groups of factors are similarly important, however, their inner reasons' structure differs.

References:

- DOLEŽAL, D., ŠIMÁČEK, P., COLLINS, D. 2026: Residential Attractiveness of European Space: A comparative study of Canadian and Czech young adults' preferences. *Journal of Maps*, 22 (1), 2688279.
- DOLEŽAL, D., FIEDOR, D., FŇUKAL, M., SZCZYRBA, Z., ŠERÝ, M., ŠIMÁČEK, P. 2022: Percepce rezidenčního prostředí v Přerově pohledem místních obyvatel. In: Fiedor, D., Minxová, P., Smolová, I. 2022. Česká a slovenská geografie: mezi národní tradicí a mezinárodní relevancí. Sborník abstraktů z XXV. Kongresu České geografické společnosti a 18. kongresu Slovenskej geografickej spoločnosti. Univerzita Palackého v Olomouci, Olomouc, s. 178.
- JANSEN S.J.T. 2020: Urban, suburban or rural? Understanding preferences for the residential environment, *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, 13(2), 213–235.
- KOREC P., SMATANOVÁ E. 1999: Perception of housing quarters quality in Bratislava by its inhabitants. *AFRNUC, Geographica Supplementum*, 223–234.

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Waste-to-Energy in Czechia: development potential, spatial distribution and challenges of social acceptance

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Keywords: waste-to-energy, Czechia, solid recovered fuel, social acceptance

Energy recovery from waste is situated at the intersection of waste management, energy systems, district heating, and regional development. This contribution focuses on the position of energy recovery in Czechia in the context of the European Union's environmental, energy, and climate policy. On the one hand, energy recovery can play a role in the management of residual, non-recyclable waste and in the provision of local heat and electricity. On the other hand, it raises questions about its position within the waste hierarchy, its limits in a circular economy, and local opposition to Waste-to-Energy (WtE) infrastructures.

For the purposes of this contribution, energy recovery from waste is understood in a broad sense as a set of technologies for obtaining energy in the form of heat or electricity from waste. Key forms include waste-to-energy facilities, i.e. incineration plants with energy recovery; district heating plants and cement plants using solid recovered fuel produced from waste; and biogas plants processing biodegradable waste. Energy recovery is recognised in the EU Waste Framework Directive (Directive 2008/98/EC) as a form of "other recovery" within the waste hierarchy. In the Czech context, it is also addressed in the Waste Management Plan of the Czech Republic for the period 2025–2035 (MŽP, 2025), which works with an expected share of approximately 25–35% of total municipal waste generated for energy recovery. However, energy recovery remains positioned below prevention, preparing for re-use and recycling, and above disposal in the waste hierarchy.

The main aim of this contribution is to evaluate the current state, potential, and barriers to the development of energy recovery from waste in Czechia. After the introduction and a brief historical overview, the focus will be on the spatial distribution of operational and planned infrastructures, particularly incineration plants with energy recovery, district heating plants, cement plants, and biogas plants.

The conclusion will address social acceptance and environmental justice, focusing on the procedural, distributive, and recognitional dimensions of justice as conceptualized by Jenkins et al. (2016). The contribution argues that the development of this sector is shaped not only by technological innovation, waste availability, markets, and legislation, but also by social and institutional factors. The most relevant factors include public trust in institutions, the quality of communication, participation in decision-making, and the perception of environmental and health risks in relation to potential local benefits. Finally, the contribution discusses the main sources of local opposition to WtE infrastructures.

References:

- JENKINS, K., MCCAULEY, D., HEFFRON, R., STEPHAN, H., REHNER, R. 2016: Energy justice: A conceptual review. *Energy Research & Social Science*, 11, 174–182.
- MŽP 2025: Plán odpadového hospodářství České republiky na období 2025–2035.
- DIRECTIVE 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

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From post-storm damage surveys to mobile severe storm observations: developing an integrated field research platform in Central Europe

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Keywords: TIM, severe convection, storm damage surveys, storm field research

Severe convective storms are among the most destructive natural hazards affecting the Western Carpathians, yet detailed field observations remain limited. Building on a successful UAV-supported damage survey of the 2025 Hažlín tornado, the Institute of Geography at Pavol Jozef Šafárik University is developing an integrated field research platform for severe storm investigations. The damage survey successfully demonstrated an integrated workflow combining UAV photogrammetry, satellite remote sensing, a dedicated mobile GIS application, and standardized damage classification based on the International Fujita Scale, enabling rapid and consistent georeferenced documentation of tornado impacts. The platform combines post-event damage assessment using UAVs, satellite remote sensing, the validated mobile GIS workflow, and real-time storm observations from deployable automatic weather stations mounted on a dedicated mobile research vehicle. Initial field deployments have further demonstrated the capability of the mobile platform to acquire high-resolution meteorological observations during severe convective events, complementing permanent observation networks. Future developments include UAV-based measurements of low-level atmospheric profiles to improve the understanding of pre-convective environments and convection initiation. The platform forms the basis of the university's contribution to the international Thunderstorm Intensification from Mountains to Plains (TIM) campaign and supports interdisciplinary research, numerical model validation, more efficient post-event damage surveys, and rapid documentation of severe weather impacts.

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The book *Guide to selected satellite measurements: an overview*

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Keywords: satellite measurements, satellite images, remote sensing, Earth's atmosphere, Earth's gravity field

Satellite remote sensing data, together with satellite measurements of the gravity field, have now become a new valuable source of environmental information, comparable to strategic "raw material resources". Their content compatibility and temporal continuity allow us to detect changes in the landscape and the Earth's atmosphere, particularly weather (especially extreme weather events), and, through them, to monitor the heterogeneous structure and development of these two systems. No less important are the data from geodetic satellites mapping the Earth's gravity field, which play an irreplaceable role in the research of geodynamics and global changes in the hydrosphere of planet Earth.

The presented book aims to help select data from satellite measurements for various purposes. It is directed to those who want to use satellite remote sensing and Earth's gravitational field measurements for various research or application purposes. It is also intended for those who hear about the use of satellite images on the radio or television, or read about them in the daily press – it should provide them with basic characteristics indicating the information content of satellite images. An important part of the goal is also to contribute to increasing general literacy in obtaining and using the results of satellite measurements in everyday life, e.g., for a better understanding of the content of image documentation of dynamically changing objects and processes in the landscape. This educational aspect is particularly important, since Slovakia is in the process of accession to the European Space Agency. The publication is compiled in a way that its individual chapters not only help the user find the data he/she needs but also indicate the basic approach, allowing him/her to obtain the information he/she is looking for.

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Digitalization of public greenery management in Bratislava

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Keywords: urban greenery management, tree inventory passportization, open data, digitalization

Reliable, spatially precise data are a precondition for the efficient and transparent management of urban greenery. Until recently, the City Hall of Bratislava, the capital of Slovakia, lacked a complete record of the green elements in its care: basic questions such as the number of administered trees or the exact lawn areas could not be answered reliably, map sources were partial, and the agenda was dispersed across many actors and several software environments (Kristiánová, 2011). This contribution describes the ongoing digitalization of public greenery management at the city level, covering the starting situation, the current state and the planned next steps.

To build a complete spatial baseline, a city-wide geodetic survey of greenery elements was carried out in 2023–2025. It covered the entire public space (not only city-owned land) and used a combined method drawing on orthophoto imagery, GNSS measurement and mobile mapping. The survey distinguishes seven element categories (lawns, shrubs, hedges, flowerbeds, groups of trees, individual trees and other elements) and captured approximately 302,000 standing trees and 1,750 ha of lawns. The complete dataset, including the administrator and ownership data, has been published through the OpenData Bratislava portal. Building on this baseline, the central task was to connect maintenance records directly to spatial elements in a shared geodatabase, replacing the previous separation of tabular contractor administration, map-based task localization and standalone tree-assessment tools. After methodical evaluation of three vendors carried out with Bloomberg Associates, the GreenSpaces application (R3GIS) was selected for its functionality, price and regional adoption; implementation began in autumn 2025. It provides a GIS environment with an integrated database of performed work, a mobile component for field documentation, and a verification system for tree assessment. Planned next steps include continued tree-condition assessment, deployment of further databases, more efficient and transparent task management for contractors, and integration of UAV-based data collection and vegetation-health analysis. The case illustrates a practical shift toward system-based, data-driven greenery management of public greenery with transparent and accurate data (Šimek and Štefl, 2020).

References:

- KRISTIÁNOVÁ, K. 2011: *Manažment sídelnej zelene*. PhD thesis, STU Bratislava.
ŠIMEK, P., ŠTEFL, L. 2020: Urban greenery management – system procedures and planning tools. *Životné prostredie*, 54(3), 183–191.

Structure of municipal tax revenues in the Czech Republic

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Keywords: taxes, revenue, municipality budget, cluster analysis, Czech Republic

Municipal tax revenues represent a key pillar of local budgets, financing public services, infrastructure development, and routine administrative operations. This paper examines the spatial differentiation of tax revenues among Czech municipalities with the aim of identifying patterns of fiscal capacity. Particular attention is paid to the extent to which municipalities rely on sources other than shared taxes and how spatial context influences this diversification. The analysis is based on cluster methodology, which distinguishes eight types of municipalities, further characterized by their tax revenue per capita. The findings indicate that four clusters achieve higher revenues through environmental charges, gambling-related income, and property taxation. At the same time, these revenue sources are associated with potential adverse effects that need to be considered. More details on this research are available at <https://doi.org/10.1080/17445647.2026.2682790>.

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A multi-source GIS framework for mapping energy and climate adaptation potential in the Košice self-governing region

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Keywords: central district heating, spatial planning, geoportal, Košice region

District heating and cooling systems in the Eastern Danube Region face fossil-fuel dependence, ageing infrastructure, energy inefficiency and growing climate-adaptation needs. Their transition requires spatially explicit information on renewable energy resources, environmental conditions, and infrastructure. This study presents a multi-source geospatial framework developed for the Košice Self-Governing Region (KSK), eastern Slovakia, to support screening-level assessment of renewable energy resources, heat decarbonisation and climate adaptation. The framework was developed within the INTERREG Danube Region project REHEATEAST – Building local partnerships to reduce the fossil energy demand for district heating systems (DRP0200401), co-funded by the EU. In this project, Via Carpatia EGTC participated in a consortium promoting reduced fossil-energy demand in district heating and cooling through renewable energy, waste-heat utilisation, digitalisation and multi-stakeholder cooperation.

The workflow integrates open and public geospatial, Earth observation, geological and meteorological data using GIS, remote sensing, atmospheric modelling and microclimate modelling. Solar irradiation was modelled with the open-source GRASS GIS *r.sun* module using a national lidar-based digital surface model. Land surface temperature was derived from quality-filtered Landsat 8 and 9 Level-2 data for 2015–2025 in Google Earth Engine, while long-term wind and precipitation patterns were derived from WRF-ARW simulations for 2014–2023. Additional indicators included geothermal potential, suitability for ground-, groundwater- and air-source heat pumps, and accessibility to district-heating sources.

To ensure spatial and cartographic consistency, the heterogeneous datasets were transformed to a common coordinate reference system and organised at predefined spatial scales. Most thematic layers were represented using a common five-level ordinal legend from very low to very high potential, while retaining indicator-specific thresholds. At building level, thematic values were linked to common INSPIRE building footprint polygons using zonal statistics. The dimensions were not normalised or weighted against each other and were retained as separate thematic indicators rather than aggregated into a composite score.

The resulting framework brings together seven energy and environmental domains, enabling joint assessment of solar and wind resources, surface overheating, precipitation and rainwater potential, geothermal conditions, heat-pump suitability and proximity to district-heating infrastructure. The derived data layers indicators were integrated into the Energy Potential application of the KSK Geoportal (<https://www.geoportalsk.sk/home/aplikacie/>), creating a decision-support environment. The study demonstrates how spatial data infrastructure can support digital decision-making for energy transition, climate adaptation and landscape planning. The framework provides a transferable approach for integrating renewable-energy potential, district-heating infrastructure and climate-related environmental indicators within a common spatial reference.

The work also complements the CLIMANEMU project (09I04-03-V02-00002), supported by the EU Recovery and Resilience Plan for Slovakia, and was supported by VEGA project 1/0780/24, strengthening geospatial evidence and urban microclimate modelling for climate-neutral and climate-resilient planning.

Towards more reliable spatial analyses of shared micromobility: a network snapping approach

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Keywords: snapping, micromobility, spatial analysis, network alignment, GIS

The growing use of shared micromobility systems has generated large volumes of GPS trajectory data, creating new opportunities for analysing urban mobility patterns. However, positional inaccuracies in raw trajectories remain a major source of uncertainty in spatial analyses, while the influence of trajectory snapping on the outcomes of these analyses has received limited attention. This study presents a reproducible framework for assessing the effects of network snapping on shared micromobility trajectories. An initial sensitivity analysis using snapping tolerances ranging from 10 to 50 m was conducted to determine an appropriate preprocessing threshold, after which a 30 m tolerance was applied to more than 1.2 million trips recorded in Košice, Slovakia, between 2019 and 2024. The effects of snapping were assessed using descriptive statistics together with trajectory length, line density, and raster-based analyses. Correspondence between trajectories and the transport network was quantified as the cumulative length of trajectory segments located within a 1 m buffer of the network, which increased from 332,473 km before snapping to 1,639,384 km after snapping (a 493% increase). These findings demonstrate that preprocessing decisions substantially influence the interpretation of spatial mobility patterns and should be considered an essential step in geographical analyses of shared micromobility.

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Fine-scale assessment of thermal exposure of shared micromobility users

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Keywords: shared micromobility, thermal stress, UTCI, snapping, trajectory analysis

Shared micromobility has become an increasingly important component of sustainable urban transport and is actively promoted by many cities. Unlike motor vehicle users, its users are directly exposed to outdoor atmospheric conditions throughout their journeys. In increasingly overheated urban environments, heat stress has become an important environmental factor affecting the comfort and safety of shared micromobility users. However, assessing heat stress exposure along micromobility routes remains challenging due to the high spatial and temporal variability of urban microclimatic conditions and the need to integrate these data with high-resolution mobility trajectories. The aim of this paper is to present a methodology for assessing heat stress exposure of shared micromobility users through the spatio-temporal integration of high-resolution Universal Thermal Climate Index (UTCI) data and shared micromobility trip trajectories. The methodology is demonstrated using a case study from the city of Košice (Slovakia) covering the period 15–21 June 2021. It combines hourly UTCI values derived from the ENVI-met microscale model at a spatial resolution of 15 m with anonymized trip data provided by ANTIK, the leading shared micromobility operator in the city. After reconstructing trip trajectories using a snapping approach, both datasets were integrated in space and time to identify road segments and locations where shared micromobility users are exposed to higher levels of heat stress. The proposed approach enables the quantification of heat stress exposure of shared micromobility users in urban environments and the identification of road segments associated with elevated heat stress exposure. It provides a basis for climate-resilient urban mobility planning and route optimization and can be further extended to support the design of alternative micromobility routes with lower heat stress exposure. More broadly, the methodology offers a practical tool for urban climate adaptation in the context of ongoing climate change.

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Light pollution in global cities based on local climate zones

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Keywords: artificial light at night, high-resolution satellite imagery, local climate zones

Light pollution is one of the major contemporary environmental problems. While the widespread ecological, socio-economic, and public health consequences of artificial light at night are increasingly documented, the specific role of urban morphology and functional zoning remains under-researched. Our study addresses this gap by integrating the Local Climate Zones (LCZs) framework to evaluate nighttime light (NTL) intensity across dozens of global cities or agglomerations. Utilising high-resolution satellite imagery from the Visible Infrared Imaging Radiometer Suite (VIIRS) instrument spanning more than a decade (2012–2023), we examine how diverse built environments modulate NTL intensity. Our statistical analysis reveals temporal trends in NTL pollution for particular cities, as well as characteristic spatial differences among LCZs. The highest NTL intensity in 2023 was found in Bogotá, followed by Buenos Aires and Istanbul. On the other hand, the lowest NTL intensities were observed in Lagos, Dhaka, and the Ruhr region. While NTL has increased in most global cities over the last decade, in some (particularly European) cities, including Madrid, London, and Paris, NTL has significantly decreased.

Multi-platform hyperspectral and thermal earth observation for environmental monitoring

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Keywords: hyperspectral remote sensing, thermal remote sensing, multi-platform Earth observation, airborne remote sensing, UAV remote sensing

The current development of Earth observation technologies makes it possible to investigate environmental processes across a broad range of the electromagnetic spectrum — from visible and shortwave infrared radiation used in hyperspectral imaging to thermal infrared radiation. Earth observation can also be carried out at different spatial scales, ranging from global and regional coverage to detailed local surveys, with varying spatial resolution, levels of generalisation, and opportunities for repeated data acquisition over time. Depending on the sensor platform, Earth observation can be divided into satellite-based, airborne, and UAV-based remote sensing. The aim of this contribution is to present a multi-platform and multi-sensor approach combining hyperspectral and thermal imaging. Such an approach enables the acquisition of complementary datasets that can be used to assess and monitor environmental phenomena, particularly vegetation condition and urban overheating.

The hyperspectral component includes the EnMAP satellite mission, Planet's Tanager hyperspectral satellite system, the airborne SAVI-1000 imaging spectrometer, and the Specim AFX10 system integrated with a UAV platform. The thermal component combines Landsat 8 and Landsat 9 satellite data with regular global coverage, high-spatial-resolution thermal satellite data provided by SatVu, airborne data acquired using the TABI-1800 thermal scanner, and highly detailed UAV data collected with the DJI Zenmuse H30T sensor. Together, these technologies provide complementary information on the spectral response, condition, and spatial structure of vegetation, as well as on the spatial distribution of land surface temperature. The contribution will present the basic characteristics of the individual sensors, the principles of data acquisition, and the main processing steps. Hyperspectral data processing includes radiometric and spectral calibration, geometric and atmospheric correction, orthorectification, and the generation of surface reflectance mosaics. Subsequent analyses focus on the evaluation of spectral profiles, the calculation of vegetation indices, the analysis of spectral variability, and vegetation classification. Thermal data processing includes the retrieval of surface temperature from radiometric measurements, the consideration of parameters affecting the measurement, geometric correction, the generation of thermal mosaics, and the interpretation of spatial temperature patterns.

Selected examples will be used to present the basic outputs of the individual technologies and their potential applications. Hyperspectral data will be demonstrated in the context of forestry, vegetation condition assessment, and urban green-space management. Thermal data will be used to identify urban hotspots, evaluate temperature differences between different surface types, and assess the cooling effect of vegetation.

The presented approach highlights the potential of combining hyperspectral and thermal data acquired from different platforms for multi-scale environmental monitoring. The resulting information can support decision-making in forestry, urban vegetation management, and the design of measures aimed at mitigating urban overheating.

"My dad says it's a hoax": exploring pre-service geography teachers' pedagogical content knowledge and emotional readiness in climate change education

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Keywords: climate education, misconceptions, pedagogical content knowledge

Climate change represents one of the most critical and pressing issues in contemporary education, demanding the attention of today's educators. Given its inherently interdisciplinary nature, it is also a topic that profoundly intersects with geography education (Owen & Taylor, 2024). This pilot study investigates how pre-service geography teachers perceive their readiness to teach climate change, specifically focusing on their pedagogical content knowledge (Gudmundsdottir & Shulman, 1987) and emotional responses when facing climate skepticism in the classroom. Utilizing a qualitative approach, the research employed the critical incident technique (vignette method) with a sample of 50 pre-service geography teachers at Faculty of Education, Masaryk University.

Participants were presented with a classroom scenario wherein an 8th-grade student dismisses global warming as a hoax due to recent heavy snowfall, confusing short-term weather with long-term climate. The pre-service teachers were asked to articulate both their immediate, internal emotional reactions and their specific, spoken pedagogical responses. The collected qualitative data were analyzed using thematic analysis (Braun & Clarke, 2006) to identify recurring patterns in teachers' reasoning and coping mechanisms.

Preliminary findings reveal a diverse spectrum of internal emotional responses, ranging from frustration and conflict-avoidance anxiety (regarding the parent's response) to pedagogical enthusiasm. Regarding teaching strategies, the data highlight a dichotomy in addressing misconceptions: some future teachers tend to rely on an authoritative, transmission-based approach, while others actively employ constructivist methods, utilizing geographical data to facilitate a dialogue distinguishing between weather and climate phenomena.

The study concludes that geography teacher training programs need to focus on pedagogical content knowledge and go beyond. They need to actively cultivate pre-service teachers' self-efficacy, emotional resilience, and specific didactic strategies to handle controversial or confrontational situations effectively. The findings provide valuable insights into modifying current didactics courses to better equip future educators for the realities of modern geography classrooms.

References:

- BRAUN, V., CLARKE, V. 2006: Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101.
- GUDMUNDSDOTTIR, S., SHULMAN, L. 1987: Pedagogical content knowledge in social studies. *Scandinavian Journal of Educational Research*, 31(2), 59-70.
- OWEN, C., TAYLOR, A. 2024: Teaching Climate Change: Thinking Critically in Geography, Geography Association.

The challenges of teaching geography of the post-soviet space – its position in geography education in Slovak schools

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Keywords: teaching of world regional geography, Russia, Eastern Europe, post-soviet space

Teaching regional geography of the former Soviet bloc countries has been classified among the so-called 'controversial' or problematic topic, particularly since 2022. The reason is more than obvious – primarily the ongoing Russo-Ukrainian conflict, which began as a (formally) covert and later progressed into a full-scale Russian invasion of Ukraine. The problematic status of the entire former Soviet Union region is evidenced merely by the difficulties in defining its name, delimitation, and subdivisions. It must be noted that politics is also intensely intertwined with academic geographical discourse here – specifically, political stances on various concepts such as Pan-Russianism, Eurasianism, etc. It has been almost 35 years since the collapse of the Soviet Union – more than half the duration of that state's existence – a state that fundamentally shaped world events and whose ideology continues to exert a significant influence in ever-changing forms. This manifests either in an active alignment with the geopolitical legacy of the Russian or Soviet empire, or conversely, in a rigorous suppression of its heritage, including the rejection of the term 'post-Soviet'.

Setting aside the aforementioned connotations, it is an undeniable fact that this region (excluding the Baltic states) covers nearly 15% of the world's landmass yet is home to only 3.5% of the global population. Such a vast portion of the Earth's surface cannot be constantly overlooked, nor can it be constantly perceived as some sort of transitional, transforming territory, or, for some, a reminder of our own past. As part of the preparatory work for a new university textbook: *Geography of Eastern Europe, Northern and Central Asia*, we conducted a brief research study of the status of teaching devoted to these macroregions at Slovak universities aiming to determine the representation of these macroregions in the teaching of world regional geography. For comparative purposes, we also briefly analyzed the representation of teaching these macroregions at universities in the Czech Republic. Since the teaching of world regional geography features prominently within the training of future geography teachers, we further analysed the curricular standing of these macroregions within the geography curriculum at primary and secondary schools in the Slovak Republic. The aim of the presented research is to explore the possibilities of employing the forthcoming textbook in the teaching of world regional geography at universities, as well as to incorporate current trends into its design; not only in the teaching of geography, but also in the way the teaching material is presented.

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Assessing the impact of weather on visitation patterns in cottage areas using mobile positioning data

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Keywords: weather, cottage areas, mobile positioning data, visitation rhythms

The study investigates how contrasting weather conditions affect visitation patterns in recreational cottage areas across Slovakia, with particular attention to the influence of altitude and the character of recreational destinations. The analysis is based on anonymized mobile positioning data, allowing detailed monitoring of hourly changes in the present population. Two consecutive weeks with markedly different weather conditions at the turn of May and June 2023 were compared. The results demonstrate that favourable weather generally leads to higher visitation, although the magnitude of this effect varies across different types of recreational areas. Less commercialized cottage destinations exhibit a stronger weather dependence, whereas more established recreational centres show greater stability in visitor numbers, suggesting that planned and pre-booked stays reduce weather sensitivity. The findings also indicate the contribution of one-day visitors and tourists to observed population dynamics. Furthermore, weather-related differences in visitation become more pronounced with increasing altitude, highlighting the greater vulnerability of mountain recreational areas to adverse weather conditions.

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Assessment of residential areas in the city of Szeged (Hungary) using a questionnaire survey and GIS

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Keywords: settlement assessment, residential preferences, multi-criteria evaluation, GIS, Szeged

The concepts of *Ortslage* (site) and *Verkehrslage* (situation) were first introduced by Friedrich Ratzel's 1903 work on the location of large cities (Ratzel 1903). The concept of site describes the characteristics of the area in which the settlement is located and whose resources it exploits through human use. Situation refers to the specific characteristics that determine the settlement's accessibility in relation to other settlements or regions.

In our view, the concepts of site and a situation can be interpreted not only at the level of continents and countries, but also at the intra-urban scale, allowing them to be applied within a single city.

From the perspective of urban residents, residential properties hold varying degrees of locational and structural value. In our model, we determine the relative differences in value among residential buildings. Attractive or unattractive characteristics often depend on the building's own attributes (e.g., construction material), but they also depend on the characteristics of its surroundings (e.g., proximity to a park or industrial facilities). We conducted a questionnaire survey among 320 residents of Szeged to analyze these preferences. Based on the questionnaire survey, we determined which housing characteristics (site) and the proximity of which facilities (situation) have a positive or negative impact. We also surveyed the population's views on the spatial extent of these effects. We surveyed the spatial locations of residential buildings and the features influencing their value. We mapped approximately 4,000 point, line, and polygon features. We rasterized the vector layers of spatial objects in QGIS software and created 27 weighted layers from them, which, when combined, produced the classification maps of the city's residential buildings. According to our model, the highest relative scores were recorded for pixels representing several brick blocks of flats in the "Belváros" (Downtown) and "Belsővárosrész" districts. The pixels with the lowest values were located in the "Újrókus" district on the western side of the city, representing a few reinforced concrete prefabricated buildings, as well as in the area of detached houses in the "Kiskundorozsma" district, which is the farthest from the city center. We also calculated the average relative score for each city district. According to the model, the districts with the highest average scores were the "Belváros" and "Belsővárosrész" – that is, the city center – which developed during the 19th and 20th centuries, as well as the "Fodor-kert" district on the northern side of the city, which consists mainly of detached houses. The lowest average scores were recorded in the "Ballagítóikiskertek", "Tápéikiskertek" and "Bodomikiskertek" districts, located on the outskirts of the city and consisting mainly of holiday homes rather than residential buildings, as well as in the "Újrókus" district, which is dominated by prefabricated concrete blocks of flats.

Reference:

RATZEL, F. 1903. *Die geographische Lage der grossen Stätte*. In: Th. Petermann (Hrsg.): *Die Großstadt Jahrbuch der Gehe-Stiftung IX.*, Dresden, 33-72.

Functional regional taxonomy of world cities based on air transport: the impact of the COVID-19 pandemic

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Keywords: Functional Regional Taxonomy; World Cities; Air Transport; Global Functional Macroregions (GFMs); COVID-19 Pandemic

This study examines the principal trends in the development and spatial distribution of air transport before, during, and after the COVID-19 pandemic. It applies the method of functional regional taxonomy, understood as the classification of spatial elements based on spatial interactions; in this case, the analysis is based on air passenger flows between cities worldwide. Unlike conventional regional taxonomies, the proposed approach does not classify regions but cities, representing the first taxonomy of this kind. Data on the intensity and spatial distribution of air transport make it possible to identify Global Functional Macroregions (GFMs), which are not represented as continuous areas but as categories assigned to global cities. The temporal comparison indicates that, after a prolonged period of relative stabilisation in air traffic during the pre-COVID period, the COVID-19 pandemic caused a sharp decline in global passenger mobility, accompanied by disruptions and irregularities in spatial patterns. In the post-COVID period, these spatial patterns have been gradually returning to their previous trajectory.

This study was supported by the Czech Science Foundation project "Structures of spatial interactions: role of distance and spatial patterns" [grant number: 24-12009S].

From single-person households to large households: differences in energy behaviour and appliance use

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Keywords: household, energy consumption, questionnaire, heating source, savings, daily activities

Electricity consumption and energy-saving measures are highly relevant subjects in both public and expert discussions. This paper analyses the energy behaviour of a selected sample of households in the Olomouc region. The research was conducted over two reference weeks in the first half of 2025 and involved 43 families with a total of 133 members. A daily activity was used to collect primary data. Each respondent recorded all activities performed, the location or room where they took place, and the devices used—both actively and passively - that affected electricity consumption. This made it possible to examine the temporal distribution of activities and device usage across different household types. Using a supplementary household questionnaire, it was possible to analyse their energy intensity, as well as socioeconomic and structural factors. An important part of the questionnaire was a list of appliances, which helped identify devices that continuously consume electricity. These were subsequently included in the analysis of actively and passively used devices.

Based on the data collected, it was possible to describe typical behavioural patterns that were identified across different household types. These differ primarily in the type and number of appliances used and their impact on overall electricity consumption. Differences were observed both during the summer and winter seasons, as well as on weekdays and weekends. The findings reveal differences not only in daily activity patterns but also in the timing of activities and appliance use. The resulting graphical representation linking daily activity logs with the number of appliances in use thus provides a clearer understanding of the energy consumption patterns of selected Czech households.

The paper has been created within the project "Hidden geographies of low-carbon transition: Czech households' energy behaviour and adaptive responses on energy poverty risks" financed by the Czech Science Foundation (No. 24-11885S).

MapStrApp: a digital application for developing map-use strategies in geography education

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Keywords: map-use strategies, geography education, digital application, adaptive learning, geographical thinking

The MapStrApp project focuses on researching and developing students' cognitive strategies for working with maps in the context of geography education. It is based on the assumption that successful map use depends not only on the level of students' map or technical skills, but also on their ability to select and adaptively apply appropriate map-use strategies. Although the importance of cognitive strategies has long been emphasised in educational research, geography education still lacks empirically grounded tools that would support their systematic development.

The project aims to develop, evaluate, and implement MapStrApp, a digital online application designed to support the development of map-use strategies among secondary school students. The application is based on the principles of instructional scaffolding and adaptive computer-supported learning. Through progressively structured map tasks, targeted support, and reflection on the problem-solving process, it enables students to expand their repertoire of strategies and develop the ability to apply them adaptively across different types of tasks.

The presentation will introduce the project's theoretical foundations, the conceptualisation of map-use strategies, and the pedagogical principles underlying the application. It will also present the application itself, its overall design, and its potential uses in geography teaching at lower- and upper-secondary school levels.

The project is supported by the Technology Agency of the Czech Republic.

The hierarchy of deservingness: Irina deserves help, but Ousmana is not welcome in the Czech Republic!

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Keywords: attitudes towards immigrants, Czech republic, deservingness, migration, vignettes

Perception of deservingness plays a crucial role in determining the extent to which others believe an individual deserves welfare, inclusion in society, or social recognition. Individuals differ in how highly their deservingness is perceived, which forms a deservingness hierarchies. At the bottom of these hierarchies are, among others, immigrants. They do not, however, form a homogeneous group; their positions vary considerably depending on their various characteristics (legal status, reason for migration, perceived economic contribution, or socio-cultural proximity to the majority population). Immigrants themselves also hold differing attitudes toward one another, which can further reinforce deservingness hierarchies. The concept of deservingness has fundamental practical relevance, as it can help explain the adoption of specific migration policies. This contribution examines the attitudes towards different types of immigrants using seven hypothetical profiles (so-called vignettes), which were evaluated both quantitatively (a representative sample of 1,240 Czech citizens) and qualitatively (four focus groups with different immigrant groups). It shows that minority populations do not merely respond to dominant deservingness hierarchies from the outside, but often internalise, negotiate, and pragmatically reproduce prevailing integration norms centred on individual autonomy, productivity, and self-reliance. By directly comparing majority and minority evaluations of distinct immigrant profiles, the contribution extends existing research beyond predominantly majority-centric and welfare-focused approaches, offering a more context-sensitive understanding of how immigrant deservingness hierarchies are reproduced, contested, and co-produced across both majority and minority populations.

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Religion and migrant integration in a broader context: examples from Ukrainian migration in Czechia

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Keywords: religion, migrant integration, religious landscape, Ukraine, Czechia

Russia's imperial aggression towards neighbouring Ukraine has brought with it a significant emigration of Ukrainians, especially to Europe and Czechia, which has transformed and is transforming the host regions. Ukrainian immigrants usually try to integrate into the host state and religion plays an important role in this process, thus becoming an important source of social capital for immigrants.

This study examines the basic premises, development, and consequences of the role of religion in the migrant integration process. In Western culture, two basic models of the relationship between religion and integration can be identified. In North America, migrants' religious identity is often perceived as a trait that can be successfully combined with a sense of belonging to American society and has frequently helped migrants integrate into the dominant society (Alba, Foner 2015).

In contrast, Europeans have experienced significant secularization of political and social institutions, and most Europeans tend to view religion as an obstacle to the successful integration of migrants.

In the context of the above, selected results and examples from the project will be presented in broad strokes, focusing on the role of religion in the integration of Ukrainian migrants in Czechia. For this topic is important the concept of post-secularism which reflects the growing awareness of the role of religion in the public sphere, and which has increased in response to social and political changes such as migration (e.g., the increase in the pluralization of the religious landscape). The formation of immigrant churches and the presence of immigrants in established churches can provide immigrant communities with a refuge from discrimination by the majority society as well as basic opportunities for economic stability and social recognition.

At present, we observe two main trends in the practiced and lived religiosity of Ukrainians in Czechia: a) the integration of Ukrainian migrants into traditional churches (primarily the Orthodox and Greek Catholic Churches) in Czechia, and b) the establishment and development of predominantly Ukrainian (independent?) Evangelical churches (such as the Baptists). Semi-structured interviews with church representatives and individual believers highlighted the believers' continuing strong ties to their country of origin and pronounced transnational tendencies of Ukrainian believers in Czechia.

Menstrual utopia from the perspective of feminist geographies

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Keywords: menstruation, utopia, inequalities, feminist geographies

Utopian thinking has long been connected to geographical inquiry through its concern with alternative spatial arrangements and the envisioning of more desirable futures. While traditional geographical engagements with utopia often focused on idealised spatial forms, feminist geographies have questioned these approaches for their universalising assumptions and limited attention to lived experiences. Instead, feminist perspectives understand utopia as an open-ended and participatory process rooted in everyday struggles and inequalities. Drawing on this conceptual framework, the paper examines menstruation as a spatially situated experience and explores what more menstrual-friendly futures might look like. The analysis is based on fourteen semi-structured interviews with women who have experience with menstruation. Participants described a range of barriers encountered in everyday environments, including inadequate access to public toilets, the absence of menstrual products and basic facilities, limited opportunities to manage menstrual pain, inflexible institutional schedules, and the continuing social stigma surrounding menstruation. The paper interprets these experiences through the lens of feminist utopianism, highlighting how everyday encounters with space reveal broader forms of exclusion and inequality. Rather than proposing a fixed model of an ideal menstrual environment, the study identifies possibilities for transforming public spaces, institutions, and social relations in ways that better accommodate menstrual needs. By connecting feminist geographies with debates on utopia, the paper contributes to discussions about how more inclusive and caring spatial futures can be imagined and negotiated.

Contribution of the operational programme just transition to the development of selected cities in Czechia

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Keywords: just transition fund, regional development, local governance

The JTF represented an important development tool for local governments in structurally disadvantaged regions. The funds can be used by coal regions to mitigate the impact of the shift away from coal mining as well as to support R&D and the circular economy. The aim is to determine how the studied cities differ in absorption levels and the thematic focus (supporting small and medium-sized enterprises; research and Innovation; digitisation; clean energy and energy savings; circular economy; land reclamation and reuse; retraining and job search assistance) of the implemented projects. The work analyzed data from the Ministry of Regional Development on subsidies provided under the Operational Programme Just Transition for the period 2021-2025. Both cities directly affected by coal mining (Chomutov, Most, Karviná) and cities on the periphery of the studied regions (Aš, Krnov, Žatec) were selected. The identified differences will then be discussed in the context of the city's political leadership and the activities of local leaders.

Managing urban transformation in a changing fin-de-siècle context: a historical-geographical assessment of urban policies in Vienna and Budapest (1880–1910)

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Keywords: historical geography, urban geography, infrastructure development, Vienna, Budapest

The fin-de-siècle period, spanning the late nineteenth century to the outbreak of the First World War and often regarded as the heroic age of urban development, left a substantial legacy in the built environment of European cities that continues to shape their character and image today. As a result, the urban policies of this era are generally perceived in both scholarly and public discourse as effective, and have therefore rarely been subjected to critical reassessment. A review of the international literature suggests that relatively little attention has been devoted to the relationship between historical forms of urban governance and patterns of urban environmental transformation. This paper addresses this gap by employing an innovative and comprehensive methodology to compare the effectiveness of urban policies in Vienna and Budapest between 1880 and 1910. Urban policy effectiveness is examined through an analytical framework that combines two dimensions – governance and infrastructure development – with three evaluative perspectives: construction and planning, municipal finance, and spatial organization. The governance dimension seeks to identify, primarily through legislative analysis, the institutional frameworks that shaped the autonomy of the two capitals. Particular attention is devoted to building and planning competences, fiscal powers, and the authority exercised by municipal districts within the broader system of urban governance. The infrastructure development dimension draws on data extracted from the statistical yearbooks of Vienna and Budapest and employs a range of quantitative indicators to assess the development of human and physical infrastructure, the evolution of spatial inequalities, and the relationship between these processes and municipal financial performance. The findings reveal a strong association between the degree of municipal autonomy and the effectiveness of infrastructure development. Across all three evaluative perspectives, Vienna – which enjoyed substantially greater municipal autonomy – achieved more effective population-adjusted development of both human and physical infrastructure. Moreover, despite undergoing two major territorial expansions, the city experienced a reduction in spatial inequalities. The findings suggest that the relatively extensive planning powers exercised by its municipal districts may have contributed to this outcome. By contrast, Budapest, whose autonomy was considerably more restricted and whose districts functioned largely as executive bodies, displayed a more ambivalent pattern of infrastructure-development effectiveness, while inequalities between districts increased over the period under examination. The analysis further demonstrates that Vienna achieved a greater population-adjusted expansion of infrastructure while incurring lower per-capita municipal expenditure than Budapest. Taken together, these findings suggest that broader municipal autonomy contributed significantly to more effective infrastructure development in Vienna, despite the city facing more substantial developmental challenges than its Hungarian counterpart. Overall, the study provides the first results of an innovative historical- and urban-geographical research agenda that opens new avenues for investigating both the effectiveness of historical urban policies and the long-term relationships between the urban governance practices of the fin de siècle and those of subsequent historical periods.

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Transformation of ethnic structure and diversity in Bratislava and the rural districts of Pezinok and Senec (1910–1950)

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Keywords: Bratislava, nationalities, transformation, diversity, hinterland

Bratislava and its surrounding territory have long represented one of the most ethnically diverse areas in present-day Slovakia, where Slovaks, Germans, Hungarians, Jews and other nationalities coexisted within an urban–rural environment shaped by profound political and demographic change. The dissolution of Austria-Hungary, the establishment of Czechoslovakia, the Second World War and subsequent post-war population policies fundamentally transformed the ethnic composition of the region. While previous studies have primarily focused either on the city of Bratislava or on individual ethnic groups, less attention has been paid to the spatial development of ethnic diversity and ethnic structure across the wider urban hinterland. This study therefore aims to analyse the transformation of ethnic structure and ethnic diversity between 1910 and 1950 in the territory of the present-day city of Bratislava and the present-day districts of Pezinok and Senec.

The research is based on population census data from 1910, 1921, 1930 and 1950. Historical census records are integrated with reconstructed historical administrative units and analysed in a GIS environment. Changes in the Slovak, German, Hungarian and Jewish populations are evaluated using absolute and relative population indicators, while the overall level of ethnic diversity is assessed through the Piasecki diversification index. By combining analyses of individual ethnic groups with diversity measures, the study compares long-term development in the urban environment of Bratislava and the surrounding semi-rural municipalities of the Pezinok and Senec districts.

The results reveal pronounced spatial differences in the transformation of ethnic structure during the first half of the twentieth century. Following the establishment of Czechoslovakia, the Slovak population strengthened throughout the study area, whereas the Hungarian population gradually lost its previous dominance in several localities. The German population remained concentrated in selected parts of Bratislava and neighbouring municipalities until the Second World War, after which its presence rapidly declined. The Jewish community, historically concentrated mainly in the urban core, experienced an almost complete collapse as a consequence of the Holocaust. Rural municipalities generally became more ethnically homogeneous over time, while Bratislava maintained a considerably more diverse ethnic composition until the post-war period. By 1950, political changes, forced migration and population transfers had fundamentally reshaped the spatial distribution of the principal ethnic groups across Bratislava and its hinterland.

The findings demonstrate that the transformation of ethnic structure between 1910 and 1950 cannot be explained solely by demographic development but was primarily driven by changing political regimes, migration processes and wartime events. Integrating analyses of ethnic diversity with the spatial development of the four principal ethnic groups provides a comprehensive historical-geographical perspective on the formation of the contemporary ethnic landscape of Bratislava and its surrounding territory and establishes a comparable spatial database for future historical and demographic research.

Geography of heat: integrating GeoAI and multi-scale geospatial modelling for analysis of urban heat stress in Košice

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Keywords: urban heat stress, GeoAI, UTCI

Climate change has transformed urban heat from a meteorological phenomenon into a complex geographical process affecting environmental quality, human health and the resilience of cities. Rather than being determined solely by air or surface temperature, urban heat stress emerges from dynamic interactions among atmospheric conditions, urban morphology, land cover, vegetation, radiation, airflow and human exposure. Understanding these interactions requires an integrated geographical perspective capable of analysing spatial and temporal processes across multiple scales.

This contribution introduces the concept of the Geography of Heat, an emerging geographical framework that combines Earth Observation, Geographic Information Systems (GIS), numerical atmospheric modelling and GeoAI for comprehensive assessment of urban thermal environments. The concept is demonstrated using the city of Košice (Slovakia), where high-resolution geospatial data derived from Sentinel-2 imagery, airborne LiDAR, three-dimensional urban morphology and meteorological observations are integrated with coupled WRF-UCM and ENVI-met simulations to analyse the spatial and temporal dynamics of urban heat stress. The multi-scale modelling framework enables physically consistent downscaling from regional atmospheric circulation to neighbourhood-scale thermal processes while preserving interactions between climate, urban form and land cover.

Unlike conventional Urban Heat Island studies based primarily on land surface or air temperature, the proposed framework evaluates human thermal exposure using the Universal Thermal Climate Index (UTCI), revealing substantial spatial and temporal variability of thermal stress within the city. The results demonstrate that the highest thermal stress develops in compact urban canyons, transportation corridors and densely built-up areas characterised by limited ventilation and intensive heat storage. Green infrastructure and riparian ecosystems significantly reduce thermal stress through shading and evaporative cooling; however, lower surface temperature does not necessarily imply lower heat stress because increased atmospheric humidity may partly offset cooling effects under particular synoptic conditions. These findings emphasise the importance of analysing the complete urban energy balance rather than isolated environmental variables.

The Geography of Heat framework extends beyond numerical modelling by incorporating emerging GeoAI methods. Machine learning and deep learning algorithms enable automated extraction of urban morphology from LiDAR and satellite imagery, semantic classification of land-cover elements, identification of thermal hotspots, prediction of local heat stress patterns from heterogeneous spatial data, and rapid generation of climate-vulnerability maps. GeoAI also enables surrogate modelling that approximates computationally intensive microscale simulations, opening new opportunities for near real-time urban climate assessment and scenario-based evaluation of adaptation strategies. Combined with explainable AI techniques, these approaches improve interpretation of the relative importance of urban morphology, vegetation, surface materials and atmospheric forcing in shaping thermal exposure.

The proposed geographical framework demonstrates how integration of remote sensing, GIS, GeoAI and physically based environmental modelling provides a new perspective on analysing urban heat as a coupled socio-environmental process. Beyond producing high-resolution heat maps, the approach supports evidence-based urban planning, prioritisation of nature-based solutions, optimisation of blue-green infrastructure and assessment of climate resilience in

medium-sized Central European cities. The Geography of Heat thus represents a promising research direction for geographical science in the era of climate change and artificial intelligence.

References:

- FEDOR, T., HOFIERKA, J. 2022:. Comparison of urban heat island diurnal cycles under various atmospheric Conditions Using WRF-UCM. *Atmosphere*, 13, 2057.
- FEDOR, T., HOFIERKA, J., ONAČILLOVÁ, K., SVETOZAROV, N. 2026: Modelling the Diurnal Dynamics of Thermal Stress in Urban Areas Using ENVI-met and High-Resolution Geospatial Data. *Urban Climate*, 67, 102923.
- JANOWICZ, K., GAO, S., MCKENZIE, G., HU, Y, BHADURI, B. 2020: GeoAI: Spatially Explicit Artificial Intelligence Techniques for Geographic Knowledge Discovery and Beyond. *International Journal of Geographical Information Science*, 34(4), 625-636.
- OKE, T. R., MILLS, G., CHRISTEN, A., VOOGT, J. A. 2017: *Urban Climates*. Cambridge University Press.

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Urban mobility constraints in central european cities: recent evidence, policy responses, and research gaps

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Keywords: urban mobility; Central Europe, transport accessibility, sustainable mobility, public transport, mobility equity, urban transport policy, mobility constraints, smart mobility, sustainable urban development

Urban mobility in Central European cities has undergone substantial transformation over the past three decades, driven by economic restructuring, rapid motorization, demographic change, technological innovation, and evolving sustainability objectives. While significant progress has been achieved in the modernization of transport infrastructure and the promotion of sustainable mobility solutions, numerous constraints continue to affect the efficiency, accessibility, and inclusiveness of urban transport systems. The presentation will review recent evidence on urban mobility constraints in Central European cities, in the context of recent modal split trends in urban environment. The review will examine key challenges related to transport accessibility, congestion, public transport performance, active mobility, environmental sustainability, social equity, and governance. Particular attention will be given to the impacts of urban sprawl, aging populations, digitalization, and the transition toward low-carbon mobility, with a special focus on vulnerable or disadvantaged urban mobility participants. Examples of good practices will be shown accross the region, covering sustainable urban mobility plans, public transport modernization, traffic calming measures, cycling infrastructure development, and smart mobility initiatives. Despite notable progress, there are persistent disparities in accessibility, uneven implementation of mobility policies, and limited consideration of vulnerable user groups in transport planning. Several research gaps will be highlighted, including the need for comparative cross-country studies, integrated assessments of mobility equity, and greater attention to the interactions between technological innovation and social inclusion.

This research has been supported by APVV project titled Depopulation and destabilization? Forecasts and simulations of demographic development in the Slovak Republic until the end of the 21st century and modeling of selected impacts (project No. APVV-23-0062).

A historical-geographical reconstruction of water bodies in the Lower Course of the Hron river based on the work of Matej Bel

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Keywords: Lower Hron River, historical water bodies, first half of the 18th century, geographical characteristics, narrated landscapes

The aim of the paper, prepared within the framework of the VEGA Project No. 1/0770/24 The Disappeared Landscape of Matej Bel (Reconstruction and Environmental History of the Historical Landscape in the Eighteenth Century), was to develop a historical-geographical characterization of water bodies based on a critical content analysis of Matej Bel's *Notitia Hungariae Novae Historico-Geographica* concerning Tekov and Esztergom Counties, as well as based on Samuel Mikovíni's maps and the maps of the First Military Survey. The descriptions contained in *Notitiae* were used as a narrative source and subsequently as original contemporary texts cited within a new methodological historical-geographical concept of narrated landscapes.

According to *Notitiae*, we identified and analysed three localities (river basins) in which water bodies (natural, human-modified, or artificial) and wetlands were concentrated along the lower course of the Hron River in the Danubian Lowland during the first half of the eighteenth century, as they were known and described by Matej Bel. Other sources further confirm that artificial water bodies were also constructed on three additional right-bank tributaries: the Lužianka, Nýrica, and Biňa.

The first of these were located on a left-bank branch of the Hron River (today known as the Perec) near Levice. In the Middle Ages, two large lakes were originally constructed there as part of the town and castle's northwestern fortification system. This fact is confirmed by the oldest preserved veduta from the territory of present-day Slovakia, dating from 1549, which depicts the castle, the town of Levice, and the surrounding landscape. By the first half of the eighteenth century, however, these water bodies had already become silted up and, according to Matej Bel, had turned into "deep" marshes.

Matej Bel described a cluster of five large water bodies along the Ket' Stream on the right bank of the Hron River. These extended from Farná to the stream's confluence near Biňa. Between the villages of Farná, Kuraľany, and Ket', there was an extensive marshland that had not been modified into a water body. Two of the water bodies situated along the lower course of the stream reached a length of approximately 1 km and a maximum width of up to 350 m. The last lake, located near Biňa, was known as Blatné jazero (Sáros Tó, "Muddy Lake").

The largest concentration of water bodies and wetlands, and the one described in the greatest detail by Matej Bel, was located along the Paríž Stream, which he referred to as Párkány. He recorded as many as eight interconnected water bodies, created by human activity by modifying natural depressions in the landscape. The water bodies were drained through a system of canals during the first half of the nineteenth century. The largest lake was situated in the area of the present-day Paríž Marshes, and was named after the village of Köbölkút (Gbelce). The other part of the lake belonged to the village of Kisújfalu (Nová Ves). The lake, which reached lengths of up to 3.5 km and widths of up to 600 m, was renowned for its floating islands, which Samuel Mikovíni also depicted on his Map of Esztergom County (1740). Matej Bel compared the lake's size, width, and depth to those of the nearby Danube River. The *Notitiae* also contain a detailed account of a "scientific" survey of the lake, focusing on the mapping of its largest floating island. This survey was most likely carried out in 1731 by Ján Matulai, one of Bel's collaborators. The largest floating island, which was circular in shape and had a circumference of approximately 600 m, is described in detail in terms of its morphology, movement across the water surface (in relation to wind conditions), vegetation,

and its use by local inhabitants as a meadow. The islands formed after the flooding of a marshland (peat bog) in the Middle Ages, when masses of peat, reinforced by vegetation, detached from the bottom and rose to the water's surface. Matej Bel also devoted attention in the *Notitiae* to a brief “geographical” description of the lake and its surrounding landscape. The present-day name of the Paríž Stream derives from a small left-bank side valley located north of present-day Gbelce, which in the eighteenth century was known as *Paríšska dolina* (Paris völgy, “Paris Valley”).

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How to teach controversial issues in geography?

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Keywords: European Values Study (EVS), geography, values education, teaching controversial issues, teaching strategies, interactive

How can geography education contribute to a better understanding of controversial issues in contemporary society? How can it foster values such as personal responsibility, solidarity, tolerance, active citizenship and democratic thinking?

The workshop aims to present a series of interactive tools, teaching materials, and instructional strategies to support geography teachers in teaching topics often perceived as sensitive or controversial due to differing opinions and attitudes, such as migration, the climate crisis, and related issues. These topics frequently present considerable challenges in classroom practice. The workshop is based on the outcomes of two consecutive Erasmus+ KA2 projects: European Values Education (EVALUE, 2019–2022) and Teaching Controversial Issues (TCI, 2023–2026). The projects were carried out by interdisciplinary teams of geographers, sociologists, education specialists, and secondary school teachers from several European countries. The consortium included universities in Tilburg (the Netherlands), Leuven (Belgium), İzmir (Turkey), and Banská Bystrica (Slovakia), as well as the European Association of Geographers (EUROGEO).

Both projects build on the extensive database of the European Values Study (EVS), a large-scale cross-national repeated cross-sectional research programme examining the values, opinions, and attitudes of Europeans. The EVS has been conducted every nine years since 1981 and currently covers almost all European countries. Through the unique integration of basic and applied research, EVS data have been transformed into a comprehensive collection of interactive maps and other educational tools available at www.atlasofeuropeanvalues.eu. The website also provides sample teaching materials and guidance on applying twelve versatile teaching strategies that can be used not only in values education and the teaching of controversial issues but also across the geography curriculum. During the workshop, participants will have the opportunity to learn how to use the interactive tools and experience several of these teaching strategies.

The workshop is supported by the Erasmus+ project 2023-1-NL01-KA220-SCH-000152141 Teaching Controversial Issues.

How development actors transform local heritage: interpretation and valorization of rural sites

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Keywords: rural, interpretation, valorisation, local heritage, Czechia

This paper focuses on the actors involved in the interpretation and valorization of local heritage in rural areas. While valorization is often a key component of (neo)endogenous approaches to rural development, less attention is paid to how the actors themselves understand, initiate, and implement it in practice. The aim of this paper is therefore to understand their motivations, resources, and experiences in the process leading from the preservation of a site to its current use. The empirical basis consists of twenty-two semi-structured interviews with actors involved in the restoration and interpretation of cultural, technical, and natural heritage sites in the Ústí nad Labem Region. The results show that the impetus for action usually comes from an individual motivated by a personal connection to the site and dissatisfaction with its condition. This is followed by the gradual mobilization of resources and people, with “learning by doing” and the ability to combine formal and informal competencies playing a key role. The actors perceive interpretation as a fundamental part of their work—not only as a tool for communicating with the public, but also as a means of legitimizing interventions and fostering a relationship with the site. Valorization then emerges more as a gradually emerging effect than as a predefined goal.

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Landscape ecological tools for climate mitigation and adaptation in Slovakia

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Keywords: climatic change, Slovakia, mitigation; adaptation; ecosystem services; green infrastructure; natural capital

The changing climate and its related consequences currently represent one of the most serious problems facing today's society. Despite all doubts, it must be stated that climate change is here. This is evidenced not only by statistical data, but also by the daily occurrence of weather extremes. Increasing temperatures and the growing frequency of extreme weather events, including droughts, floods, storms, and heatwaves, require the implementation of effective mitigation and adaptation strategies. In Slovakia, we have several tools that can play a significant role in the fight against the negative manifestations of climate change. The most important ones include:

- an automated support system for the territorial system of ecological stability, which represents an effective tool for building green infrastructure, which, in addition to protecting biodiversity, will also ensure the adjustment of the water cycle in the landscape, protection against manifestations of natural risks and hazards, as well as increasing spatial ecological stability.
- landscape planning studies, which form the basic landscape-ecological regulations for the creation of spatial planning processes. Currently, the processing of a landscape-ecological study for the needs of the territorial development concept of the Slovak Republic is underway, subsequently these studies will be processed at the regional and local levels
- Atlas of Natural Capital of Slovakia - which forms the basis for the effective use of ecosystem services, for the elimination of conflicts between the use of production and non-production services. The Atlas represents an assessment of the potential for the implementation of 34 socio-economic activities relevant to the territory of Slovakia. The Atlas of the Natural Potential of Slovakia is also available on a web portal, where each of us can find out for what purpose our land is suitable, what limits and restrictions need to be respected when using it, what is the environmental value of our land.

The results demonstrate that these tools provide a comprehensive decision-support framework for optimizing land use, strengthening ecosystem resilience, reducing landscape vulnerability, and improving climate adaptation capacity. Their integrated application contributes not only to biodiversity conservation and sustainable natural resource management but also to the regulation of hydrological processes, reduction of natural hazards, and enhancement of landscape ecological stability.

The Slovak experience demonstrates that landscape-ecological planning, based on the geosystem approach and ecosystem services concept, represents an effective instrument for integrating climate mitigation and adaptation into spatial planning and sustainable landscape management. The proposed framework can also serve as a transferable model for other countries seeking nature-based solutions to address climate change.

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Long-term socio-ecological research at the Trnava LTSER site

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Keywords: long-term socio-ecological research, Trnava LTSER site, landscape as geosystem

Long-Term Socio-Ecological Research (LTSER) is an interdisciplinary framework designed to track human-environment interactions over extended periods (one to multiple generations) to address global sustainability. It goes beyond traditional ecology by studying coupled human and natural systems, helping communities manage environmental problems and promote sustainability in practice.

One location for long-term socio-ecological research is the Trnava LTSER site, founded in 1985. It consists of the city of Trnava and 44 rural settlements. The LTSER represents intensively used industrial and agricultural areas with specific environmental problems (high levels of environmental contamination, the degradation processes of agricultural land, etc.) and a low degree of ecological stability. The use of the most productive soils for the construction of industrial parks represents a significant environmental issue. The Trnava LTSER site represents a case study area for testing landscape ecological methodologies developed at the Institute of Landscape Ecology. During its almost forty years of operation, a fairly good cooperation has been established among the main stakeholder groups, especially farmers and representatives of regional and local government, who ensure the transfer of scientific knowledge into practice. The aim of this poster is to present socio-ecological research focused on stakeholder engagement and collaboration, with an emphasis on conflicts arising from the use of ecosystem services and measures to enhance ecological stability. Several outputs were incorporated into strategic development documents at both the regional and local levels.

LTSER activities are helping raise environmental awareness and education, and bridge the gap between science and practice. The results were published in several publications (e.g., Cibira et al, 2005; Izakovičová et al., 2001; Izakovičová et al., 2011, 2024; Moyzeová et al., 2015).

References:

- CIBIRA, P., IZAKOVIČOVÁ, Z. et al. 2005. We learn from each other: manual. Bratislava. Institute of Landscape Ecology SAS, 160 p.
- IZAKOVIČOVÁ, Z., MIKLÓS, L., MOYZEOVÁ, M. et al. 2011. Model of representative geoecosystems at the regional level. Bratislava: Institute of Landscape Ecology, SAS. 86 p.
- IZAKOVIČOVÁ, Z., MIKLÓS, L., ŠPULEROVÁ, J., DOBROVODSKÁ, M., HALADA, Ľ., RANIAK, A., DICK, J. 2024. Data collection for assessment of the natural capital at the regional level: case study of LTSER Trnava region. *Environmental Sciences Europe*, 36, article no. 65.
- MOYZEOVÁ, M. et al. 2015. Assessment of the quality of the environment of rural settlements (on the example of rural settlements of Trnava district). Bratislava: Institute of Landscape Ecology SAS, 280 p.

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Shaping identity: the impact of "internal" migration on self-perception among Czechs and Slovaks

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Keywords: Czechoslovakism, Czech identity, Slovak identity, migration, Czech-Slovak relations

On 1 January 1993, Czechoslovakia dissolved into two independent states: the Czech Republic and the Slovak Republic. The shared state, established after World War I, was rooted in the idea of Czechoslovakism, which emerged at the turn of the nineteenth and twentieth centuries. The existence of a common state facilitated migration between the Czech and Slovak lands, resulting in population movements whose patterns remain partly visible today. This raises questions about the relationship between mobility and national identity. To what extent does a change of residence influence one's sense of national belonging? How can Czech and Slovak identities be defined, and did coexistence within a single political entity contribute to the formation of a shared identity?

This presentation addresses these questions by examining the historical and social dimensions of Czech and Slovak identity formation. The study is based on two case studies conducted using the biographical methods and in-depth interviews. The respondents were two male in their thirties - a Czech and a Slovak - both currently residing in Slovakia. The interviews focused on their life stories, followed by questions exploring the factors of shaping the national identity, such as language, history or religion. The respondents had experienced migration to a neighbouring country (meaning Czechia or Slovakia), where they had lived for a period of time. They also expressed a mixed identity, calling themselves Czechoslovaks.

The Czech-Slovak border region – town-twinning as a form of cross-border cooperation

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Keywords: Czech-Slovak border region, town-twinning, cross-border cooperation

The Czech-Slovak border region holds a unique position within the field of border studies, not only in terms of its (recent) history but also due to the linguistic and cultural similarities among the local populations. It can generally be considered indisputable that the key actors in cross-border cooperation are municipalities and cities – that is, self-governing institutions at the local level, with potential extensions into the (micro- and meso-) regional levels. However, this partnership is not limited to these regional (and local) development entities; various clubs and associations also collaborate—sometimes even primarily—covering a range of topics such as culture and sports, nature conservation and the environment, tourism, and transportation, among others.

So what does current, real-world cross-border cooperation between Czechia and Slovakia look like? We sought an answer to this question through desk research and fieldwork. To a certain extent, we thus built on a project by the Union of Towns and Municipalities of the Czech Republic and the Association of Towns and Municipalities of Slovakia (2012), which, however, covered both countries in their entirety and all international cooperation. The aim of the project, and of this paper, was/is to provide a comprehensive overview of cross-border partnership cooperation, with a focus on the following areas:

1. Cross-border projects (both ‘large’ and ‘small’): these concern a relatively small number of localities; however, when they are implemented, the relevant bodies are often involved on a recurring basis, though it is usually the capable actors who benefit, thereby deepening territorial differentiation;
2. Tourism organised by travel agencies: the destinations on offer are not concentrated in the immediate border region, but rather focus on natural and cultural-historical attractions – e.g. mountainous areas, spas and/or UNESCO World Heritage Sites;
3. Economic links: proximity to the national border does not play a key role in cooperation between Czech and Slovak businesses, as major – financially strong – players operate on an international scale;
4. Town twinning: the generally observed decline in partnerships does not apply to the Czech/Moravian–Slovak example; on the contrary, for border towns and municipalities, it can be described as a key factor, characterised by a wide range of forms of cooperation;
5. Nature of cooperation: the absence of a language barrier and cultural affinity are undoubtedly advantages; cross-border cooperation is not a compulsory activity, but generally depends on specific human capital, personal commitment and the level of political support and public involvement;
6. The role of the European Union, or more specifically the bilateral Interreg programme: this can be regarded as irreplaceable, as it enables activities beyond internal/own resources; whilst there are other funding options in the Czech Republic, in Slovakia it is often the only option.

References:

- JEŘÁBEK, M., SLAVÍK, V. a kol. 2025. *CZ-SK Town-twinning – prostředek k poznávání a integraci*. Masarykova univerzita, Univerzita Komenského, MINO. 172 s.
- ŠPAČEKOVÁ, Z., LABÁTOVÁ, A., ĎURECHOVÁ, S. 2012. *Medzinárodné partnerstvá miest a obcí. Príklady dobrej praxe – inšpirácie na úspešnú spoluprácu*. Bratislava: Združenie miest a obcí Slovenska. 92 s.

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Urban planning heritage and child safety: the impact of construction era on playground vegetation risks

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Keywords: playgrounds, urban green infrastructure, construction eras, playground safety, phytotoxicity, overall playground safety score (OPSS), thermal stress

Playgrounds represent critical nodes of urban green infrastructure where ecosystem services directly intersect with potential biological hazards. This paper investigates how historical shifts in urban planning paradigms shape the safety, composition, and functionality of playground vegetation in a Central European context. Using the city of Olomouc (Czech Republic) as an empirical case study, playgrounds were stratified into four distinct chronological construction eras: the Early Socialist Period (c. 1950–1960), the Prefabricated Housing Estate Era (c. 1960–1990), the Post-Socialist Transformation (c. 1990–2000), and Modern Commercial Development (c. 2000–present). The vegetation inventory was assessed using two integrated quantitative tools: the *Biological Plant Hazard Index* (BPHI), synthesizing phytotoxicity, pollen allergenicity, and mechanical risks (thorns), and the *Overall Playground Safety Score* (OPSS), which further incorporates tree vitality, structural stability, and canopy shading coverage.

The results demonstrate a strong correlation between the construction era and the nature of vegetation hazards. Mid-century socialist developments are characterized by dense, mature native tree canopies providing critical thermal comfort today, despite suffering from long-term maintenance neglect. Conversely, modern commercial developments reflect a distinct "Design Paradox": under liability pressure, designers strictly eliminate visible mechanical risks (thorns) but introduce hidden chemical risks through toxic exotic cultivars. Furthermore, the most recent playgrounds omit mature shade trees entirely. Consequently, the primary health hazard on contemporary play spaces shifts from toxic plants to severe summer heat exposure and surface overheating. The paper advocates for a paradigm shift from overly cautious "sterile playground" policies toward proactive risk communication, balanced species selection, and long-term asset management.

Socio-psychological barriers to sustainable transport: insights from Poland

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Keywords: sustainable transport, travel mode choices, residential location choices, socio-psychological perspective, Poland.

The transition towards more sustainable transport systems has progressed unevenly across Europe. Despite substantial investments in transport infrastructure, improvements in accessibility, and the implementation of sustainable mobility strategies, these efforts have not always translated into significant changes in modal split. This suggests that the barriers to sustainable transport extend beyond the physical characteristics of transport systems and require a broader understanding of the factors shaping individual mobility choices. Poland provides an interesting context for exploring these issues as a post-socialist country that has undergone profound socio-economic and spatial transformations since 1989. The rapid growth of private motorisation coincided with dispersed suburbanisation, creating a self-reinforcing relationship between residential decentralisation and increasing car dependency. Greater access to private cars expanded residential location choices, while low-density suburban development further increased dependence on automobile travel. As a result, congestion, urban sprawl, and spatial fragmentation have become major challenges in the metropolitan areas of Poland's largest cities. Although local authorities have introduced Sustainable Urban Mobility Plans and other strategies, their effects have, in many cases, remained unsatisfactory.

This raises the question of whether current approaches sufficiently recognise the socio-psychological determinants underlying travel mode and residential location choices, as well as the reciprocal relationships between these decisions. Understanding how different transport modes and residential environments are perceived, and identifying the historical, cultural, and psychological factors shaping these perceptions, is essential for explaining mobility behaviour and for designing effective mechanisms that encourage more sustainable travel and residential choices.

This paper develops a conceptual framework that explains sustainable transport from a socio-psychological perspective, drawing on the concept of the Syndrome of Released Desire as a legacy of Poland's post-socialist transformation. The transition from a centrally planned to a market economy reshaped not only transport systems but also aspirations, lifestyles, and the symbolic meanings attached to travel mode and residential choices. Within this framework, widespread car use and suburbanisation are interpreted not merely as rational responses to accessibility or travel time but also as expressions of deeper needs related to autonomy, comfort, prestige, privacy, and access to green environments.

The proposed framework demonstrates how these socio-psychological determinants simultaneously influence travel mode choices and residential location decisions, reinforcing long-term patterns of car dependency and urban sprawl. By integrating perspectives from transport geography, environmental psychology, and urban studies, the paper argues that sustainable transport should be understood not only as an infrastructural challenge based on accessibility but also as a cultural and psychological one.

This research was funded by the Excellence Initiative Research University at University of Wrocław (IDUB UWr in polish) under the project titled: The Role of Railway Transport Attractiveness and Inconvenience in Shaping Travel Behaviors and Settlement Networks: A Case Study of the Wrocław Agglomeration.

Spatial Accessibility of Selected Healthcare Services for the Ageing Population

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Keywords: spatial accessibility, healthcare, ageing population

Spatial accessibility of healthcare is important for the quality of life, especially in the context of an ageing population. This study focuses on the spatial accessibility of general practitioners for people aged 65 and over. The population in the Czech Republic is ageing (Eurostat, 2025) and people aged 65 and over can be considered as a risk group in the context of spatial healthcare accessibility. According to the United Nations (2018), older people have greater healthcare needs than younger age groups on average. A limiting factor for this group can be a reduction in mobility and limited access to some types of transport that can be used to travel for healthcare, for example due to the loss of a driving licence caused by health limitations. Therefore, in this research travel time is calculated by using a combination of walking and the public transport network based on GTFS data. The main aim of this study is to assess the spatial accessibility of general practitioners for people aged 65 and over in the Administrative District of the Municipality with Extended Competence (ORP) Ústí nad Labem. In a GIS environment the travel time is calculated using a network analysis and the closest facility. Areas with a higher share of people aged 65 and over and with longer travel time to the doctor will be identified. It is expected that parts of the region in smaller municipalities may have longer travel times. The main limitations of this study are that the model does not consider capacity of facilities, and it calculates with the closest facility without considering real-world patient choices.

References:

- EUROSTAT 2025: Population indicators [online]. [accessed 2026-06-12]. Available at: https://ec.europa.eu/eurostat/databrowser/view/DEMO_PJANIND__custom_5028383/bookmark/table?lang=en&bookmarkId=6588fe29-866c-4679-88e3-03e5e111fc0f
- UNITED NATIONS 2018: Health Inequalities in Old Age [online]. [accessed 2026-06-12]. Available at: <https://social.desa.un.org/sites/default/files/migrated/24/2018/04/Health-Inequalities-in-Old-Age.pdf>

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GeoHydroMorphoCZ_10m: an analysis-ready geomorphometric and hydrographic dataset for the Czech Republic and its applications in environmental research

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Keywords: *geomorphometry, hydrography, environmental modelling, analysis-ready dataset, digital elevation model (DEM)*

Topographic relief is a primary driver of ecological, hydrological, and climatic processes. Accurate terrain representation is therefore essential for environmental modelling and spatial analyses. To improve the consistency and reproducibility of geospatial modelling in the Czech Republic, we developed GeoHydroMorphoCZ_10m, a new open-access nationwide suite of geomorphometric and hydrographic layers at 10 m spatial resolution.

The dataset is derived from a 1 m LiDAR-based digital elevation model (DEM) generated from the 2025 update of the Digital Terrain Model of the Czech Republic (DMR 5G), openly provided by the Czech Office for Surveying, Mapping and Cadastre (ČÚZK). The DEM was interpolated from the point cloud using Natural Neighbor interpolation and corrected over water bodies using an empirical model. The final 10 m DEM was produced by weighted-average resampling.

Geomorphometric and hydrographic variables were calculated from the 10 m DEM using open-source geospatial software (GRASS GIS 8.3.2, GDAL 3.8.4, SAGA GIS 9.3.1, and PKTOOLS 2.6.7.6) with parallel processing in a Linux environment. The methodological approach was adapted from [1,2]. To enable reliable derivation of hydrological parameters, we additionally created a hydrologically corrected DEM (Hydro-DEM), using the following approach. Depressions identified in the original DEM were evaluated using orthophotos and ZABAGED vector layers of watercourse, roads and railways. Depressions ≤ 1 m deep were automatically filled as negligible. Larger discontinuities mainly occurred where roads or railways crossed watercourses via bridges or culverts, where the DEM falsely represents the flow path as interrupted. We developed an automated algorithm that reconstructs channels beneath these artificial barriers by interpolating elevations between adjacent stream sections. This preserves natural depressions (e.g. peat bogs, karst sinkholes and temporary ponds) while ensuring realistic flow.

The dataset includes elevation, Hydro-DEM, local elevation standard deviation in 3x3 moving window, slope, aspect, aspect sine and cosine, eastness, northness, profile and tangential curvature, first- and second-order terrain derivatives, convergence, terrain ruggedness index, vector ruggedness measure, roughness, geomorphon, topographic position index, topographic wetness index, convexity, depressions, flow direction, flow accumulation, stream power index, sediment transport index (RUSLE), drainage-network and Euclidean distance to the nearest stream, vertical distance above the nearest downstream channel, and stream network. All layers are perfectly aligned and distributed as 20×20 km tiles following the national RZM100 tiling scheme.

With its 10 m resolution and projected coordinate system, GeoHydroMorphoCZ_10m is fully compatible with Sentinel-1, 2 and Copernicus 10 m products (e.g. CLCplus Backbone, Tree Cover Density, Small Woody Features etc.). The dataset provides a consistent foundation for applications in ecology, hydrology, climatology, biogeography and environmental modelling. Selected applications to be presented.

References:

- AMATULLI, G., MCINERNEY, D., SETHI, T. et al. 2020: Geomorpho90m, empirical evaluation and accuracy assessment of global high-resolution geomorphometric layers. *Sci Data* 7, 162.
AMATULLI, G., GARCIA MARQUEZ, J., SETHI, T. et al. 2022: Hydrography90m: a new high-resolution global hydrographic dataset, *Earth Syst. Sci. Data*, 14, 4525–4550.

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Accurate tree and shrub mapping from 0.5 m RGB aerial orthophotos using deep learning semantic segmentation

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Keywords: woody vegetation mapping, tree and shrub segmentation, U-Net ResNet-34, RGB orthophotos, Canopy Height Model (CHM)

High-resolution mapping of woody vegetation outside forests is increasingly important for biodiversity assessment, landscape connectivity, carbon studies, urban planning and ecological monitoring. State-of-the-art approaches rely on deep learning and multi-source remote sensing data; however, national-scale tree and shrub layers at sub-metre resolution remain constrained by reliable training labels and reproducible workflows.

We developed a workflow for mapping trees and shrubs in Czechia from RGB orthophotos using a U-Net semantic segmentation model with a ResNet-34 encoder. Training and validation were based on reference data from 361 Orthophoto of the Czech Republic 2024 tiles, each covering 2 × 2.5 km, with a total area of 1,805 km². The orthophotos were resampled to 0.5 m to match the other raster data sources. Labels were created using a multi-source procedure. First, a Canopy Height Model (CHM) was derived as the difference between the corrected 0.5 m Digital Surface Model from image correlation (DMP-OK 2024) and a 1.0 m DEM derived from the fifth-generation Digital Terrain Model (DMR 5G), both distributed by ČÚZK. The CHM was classified into shrub (0.8–2.5 m), tree (>2.5–67 m), and other. To reduce false vegetation labels, buildings and solar panels were removed using ZABAGED® vector layers, and tall crops were excluded using LPIS arable-land polygons while preserving possible individual trees within fields. Remaining bright artificial objects, such as small structures, fences, rocks and bare mounds, were reduced using an empirical RGB brightness mask. Geoprocessing was performed with GDAL 3.8.4 and PKTOOLS 2.6.7.6 in a multiprocessing Linux environment. The labels were visually checked against the orthophotos and manually refined in the Pixel Editor module of ArcGIS Pro 3.5.2. Since DMP-OK and the orthophotos originate from the same aerial imagery source, the final raster labels were well co-registered with the input data.

The dataset consisted of 32,748 training and 5,780 validation chips (85/15 split), generated as 1024 × 1024 px orthophoto/label pairs with 50% overlap. To reduce computational cost while retaining robust segmentation performance, we used a lightweight U-Net with a ResNet-34 encoder initialized from ImageNet weights, three output classes, AdamW optimization, combined cross-entropy and soft Dice loss, and augmentation by flips, rotations and brightness/contrast variation. Training was limited to 100 epochs and performed on a 24 GB NVIDIA RTX 4500 Ada Generation GPU; the full training cycle lasted approximately 45 h. The best checkpoint was reached at epoch 86, with validation loss of 0.382 and training-style mean Intersection over Union (mIoU) of 0.733. Approximate class IoUs were 0.86 for other, 0.46 for shrub and 0.88 for tree. The lower shrub performance reflects the ambiguity of this class, including transitions between shrubs and low trees, lower tree crowns or branches, and residual artificial objects after masking.

The trained model was tested on three large independent territories and showed robust performance. Application to older orthophotos indicated comparable quality for imagery from 2015 onward, with decreasing performance for older images due to radiometric and acquisition differences. The workflow enables production of a national 0.5 m tree and shrub layer for Czechia for 2024–2025, with applications in ecological research, landscape monitoring, urban planning and environmental management.

This research was supported by the Technology Agency of the Czech Republic under project SS07020042, Modeling of Potential Natural Vegetation as a Tool for Nature Conservation.

School geography: without life and without a future?

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Keywords: geographical education, teacher, reform, curriculum, pedagogical research

Over the past 35 years, educational policy in Slovakia has been characterised by continuous change. Reforms of the geography curriculum have repeatedly introduced new versions of curriculum documents at irregular intervals. In the late 1990s, these reforms primarily reflected the political and societal transformation following the events of 1989. Subsequently, they focused on identifying an appropriate structure for the curriculum document defining both the basic framework and the nature of compulsory geography education. Exemplary tasks were incorporated, terminology was refined, subject titles were modified, and the categorisation of expected student knowledge and skills was revised. However, the fundamental concept of the geography curriculum, with its strong emphasis on world regional geography, has remained largely unchanged since the pre-1989 period. Even the substantial reduction in compulsory geography teaching hours at lower secondary schools in 2008 did not alter this orientation.

A major curricular reform introduced in 2023 granted geography the status of a subject component within the newly established educational area Human and Society. Together with history, civics, and ethics, geography became one of four subject components of this integrated curricular framework at the primary level of education. This professionally unsupported and internationally unprecedented integration of traditionally independent school subjects into a single curricular framework was approved despite considerable objections from the academic and professional community.

A common feature of all educational reforms implemented in Slovak schools to date has been the absence of systematic empirical research. Nationwide research neither preceded the initiation of these reforms nor comprehensively examined their impacts on students, teachers, parents, the discipline itself, or society as a whole.

If geography is to regain its meaningful place in contemporary society, its distinctive role within the education system must first be recognised. The public needs to be convinced that geography is far more than the study of capital cities, mountain ranges, populations, or travel destinations. Geography does not provide ready-made solutions or universal truths. Rather, it investigates, observes, identifies relationships, raises critical questions, and persistently seeks explanations. It also offers informed perspectives on future developments, even though its predictions cannot always achieve complete precision or certainty.

The contribution seeks to encourage professional debate on how school geography in Slovakia should be shaped to foster students' geographical thinking and prepare them to understand and respond to the challenges of an increasingly complex and rapidly changing world. Teachers are the key agents in translating this vision into educational practice. To fulfil this role effectively, they require sustained professional support, high-quality initial teacher education, continuous opportunities for professional learning, and the professional autonomy to make informed decisions about what to teach, how to teach, when to teach, and, above all, why.

The aim of this contribution is not to provide a comprehensive or systematic evaluation of curriculum reforms in geographical education in Slovakia or to assess their effects. The paper offers a critical conceptual reflection on the development of school geography and uses recent curriculum reforms as a basis for stimulating scholarly discussion on its future direction.

The contribution was developed within the framework of the following projects: National Project Digital Transformation of Education and School (DitEdu, ITMS2014+: 401402DVR6), funded by the European Union under the Slovakia Programme; and the KEPA Project No. 086UK-4/2024: The schoolyard as a space for pupils' science inquiry and investigation with the support of mobile technology.

Co-evolution of the Belá River corridor under cumulative anthropogenic pressures: linking hydrogeomorphology, river engineering and human adaptation

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Keywords: braided river, hydrogeomorphology, river management, socio-hydrology

Braided river corridors are shaped by long-term interactions between engineering interventions, fluvial processes, and human adaptation. However, their interactions are rarely investigated within a single conceptual framework. The Belá River, the longest braided river in Slovakia and part of the Natura 2000 network, has undergone profound transformation in recent decades under cumulative anthropogenic pressures, including river training, small hydropower development, and increasing human occupation of the floodplains. Rather than representing isolated disturbances, these interventions have reshaped the river corridor through interactions between hydrogeomorphic and socio-hydrological processes. This study presents an integrated assessment of the co-evolution of the Belá River corridor using historical aerial imagery (1949–2025), high-resolution orthophotos, geomorphometric analyses, repeated field surveys, bathymetric measurements, hydraulic modelling (2D HEC-RAS), hydrological records, and analyses of floodplain settlement reconstruction. The approach links channel adjustment, sediment dynamics, floodplain evolution, and human adaptation across multiple spatial and temporal scales. The results reveal persistent channel incision, simplification of braided morphology, floodplain disconnection, and vegetation encroachment following river regulation and small hydropower development. River reaches exhibited contrasting adjustment trajectories governed by hydraulic thresholds and sediment availability, while settlements continued to expand towards active channels despite increasing flood exposure. These findings demonstrate that the river corridor is evolving towards a new coupled hydrogeomorphic and socio-hydrological state rather than returning to its historical braided condition. By integrating hydrogeomorphic and societal perspectives, this study proposes a conceptual framework for understanding the long-term co-evolution of braided river corridors and supports more adaptive approaches to river management under cumulative anthropogenic pressures.

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Regional disparities and their level in selected European countries

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Keywords: GDP per capita in PPS, global indexes, Income of household per capita in PPS, regional disparities, socioeconomic status

The work focuses on the assessment of regional disparities in 24 selected European countries in 2024 and examines their relationship to the level of socioeconomic status of these states. The socioeconomic status of countries was defined through a set of eleven global social and economic indexes, namely KOF Globalisation Index, Global Competitiveness Index, Global Innovation Index, Easy Doing Business, Index of Economic Freedom, Global Digitalization Index, Corruption Perception Index, Human Development Index, Social Progress Index, Gross Happiness Index and Prosperity Index. Special attention was paid to the capital cities of the assessed countries and their impact on the overall level of regional disparities.

The analysis of regional disparities was based on two key socioeconomic indicators – Gross domestic product per capita in purchasing power standards and Income of households per capita in purchasing power standards at the hierarchical level NUTS 2 (247 European regions were included in the assessment), while the Gini coefficient and the coefficient of variation were used to measure the level of regional disparities. To express the relation (dependence) between the socioeconomic status of countries and the level of their regional disparities, regression and correlation analysis were used, where the socioeconomic status of the country represented the independent variable and the size of regional disparities (in both variants – Gini and variation coefficient) was the dependent variable.

The obtained results point to the fact that with the decreasing level of socioeconomic status of countries, the level of their regional disparities increased. At the same time, the highest level of regional disparities was identified in the countries of the former socialist bloc, while the strong influence of their capital cities on the level of regional disparities was also confirmed.

References:

- IAMMARINO, S., RODRIGUEZ-POSE, A., STORPER, M. 2019: Regional inequality in Europe. evidence, theory and policy implications. *Journal of Economic Geography*, 19(2), 273-298, DOI: <https://doi.org/10.1093/jeg/lby021>.
- KLAMÁR, R., IVANOVÁ, M., KOZON, J. 2025: Intracountry regional inequalities in the context of the socioeconomic status of selected European countries. *Geographica Pannonica*, 29(2), 121-136, DOI: <https://doi.org/10.5937/gp29-56677>.
- KLAMÁR, R., KOZON, J., IVANOVÁ, M. 2020: Regional inequalities in the Visegrad group countries, Serbia and Croatia. *Geographica Pannonica* 24(3), 187-204, DOI: <https://doi.org/10.5937/gp24-26038>.
- MATLOVIČ, R., MATLOVIČOVÁ, K. 2011: Regionálne disparity a ich riešenie na Slovensku v rozličných kontextoch. *Folia Geographica* 18, 8-88.
- NESZMÉLYI, G.I., VINOGRADOV, S., NAGY, H. 2022: Regional inequalities within the Visegrad Group over the years 2000-2018. *European Spatial Research and Policy*, 29(1), 5-24, DOI: <https://doi.org/10.18778/1231-1952.29.1.01>.
- PSYCHARIS, Y., KALIORAS, D., PANTAZIS, P. 2020: *Regional Inequalities in Central and Eastern European Countries: The Role of Capital Regions and Metropolitan Areas*. In: Śliwiński, A., Polychronidou, P., Karasavoglou, A. (ed.): *Economic Development and Financial Markets*, Springer, 3-20. DOI: https://doi.org/10.1007/978-3-030-32426-1_1.

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Re-use of brownfields for housing development: examples of good practice from Brno

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Keywords: brownfields, housing development, urban regeneration, Central and Eastern European cities, Brno

The re-use of brownfield sites for housing development represents a key pathway toward sustainable urban growth in post-industrial cities. In Brno, the second largest city of the Czech Republic, the transformation of underutilized or derelict sites has become a strategic priority, reflecting spatial constraints and the legacy of rapid deindustrialisation after 1989. Brownfields are typically located within well-established urban structures, making them suitable for residential redevelopment but also challenging due to contamination, fragmented ownership, and high regeneration costs.

This contribution examines selected examples of good practice in the conversion of brownfields into housing in Brno, focusing on projects that demonstrate effective integration of residential functions into the existing urban fabric. Representative cases include the Masná–Křenová site, the Moravan loft conversion, and the Mozartka residential development (Brno brownfields, 2013). These are supplemented by additional recent examples. For example, the DADA Distrikt project represents a sensitive conversion of former industrial warehouses into loft housing combined with community-oriented functions, notable for its green roof, rainwater reuse, and cooperative, community-based financing model (Dada district, 2026).

The analysis highlights several success factors. First, the strategic location of brownfields within consolidated urban areas supports compact city development and limits urban sprawl. Second, mixed-use approaches combining housing with services contribute to urban vitality and economic feasibility. Third, cooperation between public authorities and private investors enables the sharing of risks associated with environmental remediation and infrastructure provision. At the same time, the Brno experience reveals governance challenges typical for Central and Eastern European cities. Regeneration processes are shaped by complex interactions among local authorities, developers, and community actors, with tensions between public interest and market-driven outcomes. These dynamics reflect broader post-socialist patterns in which economic capital often prevails over social considerations under free-market pressures (Malý et al., 2021). Overall, the case of Brno demonstrates that brownfield re-use can significantly contribute to housing provision and sustainable urban regeneration. However, achieving socially balanced outcomes requires stronger institutional coordination, clearer strategic frameworks, and more proactive public-sector engagement. The presented examples provide transferable lessons for other Central and Eastern European cities facing similar post-industrial challenges.

References:

- BRNO BROWNFIELDS 2013: Publication on the Revitalisation of Brownfield Sites in Brno. https://urbancentrum.brno.cz/wp-content/uploads/2021/05/2013_Brownfields_2013_CZ.pdf.
DADA DISTRIKT 2026: <https://www.dadadistrikt.cz/>
MALÝ, J., ALEXANDRESCU, F., OSMAN, R., KLUSÁČEK, P. 2023: Rebuilding a community ‘centre’ under free-market pressure: the post-socialist experience with local brownfield management. *Territory, Politics, Governance*, 11(7), 1344-1364. DOI: <https://doi.org/10.1080/21622671.2021.1916580>

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Transformation of the urban fringes: population growth and residential relocation in the peripheries of Hungarian cities

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Keywords: Hungary, urban sprawl, post-socialist urbanisation, polycentric development

The urban periphery of Hungarian cities has been expanding faster than their inner areas for well over a century, yet the dynamics driving this process differ markedly from Western European and North American suburbanisation. This paper examines the long-run transformation of urban fringes in Central and Eastern Europe, with Budapest as the primary case, tracing the process from interwar explosive suburban growth through the distortions of the socialist period to the post-1989 re-emergence of market-driven peri-urbanisation.

The presentation argues that residential relocation to the urban fringe is shaped by an interplay of economic optimisation, life-cycle transitions, and deeply rooted psychological and cultural dispositions — including the desire for independence, property ownership, suburban utopia, and a rural idyll. In the CEE context, these motivations are inflected by the legacy of late and compressed urbanisation, the post-socialist privatisation of housing, and the lingering appeal of the family home as a marker of dignity and social status.

Drawing on historical demographic data and recent empirical work, the paper charts the formation of a polycentric metropolitan structure in which the classic city–suburb distinction is increasingly blurred. The outer fringe is no longer merely an appendage of the city: it has become a complex, socially heterogeneous space with its own economic subcentres, commuting networks, and emerging community identities.

Public transport stops under heat stress: a case study from Olomouc, Czech Republic

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Keywords: urban heat, public transport, thermal comfort, Universal Thermal Climate Index, heat stress

Urban heat represents an increasing challenge for public transport systems, as thermal conditions at stops affect the overall travel experience. Exposure to high temperatures while walking to and waiting at public transport stops may reduce passenger comfort and increase health risks, particularly for vulnerable population groups such as older adults, children, and individuals with chronic diseases. Despite the growing importance of urban heat adaptation, thermal conditions at public transport stops remain insufficiently considered in transport planning and climate adaptation strategies.

The contribution presents an assessment of thermal conditions at public transport stops in Olomouc (Czech Republic). A classification of stops based on solar exposure, shading characteristics, and passenger numbers was used to identify locations with the highest potential for heat stress and to prioritise sites for detailed microclimatic measurements. The measured meteorological data were used to calculate the Universal Thermal Climate Index (UTCI) and evaluate the spatial variability of thermal stress across the selected stops. The results identify thermally vulnerable public transport stops and provide a basis for prioritising adaptation measures to reduce heat exposure and improve thermal comfort during summer.

What does the future hold for local action groups in the Czech Republic?

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*Keywords: Local Action Groups (LAGs), CLLD (Community-Led Local Development),
Association of Municipalities, Regional Development, 2028+ Programming Period, Cohesion
Policy*

This contribution responds to the current (2026) “uncertainty” regarding the institutional anchoring of Local Action Groups (LAGs) in the new programming period after 2027 in Czechia and their relationship to the newly emerging associations of municipalities. The aim of the research is to assess how local-level actors perceive the future direction of LAGs in the context of upcoming changes to cohesion policy and national legislation. Methodologically, the study is based on a qualitative case study of the LAG Podbrněnsko, conducted through semi-structured interviews and thematic analysis. The results suggest that the future of LAGs is viewed with ambivalence; although the planned enshrinement in the Law on Support for Regional Development promises stability, concerns about financial uncertainty, a decline in funding allocations, and growing bureaucracy predominate. At the same time, the relationship with municipal associations oscillates between functional collaboration and competition over jurisdiction, and the viable operation of the LAGs after 2027 depends on maintaining their specific community character and the principle of partnership, which are perceived as irreplaceable.

We would like to thank the IGA26-FRRMS-007 grant, “Spatial Disparities and Subsidy Deserts in the Utilization of Cohesion Policy Funds,” for its support.

Land consolidation as a tool for changing landscape structure – goals versus reality

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Keywords: land use, landscape cover, non-forest woody vegetation, accessibility, biodiversity

Slovakia is one of the countries with the most fragmented land ownership within the European Union. Land consolidation projects comprise a series of technical, administrative, and legal operations that reorganize existing land ownership boundaries within a given area. Land consolidation aims to reorganize land ownership, including the settlement of ownership of land that serves as so-called public and common facilities and measures (roads, field communications, anti-erosion, water retention, and ecological measures). Land consolidation is a prerequisite for creating new eco-stabilization elements in the agricultural landscape to improve biodiversity. This contribution aims to evaluate the benefits of land consolidation, including increased areas of non-forest woody vegetation and improved accessibility of agricultural land. The cadastral areas of municipalities were selected as areas of interest where more than 20 years have passed since the approval of land adjustment projects, a sufficiently long time for landscape changes to be reflected. The selected cadastral areas represented lowland, submontane, and urbanized agricultural landscapes. Orthophotomosaics from 2003 and 2020 were used as input data. A modified version of the CORINE Land Cover legend at a scale of 1:10,000 was used to identify land cover changes, with individual areas designated by a five-digit code. Subsequently, selected landscape structure indices were calculated and evaluated: number of agricultural parcels, average size of agricultural parcel, accessibility, abandonment rate, development rate, share of non-forest woody vegetation, and number of areas of non-forest woody vegetation. The results showed that land reforms did not have a significant impact on the increase of ecologically significant areas in the agricultural landscape, nor on the availability of land and the optimization of agricultural land use. They were of greatest importance in the urbanized landscape, where a significant part of the consolidated agricultural land was built up. Within all monitored areas, we have recorded only a single case of planting non-forest woody vegetation in the form of windbreaks. After twenty years, there are no obvious positive landscape-ecological measures that would indicate a positive impact of this process on ecosystem biodiversity. The increased proportion of non-forest woody vegetation appeared more in connection with the abandonment of agricultural land than with the targeted planting of woody plants.

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Transnational narrative intermediaries: Russian geopolitical narratives and foreign interference

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Keywords: foreign interference, geopolitical narratives, strategic narratives, Russia, Georgia

Georgia and Armenia represent two contrasting trajectories of political development and geopolitical orientation in the South Caucasus. While Georgia experienced extensive democratization and Europeanization after the Rose Revolution of 2003, culminating in the granting of EU candidate status in 2023, Armenia remained politically, economically, and militarily dependent on Russia until the Velvet Revolution of 2018. However, developments between 2020 and 2026 significantly altered this regional dynamic. Under the Georgian Dream government, Georgia entered a phase of democratic backsliding and autocratization, culminating in contested parliamentary elections in October 2024 and the subsequent suspension of EU integration. In contrast, Armenia, particularly following the military defeats in Nagorno-Karabakh in 2020 and 2023 and Russia's perceived failure to provide meaningful security guarantees, has increasingly pursued democratization reforms and gradual geopolitical diversification toward the EU and NATO.

Despite these divergent trajectories, Russia continues to exercise significant political, military, economic, and informational influence in both countries. Existing research on Russian foreign interference has largely focused on elite networks, media manipulation, cyber operations, disinformation campaigns, or party politics. This paper instead examines a less visible but potentially important dimension of foreign interference: the translation of Russia's strategic narratives into geopolitical imaginary of Georgian and Armenian population through population categories connected to transnational Russian-language informational and social spaces.

The paper focuses on two categories that may function as transnational narrative carriers. In Georgia, these are ethnic Georgian return migrants from Russia who continue to maintain familial, social, linguistic, and media ties to Russia and the broader Russophone world. In Armenia, the article examines ethnic Armenian refugees from Nagorno-Karabakh, particularly those displaced after 2020 and 2023, many of whom were historically socialized within Russian-language educational and informational environments and traditionally perceived Russia as a geopolitical patron. Rather than treating these populations as coherent or homogeneous groups, the paper conceptualizes them as social categories, emphasizing internal heterogeneity and avoiding assumptions of collective political agency or loyalty.

The article argues that foreign interference should not be understood solely as direct state-to-state influence or coordinated disinformation activity, but also as a socially mediated process in which geopolitical and strategic narratives circulate through transnational media ecosystems, interpersonal networks, and everyday communicative practices. Drawing on critical geopolitics, the article conceptualizes the studied categories as potential narrative intermediaries situated between Russian informational spaces and broader Georgian and Armenian societies. From this perspective, the effectiveness of Russian influence does not necessarily depend on generating explicitly pro-Russian attitudes, but rather on delegitimizing European integration, liberal democratic norms, and Euro-Atlantic alignment through narratives portraying the EU as morally decadent, geopolitically weak, or culturally incompatible with the South Caucasus.

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Green infrastructure as part of the image of preferred housing locations for young people in Czechia

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Keywords: public green space, urban planning, green infrastructure, visual preferences, young people

The key role in the future development of climate-resilient and healthy cities and villages is played by the upcoming generation of young people, their perception of greenery and the idea of planning and their public spaces. Based on a broad online survey, we investigated the visual preferences of greenery in settlements among adolescent young people in the Czech Republic. The survey was based on the questions of the selection of graphically presented environments of cities and villages, their public spaces, typology of housing and street profiles. The aim was to assess the links between the current state and the ideal idea of the future environment of residential locations. Part of the survey also reveals preferences for the equipment of public spaces (elements of green or technical infrastructure) in the form of a game of participatory budgeting.

The visual preferences of the young generation aged 15–18 should be understood as a potential ideal image that is influenced by specific factors related to the general characteristics of Generation Z (or Alpha), such as the relationship to technology, ideas about work, relationship to the environment and sustainability. Overall, the survey shows not only a heterogeneity of opinions, influenced by the current localization of the current environment for living, but also a certain search for a compromise between the "nature-friendly" ideal of the environment (natural landscape, greenery in settlements) and the requirement for ideal equipment with services such as schools, shops, cultural centres, etc.

The study was created as part of the project TQ01000007 Young People as Actors in the Future Development of Cities and Municipalities.

Social polarization in Slovakia, global and national impulses

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Keywords: Slovakia, social polarization, political system, economy, democracy

Geographers today are in a different situation when studying the development of society, economy, regional structure of the state and other phenomena that are part of their subject of study than they were, for example, 30 years ago, when the social post-communist transformation began in the countries of Central and Eastern Europe. Nowadays, it is necessary to respect and take into account a whole range of political, social and economic phenomena in research to a much greater extent than it was 30 years ago.

We do not have to go far in Slovakia for examples. The economy, for example, at the national, regional and local levels, is today distorted by corruption and clientelism, which have a significant political background. They have already taken on a systemic form and are leading to the privatization of public power by "political-economic groupings". Within this so-called "clientelistic democracy", research into growing social (economic, social and regional) problems is very complex.

The aim of the presented paper is to point out the main social problems of Slovakia and their impact on the polarization of society with direct consequences for political development in the state. The basic research methods in the paper are a critical analysis of works published on the topic of social polarization, an evaluation of statistical data on the development of society in Slovakia, especially the economy and social affairs, and direct interviews with the management of small and medium-sized enterprises.

The global situation is bad today. Climate change, economic inequality, numerous military conflicts, global pollution of land and oceans, corrupt political systems, including the prosecution and courts, demographic problems associated with the aging of the population, migration, epidemics and other threats leave little room for hope for the future.

And what is happening in this situation in Slovakia? The current Slovak government is striving for a hybrid political regime that should appear invincible. It is trying to create a hypercentralized political system built on constitutional engineering, control of the media, clientelistic corruption, subordination of the prosecution and judiciary, the breakdown of institutional checks and balances of power, and loyalty to the leader and the party. To achieve this goal, the government is using the proven policy of the "3Ps", populism, polarization, and post-truth.

When assessing the Slovak economy, we can conclude, in agreement with practically all economists, that the Slovak economy has been stagnating for a long time and is at the bottom of the EU27 in all relevant assessments. The reasons for the stagnation are generally known and were also confirmed by a summary of interviews with the managements of 8 companies, according to which the key reason for the stagnation of the economy in Slovakia is the poorly set rules of the game (incompetent state and public administration at all levels, a large number of taxes and fees, high contribution burden on work, inefficient use of public funds, corrupt or tailor-made public procurement, poor law enforcement and others). It is obvious that Slovakia does not live in a vacuum. It lives in the global world and in the EU with their polycrises, crises and problems. On the other hand, it is also obvious that the government and institutions of Slovakia have many possibilities to prepare the "rules of the game", including respecting the basic geographical predispositions of the country, so that the economy and general social development in the state function better.

The state of the economy in Slovakia, significant economic inequality, regional differences, differences between cities and countryside, and other phenomena with great "support" for political parties have extremely polarized society. We see significant polarization when evaluating such phenomena as the relationship with the European Union, the assessment of the

war conflict in Ukraine, the issue of Slovakia's geopolitical direction, the importance of democracy in the state, the assessment of corruption, the relationship with elites, and others. The influence of political parties on the polarization of society was clearly manifested by several scientific studies.

In order to reduce social polarization, geographers must consistently explain its causes, which have a significant geographical background. This includes, for example, explaining the impact of the geopolitical stability of Slovakia, the territorial-administrative division of the state, the different primary potential of the regions, the historically formed east-west gradient of economic development, the number and concentration of the Roma population, the nature of the settlement structure, the quality of university education, the aging of the population, and others.

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Challenges of sustainable cities and possible answers

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Keywords: urban sustainability, land use, mobility

Urbanisation is among the major challenges of global sustainability, with several direct and indirect impacts that are interlinked. The growing concentration of people and wealth often results in imbalances between resource consumption and carrying capacity, placing cities at the forefront of global sustainability research. The transformation of urban areas into smart (sustainable and liveable) cities requires not only advanced technologies to enhance efficiency but also new knowledge on the contemporary challenges of sustainable urban development. This lecture aims to summarize contemporary research results in urban geography regarding urban sustainability at different scales. Some of the literature focuses on describing small-scale physical, ecological, and social elements and patterns within cities. Other studies aim to elucidate the interacting physical, ecological, and social components at city- or urban-region-wide scales. More recent studies explicitly address issues of sustainability, environmental quality, and human well-being in urban ecosystems. We seek answers to how urban areas can be reorganised to support resource-efficient growth, enhance the decarbonisation of urbanisation, reduce the ecological footprint of cities, and mitigate their contribution to climate change.

Transport-based time availability of cities

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Keywords: GIS, transport, urban, time, optimization

The contribution focuses on assessing practical time availability of cities in a GIS environment, using different modes of transport and their combinations. Rather than presenting a single case study, the contribution introduces a developing analytical platform and demonstrates its use through examples from different cities, transport modes and accessibility scenarios. The emphasis is placed on the comparison of outputs and methodological possibilities of the system. In addition to travel speed, it also considers service frequency, waiting times, transfer connections, and their impact on real accessibility.

The results are presented using time isochrone maps and population coverage efficiency curves, which show how many residents are served by the transport network within specific time limits. Different variants of transport systems and their catchment areas are compared. The aim is to show that accessibility depends not only on distance and speed, but also on service frequency and transfer connections.

Spatial dimensions of the Cyrillo-Methodian heritage in Slovakia and forms of its development

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Keywords: *Cyrillo-Methodian heritage, spatial dimensions, forms of development*

In 863, at the invitation of Prince Rastislav, a mission from the Byzantine Empire led by Constantine (Cyril) and Methodius arrived in Great Moravia. The Thessalonian brothers spread Christianity in the Old Slavonic language, created the first Slavic alphabet (the Glagolitic script), and, through their translation of the Gospels, laid the foundations of Slavic literature, culture, and education. In 1980, Pope John Paul II proclaimed them Co-Patron Saints of Europe (feast day: 14 February). Their legacy is commemorated in the Preamble to the Constitution of the Slovak Republic and by the national holiday of Saints Cyril and Methodius, celebrated on 5 July.

The aim of this original research was to examine the spatial distribution of the cult of Saints Cyril and Methodius and its various forms of development. Based on a review of available sources, communication with stakeholders, and field research, a broad spectrum of the use of their names was identified, quantified, and visualized, including statues, chapels, churches, institutions, toponyms, and municipal heraldry. The locations of churches and chapels were mapped at the municipal level. Quantitative analyses were carried out to determine the number of sites by region, denomination, and type of object, as well as the development of their numbers across five historical periods.

There are 106 churches and chapels in Slovakia dedicated to Saints Cyril and Methodius. Most belong to the Roman Catholic, Greek Catholic, Orthodox, and Evangelical Church of the Augsburg Confession. The highest concentration is found in the Prešov Region, while the lowest is in the Bratislava Region, reflecting regional differences in the religiosity of the population. The largest number of these sites (50) has been established since 1989. The Cyrillo-Methodian traditions continue to thrive through pilgrimages and cultural events (e.g. Nitra, Skalka near Trenčín, Bratislava–Devín, Terchová, and Selce), as well as through the arts.

Important sites and monuments are connected by the European Cultural Route of Saints Cyril and Methodius, certified by the Council of Europe in 2021. In Slovakia, the route passes through five regions: Bratislava, Trnava, Nitra, Trenčín, and Žilina. The rich Cyrillo-Methodian heritage remains a vibrant subject of interdisciplinary scientific research and artistic creation, continuing to enhance our understanding of their unique cultural legacy.

References:

IVANIČ, P., HETÉNYI, M., FILO, J., KRAMÁREKOVÁ, H., KROGMANN, A., ZAUJECOVÁ, T. 2025. The Cyril and Methodius Route in Slovakia - historical and cultural reflections on its creation. *Context : review for comparative literature and cultural research.*, 31, 41-56.

KROGMANN, A., KRAMÁREKOVÁ, H., PETRIKOVIČOVÁ, L., GREŽO, H., MRÓZ, F.
2023. Religious Routes in Slovakia. *Constantine's Letters*. 16, 78-91. DOI:
10.17846/CL.2023.16.1.78-91

NEMČÍKOVÁ, M., KROGMANN, A., OREMUSOVÁ, D., AMBROSIO, V., MRÓZ, F.
2020. Sts. Cyril and Methodius and Their Reflection in the Landscape of Slovakia.
Constantine's Letters, 1, 224-236. DOI: 10.17846/CL.2020.13.1.224-236.

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Geopolitical discourses among elementary and secondary school teachers in Czechia and Slovakia

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Keywords: geopolitics, teachers, discourse, Czechia, Slovakia

This contribution examines the prevalence of geopolitical discourses and narratives among geography, history, and civics teachers in Czechia and Slovakia at elementary and secondary schools. It draws on the work on critical geopolitics (Tuathail 1999) and the work by Nguyen and Lizotte (Lizotte, Nguyen 2020). Data were collected through semi-structured interviews conducted between December 2025 and July 2026. The study examined teachers' attitudes toward supranational organizations (the EU, NATO), their attitudes toward the Russia-Ukraine war, their perceptions of the conflict, their attitudes toward the war in Gaza, and their perceptions of migrants. This contribution will present the preliminary results of this research. The preliminary findings reveal differing narratives regarding the causes of the outbreak of the Russia-Ukraine conflict, differences in attitudes toward migrants from Ukraine and the Middle East, attitudes toward U.S. military interventions, and perceptions of international organizations such as the EU and NATO.

A key preliminary finding is that contemporary geopolitical topics are being incorporated into lessons by the vast majority of respondents, although the degree of participation by those shaping the discussion environment varies. For many respondents, the key players introducing geopolitical topics into the classroom are the teachers themselves, but in many cases, these players are the students - both in elementary and secondary schools.

Uzbekistan as a regional actor: state autonomy in the context of Russian and Chinese influence

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Keywords: Uzbekistan, influence, relations, cooperation, foreign policy

The contribution deals with the transformation of Uzbekistan's geopolitical position in Central Asia and its ability to maintain relative autonomy in an environment of increasing influence of external powers. Uzbekistan represents a significant case of a post-Soviet state, which is located in the area of overlapping interests of Russia, China and other regional actors, such as Turkey, Saudi Arabia and Azerbaijan. Special attention is paid to the period after 2016, when, after the accession of President Shavkat Mirziyoyev, there was a gradual opening of the country, a more liberal approach in selected areas of public life, strengthening of economic diplomacy and an intensified effort to build a positive image of the state abroad. The aim of the article is to identify the main levels in which external actors influence contemporary Uzbekistan and to evaluate how these power influences are perceived by selected respondents. Theoretically, the article is based on the concepts of soft power, hard power, asymmetric interdependence and multi-vector foreign policy. These concepts allow for a better understanding of how Uzbekistan maneuvers between the great power centers and how it tries to use their interests to strengthen its own regional position. The empirical part of the paper is based on qualitative research conducted during an internship in Uzbekistan. The main source of data is semi-structured interviews with respondents from the ranks of political scientists, economists, demographers, representatives of public institutions and other experts. The research focuses not only on the institutional and economic level of Uzbekistan's relations with external actors, but also on the perception of Russia, China and other powers by people who have been active in Uzbekistan for a long time.

The results indicate that Uzbekistan cannot be understood only as a passive object of Russian and Chinese influence, but rather as an active regional actor that strives to balance individual influences and strengthen its own space for maneuver. While Russia continues to maintain its importance, especially in terms of security, history, language and migration, China is strengthening mainly through infrastructure investments, trade ties and the implementation of the Belt and Road Initiative. The war in Ukraine has also contributed to the weakening of Russia's position in the region and created space for further diversification of Uzbekistan's foreign policy and economic ties. The article thus shows that Uzbekistan's current geopolitical direction is the result of a combination of domestic reforms, changes in the regional power environment and strategic balancing between external actors.

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Barriers to implementing nature-based solutions

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Keywords: *Nature-based Solutions (NBS), private land, implementation barriers*

Nature-based Solutions (NBS) represent a crucial tool for climate change adaptation, biodiversity enhancement, and the restoration of ecosystem services. Although their ecological benefits are scientifically proven, real-world implementation often encounters a complex spectrum of obstacles. This contribution focuses on identifying and analyzing the main barriers accompanying the implementation process of NBS, presenting the approach of the international LAND4CLIMATE project.

The aim of this paper is to shed light on the specific institutional, procedural, and social barriers faced by key actors when attempting to implement NBS on private land. The research methodology is based on the concept of six European case studies situated in diverse geographical and political contexts (the Czech Republic, Slovakia, Germany, Austria, Italy, and Romania). The research approach relies on a qualitative investigation, which includes semi-structured interviews and focus groups conducted during meetings of the case study actors, involving public authorities, private landowners, and intermediaries (e.g., agricultural associations or non-governmental organizations).

The results demonstrate that traditional engineering planning models, which first identify technically optimal locations, frequently face resistance or indifference from landowners in practice. Reversing this procedure has proven to be a more effective solution: prioritizing the identification of motivated landowners and subsequently assessing the suitability of their land. Furthermore, the research reveals that enforcing measures through public law instruments (regulations, expropriation) fails due to a lack of social legitimacy. This is particularly evident in post-socialist contexts (such as the Czech Republic and Slovakia), where historical distrust toward government intervention in private property persists. Successful NBS implementation thus depends more on trust-building and flexible private law contractual arrangements than on technical feasibility or financial resources alone.

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Water in the mining region – determinants of geotourism development in the Central Spiš Region

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Keywords: environmental hazards, geotourism, mining landscape, mining heritage, water

The Central Spiš region is one of Slovakia's historically important mining areas. Long-term mining of copper and iron ores has significantly shaped both the natural environment and the cultural landscape. Water has been a key element of this transformed landscape, playing an essential role in mining operations, ore processing, and the functioning of mining infrastructure. At the same time, it has become an integral part of the region's hydrogeological and mining heritage.

The aim of this paper is to analyse the importance of water-related structures and water bodies in the mining landscape of Central Spiš and to evaluate their potential for geotourism development. These structures and bodies, including reservoirs, mine water management structures, tailings ponds, streams, and springs, represent attractive geotourism sites that help interpret geological processes, the history of mining, and the interactions between human activities and the natural environment. However, the development of geotourism depends not only on the attractiveness of these sites but also on the environmental quality of local water resources. A major environmental issue in the region is the contamination of surface water and groundwater caused by historical mining activities. One of the most significant environmental burdens is acid mine drainage, characterised by high concentrations of iron, manganese, copper, zinc, and other heavy metals. This pollution negatively affects the ecological status of watercourses and may limit the tourism potential of some sites. At the same time, these environmental burdens can be effectively interpreted as part of geotourism and educational activities, helping visitors understand the environmental impacts of historical mining and other human interventions in the landscape.

This paper is based on a review of scientific literature, an analysis of available environmental data, and long-term field observations. The results indicate that water is an important factor in the development of geotourism in the Central Spiš region, with its potential lying in the combination of natural, historical, and technical values. However, the sustainable development of geotourism requires the systematic protection of water resources, remediation of environmental burdens, and effective interpretation of the region's mining heritage.

References:

- ČECH, V., KLAMÁR, R., KROKUSOVÁ, J., VAŠKOVÁ, J. 2025: Multi-hazard assessment in post-mining landscape and potential for geotourism development (on the example of the central Spiš region in Slovakia). *Land* 14(5), 1-26. DOI: <https://doi.org/10.3390/land14051000>.
- ČECH, V., KROKUSOVÁ, J. 2024: Challenges and risks of geotourism development on the example of the former mining region of the central Spiš in Slovakia. In: *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM Vol. 24, Issue 5.1*, pp. 33 – 40.
- ANGELOVIČOVÁ, L., FAZEKAŠOVÁ, D. 2014: Contamination of the soil and water environment by heavy metals in the former mining area of Rudňany (Slovakia). *Soil and Water Research*, 9(1), 18 - 24.

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Assessment of rurality based on qualitative characteristics

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Keywords: housing stock, rural-urban relations, spatial planning, suburbanization

Research on rural–urban relations has gradually shifted from defining a precise boundary between these settlement forms toward assessing the degree of representation of rural and urban characteristics within a given area. Contemporary research reflects the fact that rural areas are internally differentiated and, under the influence of urbanization, demographic, and socio-economic processes, acquire diverse spatial and morphological characteristics. In this context, qualitative research approaches are gaining importance, as they make it possible to examine aspects that cannot always be captured by quantitative methods. The aim of this paper is to present a method for analyzing the impact of suburbanization processes on the architectural identity of rural settlements, based on a qualitative assessment of the housing stock of the studied area as one of the characteristic features of settlement structures. The applied methodology enables the quantification of qualitative data while taking into account the architectural character of the built environment, the degree of preservation of traditional building elements, and the presence of housing forms typical of particular development periods. The results indicate spatial differences in the values of architectural identity among individual parts of the municipality, reflecting the historical and geographical development of the studied settlement. The analysis shows that despite its location near the regional administrative center (NUTS-2) Prešov, the municipality has been able to preserve the rural character of its buildings. An advantage of this approach lies in the relatively simple identification of architectural identity directly in the field, as well as in the possibility of monitoring its changes within smaller territorial units of the municipality, allowing the delineation of areas with different degrees of rurality. The practical contribution of this approach consists in its potential application in decision-making processes related to the regulation of spatial planning and planned development, with the aim of preserving rural character.

References:

- BACOVÁ, A. 2016: *Slovenský rodinný dom 2000-2015*. 1st ed.; Eurostav: Bratislava, Slovakia.
- DUDZIK-DEKO, P., RZEŹNIK, J. 2022: Architectural place identity – authorial measurment indiator. *Studia Miejskie*, 43, 83-96. DOI: <https://doi.org/10.25167/sm.4612>.
- LEŠKOVÁ, A., VAISHAR, A. 2023: The Typology of Countryside Architectonical Forms in South-Moravia, a Region of Czechia. *AUC GEOGRAPHICA* 58 (2), 214–24. DOI: <https://doi.org/10.14712/23361980.2023.16>.
- MAŇAS, J. 2026: Layout Structure of Rural Settlements and Adjacent New Developments in Czechia: Classification System and Implications for Urban Planning. *AUC GEOGRAPHICA* 61(1), 69–81. DOI: <https://doi.org/10.14712/23361980.2025.10>.
- OŤAHEL, J., SOLÁR, V., MATLOVIČ et al. 2020: Prímestská krajina: analýza premien vplyvom suburbanizačných procesov v zázemí Prešova. *Geografický časopis - Geographical Journal* 72 (2), 131–55, DOI: <https://doi.org/10.31577/geogrcas.2020.72.2.07>.
- OUŘEDNÍČEK, M. 2003: The Suburbanisation of Prague. *Czech Sociological Review* 39 (2), 235–254. DOI: <https://doi.org/10.13060/00380288.2003.39.2.06>.
- ŠVEDA, M. ŠUŠKA, P. eds. 2019: *Suburbanizácia: ako sa mení zázemie Bratislavy?* Bratislava, Geografický ústav SAV, s. 3-16.
- WALDORF, B. S. 2006: *A Continuous Multi-Dimensional Measure of Rurality: Moving Beyond Threshold Measures*. DOI: <https://doi.org/10.22004/AG.ECON.21383>

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Characteristics of brownfields in the cross-border region of the Moravian-Silesian Region and the Silesian Voivodeship

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Keywords: brownfields, cross-border region, Upper Silesian Basin, redevelopment potential, spatial typology

Long-term mining and industrial activities in the Upper Silesian Basin and its wider hinterland, together with economic transformation, modernisation, and the gradual reduction of dependence on fossil fuels, have led - and continue to lead - to dynamic changes in the landscape. One consequence of these processes is the emergence or persistence of numerous unused mining and industrial sites, which differ in the extent to which they present barriers to, as well as opportunities for, new forms of use.

This paper presents the results of an extensive survey focused on the spatial delimitation of brownfields and the identification of their key characteristics in the Moravian-Silesian Region of Czechia and the Silesian Voivodeship of Poland. Based on a harmonised database, the results highlight differences in characteristics such as site area, location, accessibility and proximity to infrastructure, contamination, ownership structure, land cover, terrain, and nature protection regimes. We examine how these attributes jointly shape the internal development potential of brownfield sites. Multivariate and spatial analyses, including PCA, identify key dimensions of site differentiation and support a cross-border typology based on redevelopment opportunities and constraints. The paper also points to differences in the management and availability of brownfield data in the context of differing institutional, planning, and policy systems on both sides of the border.

The paper has been elaborated within the scope of the Global Experts program supported by the city of Ostrava, and with the financial support of the European Union under the REFRESH Research Excellence For REgion Sustainability and High-tech Industries (project number CZ.10.03.01/00/22_003/0000048) via the Operational Programme Just Transition.

The relationship between gambling spaces and crime at the local level in Czechia

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Keywords: gambling spaces, crime, spatial analysis, municipality, Czech Republic

This study examines the relationship between the presence of Gambling Spaces and crime levels in municipalities of the Czech Republic during the period 2016–2025. The aim of the study is to determine whether and how the presence of gambling venues is reflected in local crime levels and whether this relationship exhibits spatial variation. The analysis is based on crime data obtained from the Crime Map of the Police of the Czech Republic and on gambling statistics published by the Ministry of Finance of the Czech Republic. The study builds primarily on international academic literature, particularly from the United States, and evaluates its findings within the Czech context. To achieve the research objectives, a Gambling Spaces Index and a Crime Index are constructed to assess both the intensity and spatial distribution of the examined phenomena. The study also employs advanced spatial statistical methods, including Geographically Weighted Regression (GWR), Kernel Density Estimation, and Hot Spot Analysis (Getis-Ord G_i^*). The findings suggest a positive association between the presence of Gambling Spaces and crime levels, although this relationship varies across municipalities and is influenced by local characteristics. The local-level analysis further indicates that the immediate surroundings of Gambling Spaces tend to exhibit a higher concentration of selected crime types than other parts of the municipality. The main outcome is the identification of spatial patterns of crime and Gambling Spaces and the assessment of the existence and spatial variability of their relationship across Czech municipalities. Research further includes a more detailed analysis at the local level to examine whether crime patterns in the vicinity of Gambling Spaces differ from those observed in other parts of a municipality.

This work was supported by the Czech Science Foundation project „ Borders in the gambling landscape: impacts on society and its at-risks groups“ (grant number: GA25-15267S).

Overlooked very small towns. How do they rank in demographic, social, human and economic capital?

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Keywords: very small towns, demographic capital, social capital, human capital, economic capital

How can very small towns (VSTs) be defined and how do the types of VSTs and more important towns rank in terms of demographic, social, human and economic capital? These are the main questions of this presentation, the model area of which is the South Bohemian Region (Czechia).

The towns of the model area are divided based on the presence of specific services and standardized and weighted values of 5 indicators of settlement-regional significance (number of residents, selected types of services, commuters for work and study, public transport connections and inhabitants in the catchment area). In the study area, the mezzo-regional city (České Budějovice), 17 micro-regional towns and 36 VSTs were defined. VSTs are further divided into types according to time distances (public transport) from mezzo-regional and micro-regional towns to suburban, semi-peripheral, peripheral and ultra-peripheral VSTs. Sudeten and inland VSTs and other types are also defined.

In the next step, the indicators of the four capitals (4x7 indicators) are specified. They use available data for settlements and municipalities. Demographic capital indicators map long- and medium-term population development, natural and migration balance of population, female fertility, and the representation of children and seniors. Social capital is represented by the number of non-profit organizations and sports club members per 1,000 residents, the share of residents belonging to churches, voter turnout in municipal elections, the share of re-elected representatives in municipal elections, the share of residents residing in the municipality at the time of birth, and the number of selected crimes per 1,000 residents. Human capital includes the share of residents with the highest elementary education, with university education and the share of municipal representatives with university education, the share of highly qualified and unqualified employees, the share of employers and entrepreneurs and the share of working seniors. The following indicators were included in the economic capital of residents: share of managers and specialists, unemployment rate, share of residents in foreclosure, average price of a medium-sized apartment, share of apartments locally heated by coal, number of passenger cars per 1,000 residents and model nominal net cash income per capita. The weights of the indicators are determined using expert evaluation and the PCA method.

The strongest demographic capital is shown by suburban VSTs and rural, population-growing VSTs, the weakest by rural peripheral and rural depopulation ones. Surprisingly, social capital is strongest in suburban VSTs and also in rural inland VSTs, it is very weak in rural VSTs affected by deindustrialization, the mezzo-regional city of České Budějovice and rural Sudeten VSTs. Human capital is highest in the mezzo-regional city, followed by suburban VSTs and micro-regional towns, on the opposite side are rural Sudeten and rural peripheral VSTs. The mezzo-regional city and, to a lesser extent, suburban and rural population-growing VSTs show the highest economic capital of the population, while rural deindustrialized and Sudeten VSTs have the weakest.

Industrial specialization, deindustrialization, functional, spatial and population changes: the example of Czech cities, particularly Brno

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Keywords: industrial specialization, deindustrialization and population development, post-socialist transformation, new economic environment, cities of the Czech Republic and Brno

Industrial specialization has been a key factor shaping the development trajectories of Central European cities. This contribution examines the long-term impacts of industrial specialization and deindustrialization in the Czech Republic, combining an analysis of population change (population development) with a case study of spatial industrial transformation in Brno. The research explores how inherited industrial structures influenced post-socialist urban development and how deindustrialization reshaped both population trends and the functional-spatial organization of economic activities.

The analysis draws on historical and contemporary data on industrial employment, population development, and the spatial distribution of industrial activities. Descriptive statistical methods are combined with charts and another graphical outputs to assess the relationship between industrial legacies, demographic trajectories (shrinking cities), and urban restructuring. Particular attention is paid to the transformation of industrial sites and the changing role of manufacturing within the urban environment (Brno city example).

The results suggest that industrial legacies continue to exert a significant influence on contemporary urban socioeconomic and demographic development. Cities historically specialized in machinery and electrical engineering generally experienced more favorable demographic trajectories, while former mining and metallurgical centers faced more pronounced population decline. In Brno, deindustrialization led to a substantial reconfiguration of the urban industrial landscape, characterized by the decline of traditional manufacturing, the redevelopment of former industrial areas, and the emergence of new post-industrial functions. The findings highlight the persistence of path dependency in post-socialist urban transformation and contribute to broader debates on deindustrialization, shrinking cities, and regional disparities in Central Europe.

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Machine learning-based prediction of land cover dynamics with a focus on agricultural land: a case study of the Košice Basin

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Keywords: agricultural land, food security, Land Cover and Land Use, machine learning

Rapid land-use and land-cover (LULC) changes challenge sustainable resource management and indicate human impacts on regional ecological stability. In Central Europe's post-socialist landscape, these shifts are driven by historical transitions from collective farming to fragmented management, coupled with metropolitan expansion. The Košice Basin in Eastern Slovakia, perfectly encapsulates these dynamics. As a productive agricultural region, its landscape faces severe pressure from urban sprawl, infrastructure development, and the abandonment of marginal plots. Understanding these forces is fundamental for proactive territorial planning and long-term food security. This study analyzes historical LULC transition patterns and uses machine learning to simulate future landscape states across short-term (2030) to long-term (2050) horizons. The methodology extracts transition probability matrices using spatial records from the CORINE Land Cover database (2000–2018). Simulations are executed in QGIS using the MOLUSCE plugin, with a hybrid CA-ANN model serving as the core computational framework. The model evaluates transition potentials based on biophysical and socioeconomic drivers, such as topography and proximity to roads, streams, and urban centers. Subsequently, the spatial allocation of transitions is performed, effectively simulating realistic land-use growth patterns. Validation involves comparing simulated states against actual observations using the Kappa index to ensure spatial reliability. Outcomes quantify the magnitude of agricultural land loss, map urban growth trajectories, and identify hotspots that directly threaten regional food production capacities. By critically analyzing these results, the study assesses the extent of agricultural fragmentation and evaluates the resulting negative impacts on regional production and long-term food security.

This poster was prepared as part of the project GaPU 5/2026 - Machine Learning-Based Prediction of Land Cover Dynamics with a Focus on Agricultural Land: A Case Study of the Košice Basin.

From maps to AI: How technology is transforming geography and the work of geographers

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Key words: geography, sensor networks, geoinformatics earth observation, artificial intelligence

Geography has always evolved together with the tools used to observe, map and interpret the world. Yet during the last few decades, the pace and scale of technological change have accelerated dramatically. From the perspective of a physical geographer and hydrologist, this transformation can be viewed as three interconnected revolutions that have fundamentally changed not only the data available to geographers, but also the way geographical research is conducted.

The first is an instrumentation revolution. Automated sensors, monitoring networks, optical sensing techniques, unmanned aerial vehicles and near-real-time data transmission have transformed field observation from episodic measurements into continuous monitoring of environmental processes. They allow researchers to bring the laboratory into the field, observe remote and sensitive environments, capture extreme events as they occur, and generate spatial data at unprecedented resolution.

The second is a geoinformation revolution. GIS, remote sensing, open-data policies, global Earth observation archives and cloud computing have shifted geography from a discipline often constrained by data scarcity to one increasingly confronted with data abundance. Analyses that once focused on individual maps, sites or datasets can now span large regions, long time periods and multiple interacting environmental variables.

The third is the emerging AI revolution. Machine learning, deep learning, foundation models and, most recently, agentic AI are extending our ability to identify complex patterns, build predictive models and automate parts of the scientific workflow. AI systems are beginning not only to analyse geographical data, but also to participate in model development, experimentation and evaluation.

Using examples from physical geography and hydrology, the lecture will illustrate how these transformations have progressively changed what geographers can observe, analyse and infer about environmental processes. It will conclude by asking what these developments mean for the future role of the geographer: which tasks may increasingly be delegated to technology, which capabilities will become more important, and what elements of geographical thinking remain essential in an increasingly automated, data-rich and rapidly changing world.

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Recycling shopping areas

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Keywords: recycling, retail, shopping, consumption, hyper-consumption

My proposal concerns the recycling of shopping areas. This is an issue that is at the heart of retailing, ecological transition and territory planning in many European countries, due to a number of structural factors such as the transformation and adaptation of forms of retailing to new modes of consumption, and cyclical factors such as the effects of social and economic contexts on consumption.

Recycling is now part of our daily lives, whether we do it or not, by choice or obligation. In our towns and cities, the most visible form of recycling is the collection of sorted waste, some of which will be reintroduced into the recycling stream. For several years now, local authorities (municipalities, conurbations, etc.) have also been involved in recycling in other ways, in particular by setting up or supporting 'recycling centres', which are part of the circular economy model, a model that aims for local development that is more sustainable than the current one.

Having now entered the era of questioning consumption and, more specifically, what is taken to be hyper-consumption, recycling has become the banner of the fight against it, and the term now extends to any action to recover, transform and reuse, in its original or modified form, objects, but also the places of consumption that structure our societies.

It is these that this paper will report on: places devoted to retailing, i.e. shopping areas in all their diversity. Are they too recycled? Rehabilitated? Reinvented?

In the first part, the notion of recycling and its application to shopping areas will be discussed: while the literature to this point has mainly dealt with 'rehabilitation' for buildings, and more often in residential areas or sites described as heritage sites (Verschambre, 2005; Gonzalez-Lafayesse, 2018), this notion will be put into perspective of that of recycling regarding shopping areas. The second part of the paper is concerned with the link made by the public authorities between sustainability and shopping areas: the environmental issue has entered the retailing debate through the subject of the last mile (Schorung, Escarfail, 2023) or through the subject of soil sealing (Lebrun, 2024) and now questions the limits of our modes of consumption (Lemarchand, 2021). We will conclude this paper with a discussion of the recycling of shopping areas at the risk of their disappearance, linked to their questioning as a symbol of hyper-consumption.

We don't feel like their kin": Assessing national minorities' relations with claimed kin-states in Georgia and Ukraine

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Keywords: national minority, kin-state, triadic nexus, Georgia, Ukraine

In recent years, the instrumentalization of national minorities in Eastern Europe and the Caucasus by claimed kin-states has served as a pretext for the outbreak of severe military conflicts. While the interests of states are often reflected in research and policies, the perspectives and cooperation strategies of minorities have mostly been neglected. Therefore, this paper examines the relationship between minority groups and claimed kin-states, paying particular attention to minority narratives and their heterogeneity. I critically re-evaluate the classical concept of triadic/quadratic nexus and argue, through the lens of feminist geopolitics, that treating minorities as homogeneous in their interests and ties to the kin-state ignores the group's social hierarchies and political-economic inequalities. Three national minority regions with a claimed kin-state in two ethno-culturally diverse countries, Georgia and Ukraine, have been systematically compared. These are Armenian-speaking Javakheti, Azerbaijani-speaking Borchalo and Hungarian-speaking Transcarpathia. Between June 2022 and February 2024, I conducted six research visits to Georgia and Ukraine, during which I conducted 42 in-depth semi-structured interviews with community representatives, civil-society activists and NGO workers in the regions, and with Georgian and Ukrainian experts. The data is complemented by a discourse analysis of local media. The findings suggest that significant parts of the minority population do not feel a sense of affiliation to 'their' kin-state and avoid cooperation with it. Instead, they seek to engage with majority civil society, regardless of ethno-cultural differences. However, there is great variability both between and within cases, and along the geographical and temporal context of minority regions.

Disoriented? Rethinking the (Pre)understanding of urban centrality in mobility planning

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Keywords: urban centrality, (pre)understanding, road signage, spatial disorientation, mobility planning

In geographical research, urban centrality is commonly viewed through several theoretical categories. While concepts such as functional, geometric or symbolic centrality are relatively well described separately, their actual impact and position within the urban fabric can vary. This paper focuses on the issue of the (pre)understanding of urban centrality which may, however, prove inconsistent in (everyday) routine. As a conceptual contribution accompanied by an initial look at preliminary data, this paper discusses how people perceive centrality expressed, for instance, through road signage. It aims to show that established theoretical assumptions about orientation need to be critically assessed. Although primarily designed as an intuitive navigation tool, we hypothetically argue that road signage can counterintuitively lead to spatial disorientation and complete reliance on navigation technologies due to a mismatch with the (pre)understanding of centrality or a misunderstanding of the symbolism (of the signage). The paper also addresses potential future perspectives and implications of this phenomenon for orientation in cities. It raises questions for urban mobility planning in the context of currently promoted "smart solutions."

Beyond the daytime city: urban night as a temporal landscape

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Keywords: chronotope, public-lighting experiment, temporal landscape, time-geography, urban night

Urban geography has traditionally interpreted cities through predominantly daytime perspectives, while the night has often remained conceptually and empirically underrepresented. Yet urban life does not simply stop after sunset; rather, it transforms into a distinct temporal landscape characterised by different rhythms, actors, practices, mobilities, and spatial inequalities. The persistence of daytime assumptions in both research and planning produces a temporal bias that obscures important dimensions of everyday urban life.

This paper contributes to the emerging geography of the night by conceptualising urban night as a specific chronotope embedded within the broader temporal landscape of the city. Building on time-geographical thinking and rhythm analysis, we argue that daytime and nighttime should not be understood as opposite states but as overlapping temporal regimes that continuously reorganise urban functions, accessibility, and social practices. We further suggest that conventional planning datasets unintentionally reinforce daytime perspectives because they frequently rely on residential population statistics collected during the night while simultaneously interpreting them as representations of daytime urban reality. The paper draws on empirical material from the city of Brno (Czech Republic), combining nighttime aerial imagery with information on residential population, workplaces, retail activities, pedestrian movement, service temporality, and a public-lighting experiment. Rather than treating these datasets as static spatial layers, we analyse how they reveal changing temporal configurations of the city and identify dominant nighttime chronotopes. Comparisons with conventional daytime interpretations demonstrate how different temporal perspectives fundamentally alter the understanding of functional urban areas, centres of activity, peripheral spaces, and patterns of everyday life.

Our findings show that the urban night constitutes a distinctive temporal landscape with its own spatial logic, extending far beyond leisure-oriented interpretations that dominate existing research. The paper therefore argues for a stronger integration of temporal perspectives into urban geography and planning, recognising that cities are continuously reconfigured through daily and nightly rhythms. By foregrounding urban night as a legitimate geographical object of inquiry, we seek to contribute to a more comprehensive understanding of temporal landscapes and to encourage planning approaches that are sensitive not only to where urban processes occur, but also to when they unfold.

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Implementing COIL and OpenStreetMap in secondary geography education: a case study from the EUthMappers project

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Keywords: OpenStreetMap, COIL, geography education, spatial thinking, humanitarian mapping

This paper examines the didactic potential of integrating Collaborative Online International Learning (COIL) with open-source geospatial technologies in secondary geography education within the Erasmus+ project EUthMappers. The study presents two complementary implementations combining inquiry-based learning, cooperative strategies, and authentic tasks supported by OpenStreetMap (OSM) and related tools.

The research involved approximately 30 teachers and 200 students aged 15–18 from five European countries (Slovakia, Italy, Spain, Portugal, and Romania). Within the COIL framework, students collaborated in structured international teams, engaging in shared learning activities focused on real-world geospatial challenges. The first case study addressed humanitarian mapping in cooperation with UN Mappers, where students contributed over 18,000 building features in Kandahar (Afghanistan), supporting geospatial datasets for humanitarian planning. The second case study focused on community-based mapping in Prešov (Slovakia), where students carried out field-based investigations of urban parks, including tree inventories, environmental analysis, and infrastructure mapping.

The pedagogical design followed a guided inquiry cycle (observe–map–analyse–evaluate) combined with role-based cooperative learning and metacognitive scaffolding. Students worked in rotating roles and applied open-source tools such as OSM, HOT Tasking Manager, and QGIS. The integration of fieldwork, remote sensing, and digital mapping supported the development of spatial thinking, data literacy, and higher-order cognitive skills.

Simultaneously, COIL collaboration fostered intercultural communication, project management, and presentation competences.

The findings indicate that students effectively acquired and transferred geospatial competences across both global (humanitarian) and local (community) contexts. Authentic mapping tasks increased motivation and engagement while connecting classroom learning with societal challenges. The results confirm that combining COIL with open-source mapping represents an effective pedagogical approach for developing spatial thinking, digital competences, and civic responsibility in geography education.

References:

- BROVELLI, M. A. 2024: *Formazione STEM e impegno ambientale attraverso il mapping collaborativo e umanitario: il progetto europeo EUthMappers*. In: Didacta Italia.
- GARCIA, F., SMITH, S. R., BURGER, A., HELMS, M. 2023: Increasing global mindset through collaborative online international learning (COIL): Internationalizing the undergraduate international business class. *Journal of International Education in Business*, 16(2), 184–203. Dostupné na: <https://www.sciencedirect.com/science/article/abs/pii/S1557308722000750>.
- LEE, J. 2023: Beyond geospatial inquiry—How can we integrate the latest technological advances into geography education? *Education Sciences*, 13(11), 1128. DOI: <https://doi.org/10.3390/educsci13111128>.
- NGUYEN, Q. H., BROVELLI, M. A., ALBERTELLA, A., FURUHASHI, T., MONTANI, M. 2025: Bridging humanitarian mapping and the Sustainable Development Goals. *ISPRS International Journal of Geo-Information*, 14(8), 307. DOI: <https://doi.org/10.3390/ijgi14080307>.
- STERGIOU, M. 2023: The benefits and challenges of mapping for students and teachers: Geospatial technologies as a tool in open school education. Zenodo. DOI: <https://doi.org/10.5281/zenodo.10149052>.

Sugar industry heritage in the contemporary landscape of Upper and Middle Elbe River Valley. Experiences in searching of sugar industry landscapes

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Keywords: sugar, cultural sugar landscape, historical development, landscape heritage, Polabí valley, identification

The sugar industry represents a significant part of industrial cultural heritage, traces of which are still visible in the landscape today. Sugar industry heritage in Czechia consists of three types of structures or areas: sugar beet production areas (landscape, sites, locations); service areas and facilities supporting the cultivation and transport of sugar beets, or other raw materials and products; and production and related handling or service areas associated with the production of sugar and other sugar products. In general terms, the sugar-producing landscape can be considered an area in which all three types of sites/areas. From a historical perspective, traditional sugar-beet landscape areas can typically be found in flat terrain - usually in wider river valleys - which, prior to the introduction of sugar beets, were generally unsuitable for growing other agricultural crops and were often used extensively; alternatively, they consisted of flat terrain with original arable land in their vicinity. This paper presents a broad general and professional public the historical and geographical aspects of the sugar-beet processing tradition and its impact on the cultural landscape of a selected area - Elbe River Valley region. The area has sufficient natural conditions for growing sugar beets; however, changes in land use (a reduction in sugar beet acreage, changes in the use of sugar refineries, and the dismantling of railroad spurs) have led to the complete decline of the sugar-mills tradition. Historic sugar mills, their architecture, and related infrastructure - such as railroad spurs and workers' housing estates - are important witnesses to an industrial era that fundamentally influenced economic and social development in Bohemia and Moravia. The purpose of these sites focuses not only on their physical conservation but also on interpreting their historical significance for the public. The goal is not only to preserve the tangible heritage of the sugar industry but also to raise awareness of its historical and cultural value. This paper seeks to present the historical and geographical aspects of the sugar mills tradition - and its impact on the cultural landscape of the Elbe River Valley - to a broad audience of both the general and professional public.

This paper is a result of research project „Inventory of the landscape heritage of the sugar industry in the Czech lands and support for general public awareness of its presence in the current landscape“ and has been supported by the Programme to Support Applied Research in the Area of the National and Cultural Identity for the Years 2023 to 2030 (“NAKI III”), No. DH23P03OVV065.

Topographical maps of scales 1:25,000 to 1:75,000 from the territory of Slovakia from the beginning to the end of World War II.

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Keywords: military mapping, Karte Slowakei

A few months before the start of World War II, the so-called Second Czech-Slovak Republic was ended. Germany has added the Czech lands as a protectorate to its administration. Slovakia declared its independence on March 14, 1939. The aim of the study was to trace and confirm the existence of map sheets drawn up for German plans in Central and Eastern Europe. Because after the end of World War II, most of these papers were unavailable in civilian archives and were never published. Germany's sphere of influence was noticeable, and it manifested itself by steadying first the scale series of 1:25,000 and 1:75,000, later 1:50,000. Research question: for the territory of Slovakia, was the German topographical service processed all the map sheets of the middle map scales that were published in the surveys?

In 1940, the "Karte Slowakei" 1:25 000 map set was created with a 193 ML print of the Border of the Slovak Republic and 80 ML and Karte Ungarn 1:25 000 are preserved in the archives with an orange print of the Border of the Slovak Republic. The starting material for Slovakia and the north of Hungary was the Czechoslovakian reambulanted maps of 1:25,000 and then the German set of maps of the special edition of "Sonderausgabe" of the same scale. The maps, were relatively crude but easy to read and above all updated. In addition, 5-centimeter maps made their way into this set of assemblies, and these maps were very detailed and messy in black and white. Only 116 map sheets have survived from pre-Munich Czechoslovakia. A set of maps 1:75,000 marked „Karte Slowakei“ was released in November 1940 and contained 58 map sheets that have been preserved in various forms to the present day. Most of the maps were in a two-tone design, and the third color made up the imprint of the state border again in a purple design. The printing of the maps was apparently carried out by a work site of the Imperial Surveyors Office in Berlin in cooperation with external printers.

The map file of 1:50,000, marked Deutsche Heereskarte - Slowakei (Esl 50), contained 96 map sheets. They are made up of a set of 48 map sheets of special maps in the scale of 1:75,000 of the original 3rd Austrian military mapping. The west and east parts of the sheet were divided or the figure 1 was given as west and 2 as east (e.g. 4351/west, 4351/1). These maps were published in 1944 (April to October). Only the sheets issued by the Geographical Institute of the Min. interior in Prague did not have this network. In a five-colour design, there is a combined map sheet Babia Gora 411 C, which was created by enlargement from the Grossblatt map sheet in November 1944. As part of the grossblatt leaf cladding, sheets 423 A were issued around Žilina and 425 C around Košice, according to the reports. We include them in topographical maps, but they are different from Esl serie maps.

The very specific map sheets are 4561-West Oslany and 4561-Ost Handla from March 1945. They were printed as a 2nd edition in five colours. The processors were based on čs. special maps, the original topographic sections of the 3rd Austrian military mapping and partially exploited the current aerial images at the time. These two leaves are outside the entire Esl map series.

By publishing the contents of the archives outside the Czech Republic, it was possible to almost complete the information about the German map sets Slowakei (Esl) 1:50 000 and „Karte Slowakei“ 1:75 000. The completion of information on the 1:25,000 map set will be gradual, and presumably all of its sheets will be traced or supplemented from the post-1945 edition. After the end of World War II, maps were used in Czechoslovakia on a scale of 1:25,000 based on German military maps of „Karte Slowakei“ 1:25,000. They differed only by out-of- map marginal information.

Narrating everyday mobilities: learning from older adults for inclusive X-Minute planning

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Keywords: X-minute planning, everyday mobility, older adults, small towns, accessibility

The growing interest in X-minute planning has highlighted the need to better understand the everyday mobility and accessibility practices of different population groups. Older adults represent one of the key target groups of proximity planning, yet they are often treated as a homogeneous category despite substantial differences in their mobility resources, routines, and coping strategies. Rather than assuming a uniform group, this paper explores the heterogeneity of older adults through their everyday mobility experiences. It presents methodological and empirical insights from the Czech case study of Židlochovice, a small town located within the Brno metropolitan region. The research combines questionnaire surveys, narrative focus groups, participatory mapping and scenario-building to explore the everyday mobilities of older adults and their implications for proximity planning. The paper demonstrates how narratives grounded in concrete everyday situations - such as shopping, healthcare visits, family contacts, minor errands, and leisure activities - provide a robust understanding of everyday mobility practices. Empirically, the research identifies three mobility personas representing distinct patterns of everyday mobility, independence, and accessibility. Rather than describing individual participants, these persons synthesise recurring mobility characteristics and everyday practices observed across the study population, providing a planning-oriented representation of the diversity of older adults' mobility strategies. Alongside these findings, the paper critically reflects on the methodological challenges of researching mobility with older adults. Particular attention is paid to issues such as participant recruitment, group composition, moderation, narrative elicitation, as well as the limitations and practical trade-offs associated with these methods. The paper argues that recognising these methodological specificities is essential for producing robust knowledge capable of informing more inclusive X-minute planning in small and medium-sized towns.

This project (Mobility, Accessibility, and Rhythms of Everyday Life in Towns and Neighbourhoods (MARLENE)) has been funded by the Swedish Energy Agency, the Ministry of Climate of Estonia and the Technology Agency of the Czech Republic (TQ07000002) under the Driving Urban Transitions Partnership, which has been co-funded by the European Commission.

Has the COVID-19 pandemic changed the global air transport network? Airport connectivity and hierarchy between 2019 and 2023

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Keywords: air transport, network analysis, connectivity, global cities

Global air travel and transport have undergone significant changes in recent years due to the COVID-19 pandemic, as well as the worsening security situation and economic and political imbalances. This new situation has led to changes in connectivity and the hierarchy of airports. Our analysis is based on a unique database of passenger traffic between 179 cities (airports) worldwide from the International Civil Aviation Organization (ICAO) for the years 2019 and 2023. To evaluate the position of airports, connectivity, and community structure, we use graph theory coefficients integrated into the software Gephi. The results suggest a partial realignment of the global hierarchy of airport hubs. While European cities - led by London - dominated in terms of both direct and indirect connectivity before the pandemic, the post-pandemic period has strengthened transit hubs in the Middle East, particularly Dubai and Istanbul. East Asian airports reported the sharpest decline in air traffic, likely due to prolonged sanitary restrictions. The decline of Chinese airports contrasted with the strengthening of certain South Korean and Japanese hubs, with Seoul holding the strongest position. Overall, the crucial role of the three global core regions in the Northern Hemisphere was reaffirmed.

References:

- DAI, J., WANG, Y., WANG, H., WANG, Y., GUO, C., DENG, C., RAN, Z. 2025: Quantifying COVID-19-induced disruptions and recovery benchmarks in China's aviation passenger mobility (2020–2025). *Case Studies on Transport Policy*, 21, 101547.
- CHROMÝ, F. 2026: Východoasijská letiště v kontextu globální sítě letecké dopravy: změny významu a konektivity mezi lety 2019 a 2023. Bakalářská práce, katedra sociální geografie a regionálního rozvoje, PřF UK Praha, 71 s.

The research was supported by the project Society on the move: opportunities and risks of new forms of mobility for Czech society and economy, reg. No. 1. CZ.02.01.01/00/23_025/0008717 from the Operational Programme of Jan Amos Comenius. The authors gratefully acknowledge the kind support.

How do basic school principals decide on the number of geography lessons? A report on Czech schools at the time of curriculum revision

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Keywords: educational benefits of geography, basic school principals, number of hours

In Czechia, basic school principals (incl. lower secondary level) have the authority to allocate teaching hours to individual subjects. They are relatively loosely bound by the state curriculum, i.e. the Framework Educational Programme (FEP). The outcome of the ongoing curricular reform is a revised version of the FEP for lower secondary education, which gives principals even greater freedom in allocating hours. So far, no research has documented this mechanism, which in practice decides the possibility of realising a subject's educational potential. We assume that the number of hours allocated corresponds to the perceived social benefit, or rather the students' utility, as perceived by school management. In our questionnaire survey, we therefore asked principals of all basic schools (lower secondary level) in Czechia about this. This paper presents the main findings resulting from a total of 341 completed responses. For example, we found that a principal's teaching qualification in geography does not lead to a higher number of geography hours. A more democratic or centralised method of decision-making does not have a statistical effect either. However, the principal's views on the educational benefits of geography do have certain influence. This research was conducted in collaboration with the sociological research company Augur Brno, with the support of the Geography Section of the Faculty of Science, Charles University, Prague.

References:

- BERGER, P. L., LUCKMANN, T. 1991: *The social construction of reality: A treatise in the sociology of knowledge* (No. 10). Penguin UK.
- BIDDULPH, M., ADEY, K. 2003: Perceptions v. reality: pupils' experiences of learning in history and geography at Key Stage 4. *The Curriculum Journal*, 14(3), 291-303. DOI: <https://doi.org/10.1080/0958517032000137621>.
- BIESTA, G., PRIESTLEY, M., ROBINSON, S. 2015: The role of beliefs in teacher agency. *Teachers and Teaching*, 21(6), 624-640. DOI: <https://doi.org/10.1080/13540602.2015.1044325>.
- HERMAN, G. V. et al. 2020: The Perception of Geography in School and Society, *Baltic Journal of Health and Physical Activity, Special Issue 1*, 112-119. DOI: 10.29359/BJHPA.12.Spec.Iss1.13.
- HOLT-JENSEN, A. 2005: *The status of geography in Norway; an issue of grave concern*. In: Donert, K., Charzyński, P. (eds.): *Changing horizons in geography education*. Herodot Network and Association of Polish Adult Educators, Toruń, 137-145.
- MATLOVIČ, R., MATLOVIČOVÁ, K. 2012: Spoločenská relevancia a budovanie značky geografie. *Geografie*, 117(1), 33-51.
- JOHNSON, C., PRICE, M., et al 2020: Geography: Why It Matters. *The AAG Review of Books*, 8(1), 34-42.
- SCARATTI, G., GALUPPO, L., GORLI, M., GOZZOLI, C., RIPAMONTI, S. 2017: The social relevance and social impact of knowledge and knowing. *Management Learning*, 48(1), 57-64.

The physical environment and health outcomes: evidence from Aotearoa New Zealand

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Keywords: mental health, physical health, spatial epidemiology, built and natural environment, spatial co-occurrence

The natural and built environments in which people live are increasingly recognised as an important determinant of health, yet research often focuses on individual environmental components and rarely accounts for the whole mix of environmental influences that people experience. This contribution draws on the evidence from Aotearoa New Zealand examining associations between the physical environment, represented by the Healthy Location Index (HLI), and a range of health outcomes using both surveys and whole-of-population data. HLI is a composite area-level index that accounts for the co-occurrence of selected domains of natural and built environments. It classifies whether the area is rather health-promoting or health-constraining and quantifies the intensity. Using the HLI, our research consistently found that exposure to health-constraining environments was associated with poorer mental health outcomes, including emotional disorders, substance use, depression, anxiety, and psychological distress, as well as adverse physical health outcomes and negative health behaviours.

Conversely, access to health-promoting natural features, particularly greenspace and bluespace, was associated with better mental health outcomes, pointing to the value of the overall environmental mix rather than any single feature in isolation. These patterns held across large longitudinal cohorts and national survey samples alike and persisted after adjustment for wider individual and socioeconomic characteristics.

Together, our findings strengthen the case for integrating environmental planning into public health policy. Place-based, preventive interventions targeting communities with disproportionate exposure to health-constraining environments represent a promising avenue for population-level health improvement.

Similarities and differences in the tourist use of defensive and peaceful relict borders: the example of the Berlin Wall and the Bohemian-Moravian boundary

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Keywords: tourism, relict border, Berlin Wall, Bohemian-Moravian boundary

The presentation draws attention to the existence of different types of relict borders and their usage in tourism, which are topics scholars have not dealt with so far. It compares two highly dissimilar relict borders used in tourism: the notorious Berlin Wall and the lesser-known Bohemian-Moravian boundary. Although at first glance very different historical boundaries, they both experienced processes of bordering, during which they arose in people's minds as well as in the landscape; debordering, through which they became relict borders, since they lost their original dominant function/meaning (defensive in the case of the Berlin Wall, and political in the case of the Bohemian-Moravian boundary); and rebordering, while these previously dividing borders have been reinterpreted as heritage, memory sites and tourist attractions (among other meanings) that can unite people. However, conversely, the timing and duration of bordering/debordering/rebordering processes (i.e., history) of both relict borders as well as their geography (location, length, and scale) and purpose (defensive vs. peaceful) vary greatly. These differences, mainly in purpose, highly affect the analysed borders' tourist appeal and usage. While the global-scale Berlin Wall had a defensive function, which caused lots of suffering, and many relicts (e.g., walls and watchtowers) are preserved to this day, the Bohemian-Moravian boundary represented a peaceful intra-state administrative boundary, of which only few relicts (mainly in the form of boundary stones) have survived. While the Berlin Wall attracted foreign tourists' attention already during the bordering process and is today one of the German capital's biggest tourist attractions, the boundary between Bohemia and Moravia, passing through a largely natural landscape in the Czech inner periphery, is only just beginning to attract (mainly domestic) tourists.

Evaluation of 360° photogrammetry for 3D modelling of inaccessible geological outcrops: a case study of the Ortášska Ryha

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Keywords: 360-degree camera, Structure-from-Motion, Ortášska ryha, Agisoft Metashape, Geological mapping

This study introduces an innovative, low-cost methodological framework for digital relief modeling and quantitative geomorphological analysis in extremely inaccessible natural environments using 360-degree Structure-from-Motion (SfM) photogrammetry. The research focused on the Ortáše Trench (Ortášska ryha), a unique but challenging geomorphological phenomenon located in Eastern Slovakia. In such confined, heavily vegetated, and topographically complex terrain, traditional spatial data acquisition methods face severe constraints; the deployment of Terrestrial Laser Scanning (TLS) is logistically unfeasible, and Unmanned Aerial Vehicle (UAV) photogrammetry is largely restricted by dense canopy cover and hazardous flight geometries.

The primary objective of this paper was to evaluate the spatial accuracy, consistency and completeness of 3D point clouds and digital terrain models derived from a commercial-grade 360-degree camera. The objective was to determine the feasibility of measuring micro-geomorphological features, sedimentary layering, outcrop dimensions, and structural orientations directly from the virtual model. Fieldwork data acquisition was processed using SfM algorithms within Agisoft Metashape software. To ensure rigorous spatial referencing and geometric validation, Ground Control Points (GCPs) were measured in-situ using High-Precision Global Navigation Satellite System (GNSS) RTK positioning.

The structural accuracy of the generated SfM model was validated through a dual-verification approach: direct manual reference measurements of layer dip and strike using a traditional geological compass in the field, and macro-scale geometric comparison with Airborne Laser Scanning (ALS) datasets obtained from the national ZBGIS database. The results demonstrate positive correlation and geometric consistency between the SfM-derived model and the physical field measurements, proving that 360° SfM photogrammetry can reliably capture complex vertical and overhanging geological structures that are typically subject to data voids (shadowing) in airborne data. Expected future outcomes of this ongoing research focus on fusing these highly detailed, multi-source geospatial datasets with machine learning workflows.

This work was supported by the Scientific Grant Agency of the Ministry of Education, Research, Development and Youth of the Slovak Republic and the Slovak Academy of Sciences under the projects VEGA 1/0780/24 ("Combination of LiDAR and hyperspectral data with machine learning methods for improved land cover classification") and VEGA 1/0170/26 ("Paleoenvironmental and paleogeographical reconstructions based on changes in morphological and microtextural features of detrital minerals and machine learning").

Progressing cities, progressive parties? Relevance and spatiality of the transnational cleavage – the case of Progressive Slovakia

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Keywords: transnational cleavage, urban-rural cleavage, electoral geography, electoral behaviour, Progressive Slovakia

The nature of political competition across Europe is undergoing a transition, reflected by the concept of the *transnational cleavage*, a socio-political conflict between radical right or TAN (traditional, authoritarian, nationalist) parties and parties representing progressive, GAL (green, alternative, liberal/libertarian) values. While much of contemporary research is focused on TAN parties within the context of popular concepts such as *geography of discontent* or *left-behind places*, the other side often remains overlooked. Together with the resurgence of the traditional urban-rural divide this underscores the need for geographical methodology and the importance of focusing on advancing urban environments in the study of electoral behaviour. In Slovakia, the party Progressive Slovakia (PS) can be considered a representative of the GAL spectrum. This conference contribution presents findings from a forthcoming research article. Reflecting the latest theoretical insights in political science and geography, the aim of the research is to examine the geography of electoral support for PS in parliamentary elections, its factors, and spatial non-stationarity at the municipal level using analyses of spatial autocorrelation, multiple linear regression (OLS), and multilevel geographically weighted regression (MGWR). Preliminary results confirm the assumptions based on the theoretical framework, taking local specifics into account. Space and urbanity proved to play a significant role, as high electoral support for PS tended to be concentrated in “progressing” metropolitan areas. The research findings offer theoretical implications regarding the relevance, spatiality, and forms of the transnational cleavage in Slovakia and the broader region of Central and Eastern Europe.

Toward a metamodern geography: beyond modernist certainty and postmodern fragmentation

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Keywords: metamodernism, geographical thought, metarealism, zetetic epistemology, hylosemiotics

The paper presents metamodernism (Vermeulen, van den Akker 2010) as a possible fundamental shift in geographical thought, one that may represent its fifth first-order discontinuity. Its central thesis is that metamodernism enables geography to move beyond the unproductive opposition between explanation and interpretation, objectivity and reflexivity, materiality and discourse, generalisation and plurality. This is not a simple compromise between modernism and postmodernism, but an oscillatory mode of thought that allows for a disciplined movement between different ontological, epistemological, and methodological registers. Within this framework, geography is understood as a post-disciplinary and post-paradigmatic field whose strength lies not in paradigmatic purity, but in its capacity to mediate relations between natural-scientific, social-scientific, humanistic, and technological regimes of knowledge.

The paper briefly outlines the key concepts of the metamodern shift in geographical thought: metarealism as a way of grasping multilayered geographical reality; zetetic epistemology based on an open, critical, and abductive search for the best explanation; hylosemiotics as a framework for analysing relations between materiality, meaning, and spatial organisation; and sublation as a process of preserving, overcoming, and integrating opposing epistemic regimes (Storm 2021, Matlovič, Matlovičová 2025). The aim of the paper is to present metamodern geography as a metatheoretical framework that may renew the synthetic ambition of geography without returning to naïve scientism and without becoming trapped in postmodern fragmentation.

References:

- MATLOVIČ, R., MATLOVIČOVÁ, K. 2025. The Metamodern Shift in Geographical Thought: Oscillatory Ontology and Epistemology, Post-disciplinary and Post-paradigmatic Perspectives. *Folia Geographica*, 67(1), 22-69.
- STORM, J.A.J. 2021. *Metamodernism. The Future of Theory*. Chicago: The University of Chicago Press. 359 p.
- VERMEULEN, T., VAN DEN AKKER, R. 2010. Notes on metamodernism. *Journal of Aesthetics & Culture*, 2(1), 56-77. DOI: <https://doi.org/10.3402/jac.v2i0.5677>.

The contribution was elaborated within the VEGA Project No. 2/0058/24 „Genealogy of modern geographical thought in Slovakia: interference of autochthonous and allochthonous conditionalities“ and the KEPA Project No. 020EU-4/2024 „Game based learning (GBL) - innovation in teaching and training of tourism students“.

Uneven legacies, uneven exposure: Mapping household vulnerability to EU emission trading systems in Czechia

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Keywords: Energy transformation, socio-spatial inequalities, housing, transport

With approaching commence of EU emission trading system for buildings and road transport (ETS2) and increasing political opposition against this EU climate policy measure, concerns about and research interest in social impact of new emission allowances is increasing. In media and political debates, the ETS2 system is pictured as threat to households which are already vulnerable and whose costs of heating their homes and commuting to work, school or to basic services will increase, while potential benefits from new policies funded from ETS2 revenues (e.g. the Social Climate Fund) targeting energy and transport poverty are overlooked. Using mostly EU SILC data, studies in several EU member states identified social groups in risk of energy poverty if the costs of ETS2 contributes to larger increased prices of coal, natural gas or petrol. Despite increasing evidence on who might be affected, providing some evidence for design of socially targeted policies, little is known about where these effects will take place and thus where specific support of investment in increasing housing energy efficiency, change of fuel used for heating or supporting more sustainable transport should be prioritized. Moreover, focusing on ETS2 alone fails to capture how household vulnerability to carbon pricing is territorially mediated by previous ETS1 exposure, efficiency of district-heating infrastructures or housing stock, commuting regimes, local fuel mixes and inherited socio-spatial inequalities. The paper explores this missing context of mechanisms which influence vulnerability of Czech households during complex energy transition. Uneven spatial patterns of fossil fuel usage for heating and commuting as well as speed of ongoing energy transition to renewable energy sources are analysed. We construct municipal-level indicators of household exposure to ETS1 and ETS2 by combining census-based data on heating sources, dwelling structure and commuting behaviour with administrative data on district heating systems, fuel mixes, carbon intensities and social vulnerability indicators. Most vulnerable places are identified which should be targeted by investment support to mitigate increased energy costs. Administrative structure of Czechia which has about 6250 municipalities with average population of about 1700 allows for detailed analysis of spatial patterns in particular in rural areas.

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Socio-economic deprivation, collaborative practices and territorial transformations in marginalized urban peripheries: a comparative analysis of Tor Bella Monaca (Rome) and Le Mirail (Toulouse)

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Keywords: Urban peripheries, Collaborative governance, Spatial justice, Geo-Care, Urban commons

Across Europe, large-scale peripheral housing estates developed during the post-war period have become emblematic spaces of socio-spatial inequality, territorial stigmatization and uneven urban development. At the same time, these neighbourhoods increasingly represent laboratories of civic engagement, collaborative governance and community-based initiatives that challenge deficit-oriented representations of urban peripheries.

This paper investigates the relationships between socio-economic deprivation, collaborative practices and territorial transformation through a comparative study of Tor Bella Monaca in Rome and Le Mirail in Toulouse. Despite their different institutional, political and cultural contexts, both neighbourhoods share similar trajectories: they were conceived as ambitious modernist urban projects, subsequently experienced processes of marginalization and socio-economic decline, and are currently undergoing significant transformations driven by urban regeneration policies and local collective action.

The research is situated within contemporary debates on the right to the city (Lefebvre, 1968), spatial justice and urban inequality (Harvey, 2012), urban commons and collective forms of governance (Ostrom, 1990; Foster & Iaione, 2016; Stavrides, 2016), and emerging perspectives on care and territorial interdependence (Lassault, 2024; Tronto, 2015). It adopts a mixed-methods approach combining the analysis of socio-economic indicators, cartographic representations and policy documents with the examination of participatory initiatives and collaborative governance mechanisms. Particular attention is devoted to the role of community-led practices, forms of active citizenship and place-based networks of care in addressing territorial inequalities and fostering social cohesion.

The comparative analysis highlights significant convergences and divergences between the two case studies. While regeneration strategies in Toulouse have largely relied on large-scale urban restructuring and demolition programmes, recent interventions in Rome increasingly combine institutional investments with bottom-up initiatives and collaborative practices. Preliminary findings suggest that the effectiveness of regeneration processes depends not only on physical transformation but also on the capacity to strengthen local social capital, support collective forms of territorial stewardship and recognize residents as active agents in the production of urban space. The paper contributes to ongoing discussions on socio-spatial inequalities and peripheralization by proposing an integrated framework that connects deprivation, collaborative governance, cartographic representation and community-based care practices in contemporary European urban peripheries.

References:

- FOSTER, S. R., IAIONE, C. 2016. The City as a Commons. *Yale Law & Policy Review*, 34, 281–349.
- HARVEY, D. 2012. *Rebel Cities: From the Right to the City to the Urban Revolution*. Verso.
- LUSSAULT, M., 2024. *Cohabitons! Pour une nouvelle urbanité terrestre*. Parigi, Seuil.
- LEFEBVRE, H. 2009. *Le Droit à la ville* (3rd ed.). Anthropos.
- OSTROM, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press.
- STAVRIDES, S. 2016. *Common Space: The City as Commons*. Zed Books.
- TRONTO, J. 2015. *Who Cares?: How to Reshape a Democratic Politics*. Cornell University Press.

Digital twin as a participatory tool

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Key words: Digital Twin, 3D model, Participation, Spatial Planning

The concept of a Digital Twin can be generally defined as a digital copy or virtual representation of real-world objects, processes, services, or systems (Caprari et al. 2022; Dihad Shezad et al. 2024). It is typically used to perform simulations, analyses, and predictions that support higher-quality decision-making and management processes. However, its functionalities vary primarily depending on the field and purpose for which it was created (Adade and de Vries 2023). Most commonly, the data foundation is associated with 3D objects, real-time sensor data, IoT, BIM, LiDAR, or GIS (Boccardo, La Riccia and Yadav 2024). In practice, however, usually only a partial component is implemented, mainly due to challenges related to software benchmarking, data sharing, financial constraints, synchronization, and data interoperability (Dihad Shezad et al. 2024). The aim of this poster is to present an emerging participatory Digital Twin platform developed within the RUR project (<https://rur.ujep.cz/>). The combination of 3D visualization and the participatory component of the platform represents an effective tool for engaging the general public in planning and for the visual presentation of intended spatial developments. Primarily, the platform is designed for public administration experts, but its future application offers significant potential in other sectors as well (non-profit organizations, civic initiatives, the private sector, etc.). The practical application of the platform will be demonstrated using the example of one of three pilot sites, specifically the campus of J. E. Purkyně University in Ústí nad Labem.

References:

- ADADE, D., DE WRIES, W. T. 2023: Digital Twin for Active Stakeholder Participation in Land-Use Planning. *Land*, 12, 3. DOI: <https://doi.org/10.3390/land12030538>.
- BOCCARDO, P., LA RICCIA, L., YADAV, Y. 2024: Urban Echoes: Exploring the Dynamic Realities of Cities through Digital Twins. *Land*, 13, 5. DOI: <https://doi.org/10.3390/land13050635>.
- CAPRARI, G., CASTELLI, G., MONTUORI, M., CAMARDELLI, M., MALVEZZI, R. 2022: Digital Twin for Urban Planning in the Green Deal Era: A State of the Art and Future Perspectives. *Sustainability*, 14, 22. DOI: <https://doi.org/10.3390/su14106263>.
- DIHAD SHEZAD, Md. et al. 2024: Digital twin: Data exploration, architecture, implementation and future. *Heliyon*, 10(5). DOI: <https://doi.org/10.1016/j.heliyon.2024.e26503>.

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Spatio-temporal dynamics of school choice: the case of basic education in Czechia

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Keywords: school choice, enrolment, basic school, geography of education, education

School choice has long been a subject of academic interest across various scientific disciplines. However, most research focuses on parental preferences, factors influencing school choice (Burgess et al. 2011; Boterman 2021), and the consequences of these choices, such as various forms of segregation (Noreisch 2007; Zancajo and Bonal 2020). The developmental perspective of school choice in time and space, however, is often neglected. This paper therefore focuses on the spatio-temporal dynamics of basic school (ISCED 1 and 2) enrolment data, which represent a real manifestation of parental choice. Methodologically, the work employs quantitative methods (descriptive statistics) and cartographic visualization. More specifically, it utilizes enrolment data from all basic schools in Czechia (n=approx 3,600) for the period 2015–2025. The analyzed data indicate that school choice in Czechia has been increasing over the last decade. This increase was demonstrated at both national and regional levels, as well as across all monitored structural indicators of schools (population size of the school municipality, school capacity, and school operator). School choice should therefore be perceived as a dynamic process in terms of time and space, and monitoring enrolment behaviour is valuable not only for educational planning.

References:

- BOTERMAN, W. R. 2021: Socio-spatial strategies of school selection in a free parental choice context. *Transactions of the Institute of British Geographers*, 46(4), 882–899. DOI: <https://doi.org/10.1111/tran.12454>.
- BURGESS, S., GREAVES, E., VIGNOLES, A., WILSON, D. 2011: Parental choice of primary school in England: what types of school do different types of family really have available to them? *Policy Studies*, 32(5), 531–547. DOI: <https://doi.org/10.1080/01442872.2011.601215>.
- MEYER, P. 2026: Spatio-temporal dynamics of school choice: An analysis of basic school enrolment data. *Geographical Journal*, 78 (2), 85–94. DOI: <https://doi.org/10.31577/geogrcas.2026.78.2.03>.
- NOREISCH, K. 2007: Choice as Rule, Exception and Coincidence: Parents' Understandings of Catchment Areas in Berlin. *Urban Studies*, 44(7), 1307–1328. DOI: <https://doi.org/10.1080/00420980701302320>.
- ZANCAJO, A., BONAL, X. 2020: Education markets and school segregation: a mechanism-based explanation. *Compare: A Journal of Comparative and International Education*, 52(8), 1241–1258. DOI: <https://doi.org/10.1080/03057925.2020.1858272>.

Semiautomatic detection of channel and its basic hydraulic parameters

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Keywords: channel detection, random forest, LiDAR

Flood hazard assessment requires very accurate data on landscape, geology, land cover, and, most importantly, precipitation and discharge. Pre-processing of these data, analysing and modelling of different flood magnitudes is demanding in terms of time and computational power. Therefore, these processes are not suitable for very large areas. In the preliminary phase of flood hazard assessment, information about the severity of the hazard provides details upon which to decide which area is more suitable for detailed assessment. With the help of technologies like detailed LiDAR and big data processing, we are able to provide more detailed information about the capacity of channels.

In our contribution, we are providing a new method for semiautomatic channel identification, with the help of machine learning. We are using LiDAR data from the Geodesy, Cartography and Cadastre Authority of the Slovak Republic and its derivatives like slope, curvature, topographic position index, topographic wetness index and LiDAR intensity data. For machine learning, we used the random forest algorithm. Validation of results showed an accuracy over 85%. Therefore, this new method will shorten the identification of this landform. Subsequently, we prepared an automated calculation of basic hydraulic parameters on the cross-section profiles every 100 m. We calculated maximum depth, wetted perimeter, bed slope, cross-sectional area and capacity of channel. Hence, this methodology provides fast and accurate basic parameters of rivers for large areas for flood hazard assessment purposes.

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The significance of borders as tourist attractions (case study of Bratislava)

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Keywords: borders, tourist attractions, Bratislava, Limes, Iron Curtain

Central Europe is one of the regions where empires, states, and territorial affiliations are constantly changing. Borders emerge, disappear, are shifted, and sometimes return to their former positions. Certain areas, such as the area around contemporary Bratislava, are prime examples of the border changes. The area of Bratislava city is full of current and former political borders. At the beginning of the first millennium, the Danube Limes were founded here. In 2021, the western segment of the Danube Limes (including Gerulata in Rusovce) was inscribed on the UNESCO World Heritage List as part of the set of "Frontiers of the Roman Empire" World Heritage Sites. Another interesting border created in the vicinity of this city became the Iron Curtain. The border left behind many objects and symbolic places such as the open-air Iron Curtain Museum in Devínska Nová Ves and monuments the Gate of Freedom or the Heart of Europe in Devín. In turn, the modern borders with Austria and Hungary create a new version of elements that are now becoming symbols of integration. The tripoint of borders between these three countries plays a special role in this process. The rich history and variability of borders in the vicinity of the Slovak capital have created a veritable palimpsest of imposed borders. They have become symbols of old divisions, serving as heritage and memory. These facilities, infrastructure, event venues, and special points have become important places on the tourist map of Europe. The main methods used were desk research and field observations. The aim of this study is to point to the role of borders in tourism and to analyse selected elements of borders that serve as tourist attractions and complement the tourism offer in the Bratislava region.

The study was carried out within the framework of project No. 2/0072/24 financed by the Slovak VEGA Grant Agency.

Regional aspect of physical geomorphometry – a new interpretation of land surface roughness

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Keywords: land surface, physical geomorphometry, roughness, gravity energy

Physical geomorphometry is defined as a specific subfield of geomorphometry investigating the land surface in terms of the basic principles, practices and concepts of physics (Minár et al., 2024). It interprets the geometric properties of the land surface mainly in the context of the relationships between geomorphometric variables and gravitational energy. The basic concept interprets local point-based variables (derivatives of elevation: slope gradient, curvatures, and changes in curvatures) as parts of gravitational energy responsible for the speeds, acceleration, and changes in acceleration of gravitational flows, the energy and change of energy of the flow caused by its concentration, and the energy of diffusive geomorphic processes.

Complementing these pointwise energies are areal energies, which are defined by the variability of elevation and its derivatives in a given area. This is basically expressed using simple measures of land surface roughness, such as relief (elevation differential = vertical dissection), standard deviation, or mean/median absolute deviation of elevation. If we calculate these areal-based variables in a small window, they correlate with point-based variables. However, if the calculation window matches the wavelength of the land surface (topographic grain), they gain an autonomous physical interpretation – expressing different aspects of geomorphic work – geomorphic energy spent in the past (Bandura et al., 2021). Different roughness variables can express not only the intensity of this regional geomorphic energy but also its wavelength (corresponding to topographic grain), (an)isotropy (showing how the wavelength changes in different directions), and other variables defining various changes in geomorphic work across space. In the end, the nested hierarchy of landforms creates a hierarchical system of undulations of different wavelengths, which defines a spatially variable spectrum of regional energy. Such system developed for the physical and geomorphometric interpretation of roughness provides a theoretical basis for selecting appropriate roughness measures in different applications of digital landscape modelling.

References:

- MINÁR, J., DRĂGUȚ, L., EVANS, I. S., FECISKANIN, R., GALLAY, M., JENČO, M. & POPOV, A. 2024. Physical geomorphometry for elementary land surface segmentation and digital geomorphological mapping. *Earth-Science Reviews*, 248, 104631.
- BANDURA, P., MINÁR, J. & BIELIK, M. 2021. Physically based morphostructural land surface segmentation: Case of the Alps and Western Carpathians. *Trans. GIS* 25, 2394–2418.
- MINÁR, J., FECISKANIN, R., GALLAY, M. & ŠUPINSKÝ, J. 2025. Advances in theory of physical geomorphometry. *Geomorphometry 2025*. Perugia, Italy.

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A stable or a fuzzy border: The Czech–Slovak frontier in historical-geographical research

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Keywords: Czech–Slovak borderland, border formation, historical geography, settlement

The Czech–Slovak state border is often portrayed as a medieval-era, stable “natural” boundary. This study examines its historical–geographical development, regional differentiation, and present alignment, including disputes that accompanied its formation. Historical analysis is complemented by GIS-based mapping and ordinary least squares (OLS) and geographically weighted regression (GWR) models relating the year of first written mention of settlements to elevation and distance from the border. Results indicate that the “natural, millennial stability” narrative is oversimplified: the border only partly follows major drainage divides and other natural features, and its precise routing remained uncertain for much of its history. Both elevation and border distance significantly predict settlement timing, consistent with gradual frontier formation and local adjustments, particularly in mountainous, later-settled sections.

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Demographic decline and the future of higher education in Slovakia: a cohort and regional outlook to 2040 with a perspective to 2050

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Keywords: demographic transition, natural population decrease, population decline, higher education, university students, cohort model, regional model, population prognosis, Slovakia

Slovakia's population can be characterised as post-transitional, marked by sustained below-replacement fertility, delayed family formation and childbearing, progressive population ageing, the recent emergence of natural population decline, and the growing importance of international migration in shaping overall population dynamics. The recent pronounced decline in the number of births has further reduced the size of younger cohorts and poses long-term challenges for educational planning, school network optimisation, staffing, and resource allocation. The effects of demographic change emerge across different levels of education with varying time lags and are spatially differentiated. The aim of this contribution is to place the future development of the university student population in Slovakia within the broader context of demographic transition, natural population decrease, and shrinking population cohorts, and subsequently to assess its temporal and regional differentiation. The analysis draws on data from the Statistical Office of the Slovak Republic and the Slovak Centre of Scientific and Technical Information. The future number of domestic university students is estimated using two complementary projection approaches. The cohort model applies age- and sex-specific higher education participation rates to projected population cohorts, whereas the regional model combines enrolment rates by students' region of origin with regional population projections.

The results of both models indicate a short-term decline in the number of domestic university students until approximately 2026, followed by a modest recovery. By 2040, their number is projected to increase by approximately 4–6% compared with the baseline period, primarily owing to the temporary expansion of cohorts aged under 26. However, the national trajectory conceals substantial regional disparities, as the population potential for higher education is expected to become increasingly concentrated in growing and migration-attractive regions, while peripheral regions will continue to experience a weakening of their potential student base. An indicative outlook to 2050 further points to the risk of a renewed, more substantial decline after 2040, when exceptionally small cohorts born during the current sharp fall in births begin to reach university age. Projection accuracy is assessed by comparing modelled values with observed data, with the mean absolute percentage error amounting to approximately 3%. The findings highlight the need for forward-looking and regionally differentiated planning of capacities, funding mechanisms, and the spatial organisation of higher education in Slovakia.

This research was supported by the Scientific Grant Agency of the Ministry of Education, Research, Development and Youth of the Slovak Republic and the Slovak Academy of Sciences (VEGA), grant No. 1/0768/24, "Multi-scale assessment of spatial variability of socio-economic stratification of the population".

Specifics of viticulture and winemaking in the Nitra Region

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Keywords: viticulture, viticultural zoning, winemaking, wine producers, field research, Nitra Region

Viticulture is one of the traditional agricultural sectors of the Nitra Region. The region plays a significant role in the viticulture and wine industry of Slovakia. The aim of this paper was to analyse the spatial characteristics of viticulture and winemaking in the Nitra Region and to identify its distinctive features in comparison with other Slovak wine-growing regions. Three wine-growing regions extend into the Nitra Region: the Nitra, South Slovak, and Central Slovak wine-growing regions. The analysis is based on data concerning vineyard area, grape variety composition, registered viticultural and wine-producing entities, and field research conducted through questionnaire surveys and interviews with selected wineries. The field research made it possible to identify regional specificities in grape cultivation, production practices, and the development priorities of wineries. The visualised results indicate a pronounced concentration of viticulture in the southern part of the Nitra Region, where several of Slovakia's most important wine-growing districts are located, namely the Hurbanovo, Strekov, and Štúrovo districts. These districts have the highest proportion of vineyards within agricultural land and a significant concentration of wine-producing enterprises. The analysis also confirmed the dominant position of the Nitra Region within Slovak viticulture in terms of both the extent of vineyard production and the diversity of wine producers. A distinctive feature of the region is the combination of modern technologies with traditional winemaking practices. Alongside large-scale wine producers, family-owned wineries specialising in the production of high-quality premium wines also play an important role. The findings of the field research further highlight the increasing emphasis placed by wineries on technological innovation, sustainable vineyard management, and the development of wine tourism. These characteristics distinguish the Nitra Region from other Slovak wine-growing regions and represent important factors supporting its development and long-term competitiveness.

References:

- NÉMETHOVÁ, J., CIVÁŇ, M. 2018. *Nitra wine region - the most diverse wine region in Slovakia*. Useful Geography: Transfer from Research to Practice: Proceedings of 25th Central European Conference, 12th-13th October 2017. Brno: Masaryk University, p. 494-505. DOI: <https://doi.org/10.5817/CZ.MUNI.P210-8908-2018>.
- NÉMETHOVÁ, J., KRAJČI, F. 2022. *Structure of Wine Entities in the Nitra Region*. 25. mezinárodní kolokvium o regionálních vědách. Sborník příspěvků. Brno: Masarykova univerzita, p. 417-425. DOI: <https://doi.org/10.5817/CZ.MUNI.P280-0068-2022-51>.
- NÉMETHOVÁ, J., KRAJČI, F. 2023. *The Impact of Climate Change on the Viticulture of the Nitra Region – Predictions of Development and Field Research*. 26. mezinárodní kolokvium o regionálních vědách. Sborník příspěvků. Brno: Masarykova univerzita, p. 182-190. DOI: <https://doi.org/10.5817/CZ.MUNI.P280-0311-2023-22>.

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International students' university experience and change in staying intention: evidence from the UK and Czechia

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Keywords: international student mobility, staying intention, social networks, partnerships, integration

This paper explores the association between the change in international university students' staying intention during their studies and various aspects of their university experience. These aspects include the social networks and location-specific experiences that international students acquired during their studies, as well as the role of the COVID-19 pandemic. The paper derives and tests hypotheses based on the migration networks theory and related literature. For the tests, it uses a dataset containing 3,205 responses, collected among international students at 27 universities in the UK and Czech Republic. The findings show that international students' staying likelihood increased during their studies if they acquired a new partner who is a local or works in the country of study, undertook internships or were involved in student societies in the country of study, and faced fewer integration difficulties. Conversely, their staying likelihood decreased if they were unable to attend in-person lectures due to the pandemic.

Spatial distribution of toponyms with the adjective "Czech": historical and cultural perspectives

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Keywords: toponyms, spatial distribution, border effect, development, regional identity, Czechia

This paper examines the spatial distribution of toponyms containing the adjectival modifier. “Czech” (český/á/é) within the territory of Czechia and the factors that have shaped their spatial pattern. The results are based on a spatial analysis of the current occurrence of these toponyms and are presented through cartographic outputs. The analysis reveals clear spatial regularities, with a key role played by the border effect (state, provincial, and historical ethnic boundaries) together with associated cultural historical processes. The interpretation focuses on historical impulses and processes that contributed to the establishment of the adjectival modifier “Czech” in toponymy. In this respect, three main periods of development can be identified: the late 18th century, the mid 19th century, and the period following the end of the First World War. The paper demonstrates a close relationship between toponymic development, historical events, and regional identity in space.

Regional inequalities in social care under demographic ageing

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Keywords: care service coverage, informal care, latent demand, peripherality

This study examines regional inequalities in social care services for the elderly in the Czech Republic. It combines data on selected types of social care services and their capacity with demographic indicators and proxies for care dependency to assess how service provision corresponds to potential care need across territories.

The study addresses a key limitation of current planning practices, which often rely on absolute service capacities and do not adequately reflect differences in demographic structure. By incorporating indicators of ageing and care dependency, the analysis captures variations in potential care needs that remain overlooked in standard approaches.

The results reveal substantial regional disparities, particularly in peripheral areas, where formal service capacity does not correspond to the care needs of the population. They further demonstrate that planning based solely on service capacity may underestimate long-term care needs. The findings also suggest that the demographic potential for family and community-based care should be considered when interpreting regional disparities, as areas with more limited informal care resources may face additional pressure on formal service provision.

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Mechanisms underlying public attitudes towards migrants and migration policies

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Keywords: migration attitudes, pluralistic ignorance, social norms, public opinion, Czechia

Ideological and value orientations, intergroup contact, media-related processes, perceptions of migration, and perceived social norms represent some of the major mechanisms used to explain public attitudes towards migrants. While previous research has often combined several of these perspectives, less attention has been paid to their comparative role and relative importance when examined simultaneously. Drawing on a representative survey of the Czech adult population conducted in 2025 (N = 1,240), this paper compares the role of multiple mechanisms underlying attitudes towards migrants and migration policies. The analysis examines how these mechanisms relate to several forms of migration attitudes, including general evaluations of migrants, social distance, support for restrictive and solidarity-based policies, and evaluations of distinct migrant profiles. Preliminary analyses suggest that these mechanisms differ considerably in their associations with migration attitudes. While ideological and value orientations appear to play a central role, the findings also point to a substantial degree of pluralistic ignorance, with respondents tending to perceive broader societal attitudes towards migrants as more negative than their own.

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Toward a context-sensitive analysis of urban sanitation in India across scale and space

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Keywords: urban sanitation, urban scaling, spatial heterogeneity, open defecation, India

Achieving universal safe sanitation remains far from reach in rapidly urbanising regions, where poor sanitation outcomes persist across diverse urban contexts despite large-scale policy interventions. Yet existing research rarely examines how patterns of poor urban sanitation practice are jointly structured across settlement size, urban hierarchy, and geographic space. Here, we develop an integrated analytical framework combining urban scaling theory and spatially explicit analysis to examine open defecation (OD) burden and its predictors across 1,831 Indian towns using nationally comprehensive town-level data from the Census of India. We first establish the expected scaling trajectory of OD burden across the urban hierarchy and subsequently analyse scale-adjusted deviations from these expectations, identifying settlements that systematically over- or under-perform relative to their size. We then examine how both OD burden and its predictors vary across the urban hierarchy and inter-urban space. We show that predictors linked to urban form and settlement structure are more closely tied to size-driven urban differentiation, whereas socio-economic, infrastructural, and environmental conditions are more strongly associated with deviations from expected sanitation outcomes at a given settlement size. These effects are further conditioned by urban hierarchy and geographic context, revealing poor urban sanitation practice as the outcome of interacting hierarchical and spatial processes rather than uniform urban dynamics.

This research has been supported from the Czech Science Foundation (GAČR) through the project “Rethinking the Urbanisation–Migration Nexus” (Project No. 26–23579 S; 01/2026–12/2028).

High socio-economic segregation in a low-inequality country? The role of spatial scale in interpreting segregation in Slovakia

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Keywords: socio-economic stratification, socio-economic segregation, spatial scale, occupational structure, Slovakia

Following the collapse of state socialism in the late 1980s and early 1990s, income inequality increased substantially in most post-socialist countries and has remained relatively high to the present day. Czechia and Slovakia, however, continue to belong among the countries with the lowest levels of income inequality in the world. Based on previous research, such countries would generally be expected to exhibit relatively low levels of socio-economic segregation. Nevertheless, substantial changes in social conditions, labour markets, regional economies, and internal migration have created favourable conditions for increasing socio-economic stratification and its spatial manifestations in Slovakia. The interpretation of these processes may therefore strongly depend on the spatial scale of analysis.

The aim of this study is to provide a multi-scale perspective on socio-economic differentiation in Slovakia. Using occupational structure as a proxy for socio-economic status, the analysis compares national, regional, municipal, and sub-local (Basic Settlement Units, equivalent to census tracts) spatial levels. At the national and regional levels, socio-economic differentiation is assessed using the Gini coefficient. At the municipal and sub-local levels, the localization quotient is employed to identify the spatial concentration of socio-economic groups. The combination of these complementary measures enables the interpretation of both socio-economic differentiation and socio-economic segregation across multiple spatial scales. Specific patterns observed at lower spatial scales are further illustrated using case studies from selected regions and municipalities.

The results indicate that while low income inequality at national, regional, and municipal levels may coincide with relatively weak socio-economic differentiation, the sub-local scale reveals pronounced patterns of socio-economic segregation that remain hidden at more aggregated spatial levels. These findings show that the interpretation of socio-economic segregation strongly depends on the spatial scale of analysis and highlight the need for finer-scale research to provide a more realistic understanding of socio-economic segregation in Slovakia.

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A spatiotemporal analysis of changes in land surface temperature and land cover in the Prešov city using downscaling and machine learning algorithms

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Keywords: Urban heat island, land surface temperature, land cover, Google Earth Engine, machine learning algorithms, Landsat, Sentinel

The ongoing climate change and global warming, combined with intensive and often uncontrolled urbanization, are increasing the urban heat island (UHI) phenomenon, which causes significant temperature differences between cities and their surrounding, mainly rural, landscapes. The replacement of natural landscape elements with impermeable artificial surfaces changes the landscape's thermal and radiative properties, disrupting the energy balance of the area. While natural surfaces lower environmental temperatures by providing shade and through evapotranspiration, artificial surfaces, such as concrete areas or buildings with metal structures and roofs, accumulate solar radiation and subsequently radiate it back into the environment in the form of heat. A key parameter for monitoring these processes is land surface temperature (LST), which reflects the character and dynamics of different types of land cover at the local level. Studying these processes requires data at the highest spatial resolution possible, however freely available satellite thermal sensors do not provide such information. The goal was to create a freely available and customizable application on the Google Earth Engine cloud platform that combines thermal data from the Landsat-8 and Landsat-9 satellites with the spectral indices NDVI, NDBI, and NDWI derived from the Sentinel-2 satellite, and uses a multiple linear regression model to resample LST from its original 30-meter spatial resolution to 10-meter spatial resolution. The second part of the application provides semi-automatic supervised land cover classification using the Support Vector Machine (SVM) and Random Forest (RF) machine learning algorithms. The analysis was applied to the city of Prešov and its surrounding municipalities in 2017, 2019, and 2023 and was supplemented with in-situ surface temperature measurements on five types of natural and artificial surfaces. The regression model achieved a coefficient of determination of 0.92, with the downscaled LST showing a lower error relative to field measurements compared to the original 30-meter LST. The evaluation of land cover changes using the RF algorithm showed an overall accuracy of 93.2% in 2017, 89.6% in 2019, and 91.5% in 2023, outperforming the SVM model by 0.8% in 2017 and by 4.3% in 2023. A spatiotemporal comparison revealed that areas where natural landscape was replaced by artificial surfaces showed an increase in LST of up to more than 15 °C in some locations. The cooling effect, on the other hand, was observed in areas with natural, green vegetation or bodies of water. The results confirm the suitability of freely available satellite data and cloud-based processing for identifying hot spots prone to the UHI and provide a foundation for strategic land-use planning tools and adaptation measures to mitigate negative UHI effects in medium-sized cities.

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Neither north nor south: the global east and the uneven geographies of knowledge production in development studies

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Keywords: Global East, Development Studies, geographies of knowledge, epistemic justice

Development Studies is an interdisciplinary field concerned with processes of socio-economic change, inequality, development policy, aid, and institutional transformation, especially in countries and regions historically positioned as “developing” or marginal within the global economy. Although the field is explicitly concerned with global inequalities, its own knowledge production has long been structured by the binary of the Global North and the Global South. This distinction continues to shape research agendas and publication practices through which development knowledge is produced and validated.

This contribution argues that this binary leaves an important spatial and epistemic blind spot: the Global East. The term is used here as a heuristic category referring primarily to post-socialist and post-Soviet societies, especially in Central and Eastern Europe and the former Soviet space. The Global East occupies a liminal position between North and South. It is not usually treated as part of the postcolonial Global South, but it is also not fully included among the dominant Western centres of academic knowledge production.

This ambiguous position matters because the historical experience of the Global East remains weakly integrated into Development Studies. Post-socialist and post-communist societies offer distinctive knowledge about systemic transformation, institutional restructuring, externally driven reforms, uneven development, democratic backsliding, state capacity, social welfare, and shifting positions between aid recipient and donor. Their marginal position entails a loss of knowledge for a field concerned with global development.

Empirically, the contribution examines the representation of the Global East in selected leading Development Studies journals. It analyses the geographical affiliation of editorial board members as a proxy for knowledge validation and the geographical distribution of published authors as a proxy for knowledge creation. The findings indicate a persistent asymmetry. While the Global South has become increasingly visible in debates on geographical diversity and epistemic justice, the Global East remains significantly underrepresented both among editorial board members and published authors.

The paper situates these findings within the historical evolution of Development Studies as a field primarily oriented towards postcolonial societies and the problem of underdevelopment. Post-socialist and post-communist societies have often been studied through separate vocabularies of transition studies, Europeanisation, area studies or post-socialist studies rather than as part of Development Studies.

Temporal design of public transport smoothness

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Keywords: public transport, moving infrastructure, temporal design, rhythm, smoothness

Public transport is frequently conceptualised as public space, yet it is less commonly understood as public time. For both passengers and drivers, the smoothness of the journey is intertwined with specific chrononormative expectations of rhythmic repetition. This paper explores the temporal architecture of the journey. Drawing on twenty interviews with public transport drivers in Brno, Czech Republic, the study presents rhythm analyses of both 'normal' and 'abnormal' journeys. Attention is directed towards how the polyrhythmicity of a tram driver's operation is composed during routine service, and what rhythmic shifts occur during unforeseen disruptions (accidents, mechanical failures, etc.). The routine operation is rhythmised by a regular cycle: monitoring traffic, braking, approaching the platform cautiously, stopping at the designated mark, opening the doors, observing passengers boarding, checking the schedule, ensuring the door area is clear, closing the doors, inspecting the platform, announcing the departure and accelerating. In contrast, extraordinary situations disrupt this rhythmicity, challenge chrononormative expectations, and require entirely different sets of activities from the driver. Depending on the scenario, these include self-assessment of health, securing the vehicle, checking the well-being of other parties and passengers, identifying involved individuals, evaluating the situation, contacting dispatch, documenting the scene, and informing passengers. Such moments place extreme demands on the driver. Findings suggest that while drivers are well-trained for the chrononormative rhythmicity of the regular ride, they often lack experience with the rhythmicity of emergencies. Consequently, the paper highlights two distinct rhythmicities of tram drivers' labour: one associated with smoothness and the other with managing interruptions. The study emphasises that labour within the context of moving infrastructure is not merely about spatial design, but fundamentally about temporal design.

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Comparison of the extent of residential suburbanization in an international context: Czechia, Slovakia and Poland

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Keywords: suburbanization, migration, Czechia, Slovakia, Poland

Deconcentration processes in the settlement system, especially suburbanization, have been among the most frequently evaluated processes in Central European countries in recent decades. Most research studies focus on case studies of individual cities or metropolitan regions. Far less attention is paid to evaluating the position of suburbanization within other urbanization processes in the settlement system. This makes it difficult to compare the number and share of residents living in suburban settlements. As part of our previous research, we have several times defined so-called residential suburbanization zones, with the help of which we can distinguish between three types of settlements - core cities, which are source areas of suburban migration, suburbanized settlements in the hinterland of these cities, and other rural settlements. Such delimitations have particular practical meaning in the field of spatial planning or regional development and in Czechia they are used at the national and regional levels in various strategic documents.

The aim of the paper is to offer the latest results of the definition of suburban zones in Czechia and to present the possibilities of applying the methodology in Poland and Slovakia. Methodological differences are evaluated, which stem mainly from the different settlement structure, size of municipalities and the method of statistical evidence of migration. Subsequently, the paper is the first to compare the extent of residential suburbanization in these three countries on the basis of a uniformly developed methodology. This methodology is based on data for migration and completed housing construction for the period 2015–2024. The paper documents relatively different spatial patterns of residential suburbanization not only within the three countries, but also in sub-regions with a specific settlement structure.

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Investigating nationalist dynamics in the changing political environment after the 2016 military coup in Türkiye: analysis of the partnership between the Republican People's Party (Pro-Turkish) and the People's Democratic Party (Pro-Kurdish)

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Keywords: Political Geography, Opposition Alliances, Turkish–Kurdish Relations, Ethnic Conflict Transformation, Türkiye

Opposition alliances are commonly understood as pragmatic electoral strategies for challenging incumbent governments, particularly in authoritarian settings. Yet far less attention has been paid to whether they also reshape relations between historically divided ethnic communities. This study investigates the spatial dimensions of the informal cooperation between the Republican People's Party (CHP), the country's main secular opposition party drawing much of its electoral support from the Turkish majority, and the Peoples' Democratic Party (HDP), the principal pro-Kurdish political party, after 2016. Bringing together parties traditionally associated with different ethnic constituencies, this cooperation provides a unique opportunity to examine whether opposition alliances can reshape interethnic relations, nationalist narratives, and everyday forms of coexistence within the context of Türkiye's long-standing Turkish–Kurdish divide. While existing scholarship has predominantly interpreted the CHP–HDP alliance through the lens of competitive and electoral authoritarianism, this study explores its broader societal consequences across different political and geographical settings.

Guided by theories of institutional design, power-sharing, and relational conflict transformation, the study adopts a comparative mixed-methods research design across five cities — Van, Diyarbakır, Ankara, İzmir, and İstanbul — selected to represent distinct political geographies, ethnic compositions, and patterns of intergroup interaction within Türkiye. The analysis integrates semi-structured elite interviews, multi-site voter surveys, and political discourse analysis through a comparative mixed-methods framework combining thematic and statistical analyses to examine how local contexts shape the societal consequences of opposition cooperation.

Preliminary findings suggest that the societal effects of the CHP–HDP cooperation extend beyond electoral coordination by reshaping mutual perceptions between Turkish and Kurdish voters. Rather than producing uniform outcomes, these transformations appear to be conditioned by place, varying across different political and geographical contexts according to local political cultures, ethnic composition, and patterns of intergroup interaction. By conceptualising the alliance as a multilayered political process operating across institutional, political, and societal dimensions, the research contributes to debates on political geography, opposition politics, and ethnic conflict by demonstrating how spatial context shapes both the opportunities and the limits of interethnic political cooperation under competitive authoritarianism.

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Mapping "Funding Deserts" in the South Moravian Region: spatial analysis of funding disparities at the municipal level (2014–2020)

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*Keywords: funding deserts, municipal level, South Moravian Region, spatial clustering,
funding acquisition, regional disparities*

This study examines the phenomenon of "funding deserts," which are defined as specific municipalities that consistently exhibit low levels of public funding acquisition and utilization. The study focuses on the South Moravian Region, analyzing comprehensive funding data from the fully concluded 2014–2020 programming period. By shifting the analytical lens to the municipal level, this research reveals internal micro-regional asymmetries that are often masked by aggregated district-level data. Using spatial analysis and GIS mapping, we identify the exact geographical clusters of these underfunded municipalities.

The presentation will outline the spatial localization of these funding deserts and identify the primary structural barriers hindering successful funding acquisition. The findings will provide concrete evidence for future regional development policies aimed at preventing further spatial polarization.

Slovak industry in the context of economic trends and regulatory processes at the global, macro-regional, and national levels

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Keywords: Slovak industry, economic trends, regional disparities, branches of industry, industrial enterprises

Industry is a fundamental pillar of the economy, and its development is shaped by growing international instability, economic trends, and regulatory processes. At the global level, the main drivers include: (i) changing US trade and tariff policies, (ii) China's industrial and trade dominance, (iii) the energy crisis and the conflict involving Iran and the broader Middle East, (iv) the war in Ukraine, (v) the ongoing trend towards shorter and more resilient supply chains. At the European level, industrial development is influenced by the relatively limited effectiveness of EU industrial policy promoting: (vi) strategic resilience, (vii) digitalisation, automation, artificial intelligence, (viii) decarbonisation, (ix) continuing European deindustrialization, including German, e.g. Volkswagen (European Commission, 2024; OECD, 2026; Ruczaj, 2026). At the national level, Slovakia's industry is affected by: (x) fiscal consolidation measures aimed at restoring public finances, together with (x) an increasing tax burden on businesses.

As a result of adverse international developments and fiscal consolidation measures, the Slovak economy grew by only 0.8% in 2025 (MF SR, 2026, p. 5), recording its weakest performance in the past three years. Industry, (i) highly dependent on foreign markets and capital, remains one of the country's most export-oriented sectors, accounting for 98% of total exports; (ii) however, its performance has declined since 2019 and is now comparable to the 2012–2014 level; (iii) despite this trend, industry still generates almost one-quarter of Slovakia's gross value added (22.8% in 2025) and (iv) remains the largest employer, accounting for 24.6% of total employment, although industrial employment has continued to decline (Eurostat, 2026; ŠÚ SR, 2026).

The spatial and sectoral structure of Slovak industry is characterised by: (i) its high concentration in the western part of the country, where the Bratislava and Trnava Regions have consistently accounted for almost one-half of total industrial revenues, while approximately one-third of industrial employment is concentrated in the Bratislava and Trenčín Regions; (ii) the dominant position of the automotive industry, which generated 30.8% of total industrial revenues in 2025; (iii) the growing importance of the electrical engineering industry, alongside the significant contribution of the machinery, metal-processing, chemical, and food industries; and (iv) the contribution also presents the leading industrial enterprises in the branches of industry.

The research methodology is based on an analysis of the relevant scientific sources and selected macroeconomic and structural indicators obtained from Eurostat, the Statistical Office of the Slovak Republic, and corporate databases, including Finstat and Registeruz.

The ultimate aim of this paper is to provide a foundation for the preparation of a university-level textbook on the industry of Slovakia.

References:

- EUROPEAN COMMISSION 2024: The EU Competitiveness Compass. <https://shorturl.at/jxL94>.
EUROSTAT 2026: Businesses in the manufacturing sector. <https://shorturl.at/DXQEQ>.
MF SR 2026. Výročná správa o pokroku Slovenskej republiky 2026. <https://l1nq.com/7y8n67e>.
OECD 2026: Economic Surveys: Slovak Republic 2026. <https://shorturl.at/jCIL5>.
RUCZAJ, M: 2026. Ďalšia vojna na obzore. Európa ju prehráva na celej čiare. Postoj. <https://shorturl.at/xwYle>.
ŠÚ SR 2026: DATAcube. <https://shorturl.at/cmor9>.

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Revealing fine-scale socio-economic spatial patterns using local spatial autocorrelation: evidence from Slovakia

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Keywords: spatial autocorrelation, socio-economic stratification, fine-scale spatial analysis, basic settlement units, Slovakia

Socio-economic stratification is typically analysed within administrative units, although such territorial frameworks may conceal substantial internal spatial heterogeneity. Availability of highly detailed census data enables the application of spatial statistical methods at much finer spatial scales, providing new opportunities for understanding the spatial organisation of socio-economic structures. The aim of this paper is to demonstrate the potential of local spatial autocorrelation methods for identifying hidden fine-scale spatial patterns of socio-economic stratification in Slovakia using occupational structure (ISCO-08) data from the population census in 2021. The analysis is conducted at two spatial levels, municipalities and basic settlement units, allowing a direct comparison of how spatial scale influences the identification and interpretation of socio-economic patterns. The methodological framework combines Global Moran's I to assess the overall degree of spatial autocorrelation with Anselin Local Moran's I (LISA) and Getis-Ord G_i^* statistics to identify local clusters, spatial outliers, and statistically significant hot and cold spots of socio-economic categories. The comparison of both spatial levels demonstrates that analyses based solely on municipalities may overlook considerable intra-municipal heterogeneity. Although the general spatial organisation of socio-economic stratification remains similar at both spatial levels, the level of basic settlement units analysis reveals significant internal differences within municipalities that cannot be detected using municipal-level data alone. Local spatial autocorrelation highlights neighbourhood-level clusters and spatial outliers, demonstrating that socio-economic structures within settlements are often highly heterogeneous. These findings emphasise the importance of fine-scale spatial analysis and the added value of local spatial statistics for revealing hidden intra-municipal spatial patterns.

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The Africa that Africans want: perceptions of Agenda 2063 between Pan-African aspirations and local development realities

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Keywords: Agenda 2063, African Union, regional integration, African voices, spatial inequalities

More than a decade after its adoption, Agenda 2063 remains the African Union's flagship framework for promoting sustainable development, regional and continental integration, and a shared Pan-African vision. Yet relatively little is known about how its ambitions are perceived by African stakeholders and how they resonate across different spatial scales.

This paper examines perceptions of the first decade of Agenda 2063 implementation through original mixed-methods research combining in-depth interviews with African and European experts, capturing perspectives from multiple African regions, focus groups with young African scholars (2025–2026), and Afrobarometer survey data. The paper asks how Agenda 2063 is perceived by experts and young African scholars, and to what extent its Pan-African vision is reflected in local development realities across African regions. The analysis explores how different actors assess the African Union's role in fostering regional and continental integration, addressing spatial inequalities, and translating Agenda 2063 into national and local development realities.

Drawing on a development-geographical perspective, the paper highlights the tensions between continental aspirations and local experiences while amplifying African voices in debates on Agenda 2063. It contributes to discussions on African agency, multi-scalar development, and regional integration, while encouraging European audiences to move beyond external representations of Africa towards a more balanced understanding of Africa-Europe partnerships grounded in African perspectives.

Geomorphological response to the catastrophic outburst of a Dune-Dammed Lake during the pleistocene–holocene transition

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Keywords: Sološnica Depression, Vienna Basin, dune-dammed lake, catastrophic outburst, Late Glacial

The Podmalokarpatská Depression is a half-graben-type depression located on the eastern margin of the Vienna Basin. It is bordered by the Little Carpathians to the east and by a system of elevations belonging to the Bor geomorphological unit, covered by aeolian sands, along its western margin (Fordinál et al., 2012). The depression is filled with of Quaternary sediments and is subdivided transversely into several sub-depressions. The most interesting of these is the Sološnica Depression, which became extensively waterlogged during the Holocene and, owing to its morphology under glacial climatic conditions, provided favourable conditions for the formation of a dune-dammed lake. In this paper, we present preliminary results of research on this unique limnic geosystem, focusing particularly on the circumstances of the lake's outburst, which appears to have been catastrophic. At first, we concentrated on confirming the existence of the lake through sedimentological investigations of material from the lake bed. The mapped deposits interpreted as lacustrine sediments displayed considerable variability, reflecting local depositional conditions. The material was subjected to palaeoecological analysis, which confirmed deposition in an aquatic environment. Although these sediments have not yet been directly dated, a previous study from the bed of the lake investigated a limnic deposit and dated it to the end of the Last Glacial period (Hájková et al., 2015). The existence of a lake has thus been confirmed, and the current phase of research focuses on identifying the mechanism responsible for its outburst. In the Rudava valley (the watercourse draining the depression), morphologically distinct landforms known as wagrams occur at a certain elevation above the present floodplain. Their dimensions and morphology are inconsistent with the current discharge of the river. Our research is testing the hypothesis that these forms developed during an extreme flood event associated with the sudden outburst of the lake. Preliminary sedimentological analyses have confirmed the distinctive character of the material deposited within these landforms, supporting the interpretation that they represent deposits of a catastrophic flood. OSL dating of these sediments indicates an Early Holocene age, which likely corresponds to the time of their deposition. One of the proposed explanations for the sudden lake drainage is the failure of the dam during a seismic event (Muccignato et al., 2024), which could also account for the formation of several associated features. However, given the inferred timing of the drainage, its connection with the major climatic changes that occurred at the onset of the Holocene appears more likely.

References:

- FORDINÁL, K., ed., et al. 2012: *Vysvetlivky ku geologickej mape Záhorskej nížiny 1:50000*. Bratislava: Štátny geologický ústav Dionýza Štúra, 232 s.
- HÁJKOVÁ, P., PETR, L., HORSÁK, M., ROHOVEC, J., HÁJEK, M. 2015: Interstadial inland dune slacks in south-west Slovakia: a multi-proxy vegetation and landscape reconstruction. *Quaternary International*. 357, pp. 314–328.
- MUCCIGNATO, E., MINÁR, J., PROCHÁZKA, J., HAJDÚCHOVÁ, V., BENOVÁ, A., LENART, J., PÁNEK, T. 2024: Lateral spreading in Záhorie dunes: earthquake-induced paleolandslides? In: Zborník Študentskej vedeckej konferencie Prírodovedeckej fakulty UK v Bratislave. Bratislava: Prírodovedecká fakulta UK v Bratislave, pp. 909–914.

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From data to map: the use of GIS in interpreting selected geographical methods in demogeography

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Keywords: Geographic Information Systems (GIS), cartographic methods, demogeography, statistical data, questionnaire survey

The paper focuses on the possibilities of using Geographic Information Systems (GIS) in the teaching of population geography, with an emphasis on linking statistical data and their spatial visualisation. The aim of the paper is to highlight the importance of working with real demographic data and transforming them into map form as an effective didactic tool in population geography. Through individual cartographic methods (the choropleth method, the diagram map method, the dot method, the flow map method, etc.), we demonstrate the interpretation of individual demographic processes into cartographic outputs.

The perceived educational benefit of the proposed activities was verified through a short anonymous questionnaire survey among students who had completed a learning activity focused on the processing and visualisation of demographic data in a GIS environment. The questionnaire survey was conducted during the Fundamentals of GIS course among 28 students enrolled in the Bachelor's degree programme in Geography Teaching in combination with another subject. The questionnaire focused on perceived visual clarity, students' active engagement, and the contribution of GIS to understanding the spatial relationships of demographic processes. The results indicate a positive evaluation of the use of GIS by the students, particularly in terms of a better understanding of spatial relationships, facilitating the interpretation of demographic processes through the linking of statistical data with map-based representation, and identifying regional differences in demographic indicators that were not as apparent from the tabular data alone. The students also positively evaluated the visual clarity and comprehensibility of cartographic representation in the interpretation of demographic processes.

References:

- ABDURAKHMONOV, ABDURAHMANOV, I., MURODOVA, D., PARDABOYEV, A., MIRJALOLOV, N., DJURAYEV, A. 2020: Development of demographic mapping method based on GIS technologies. *InterCarto InterGIS*, 26(1), 319–328. DOI: <https://doi.org/10.35595/2414-9179-2020-1-26-319-328>.
- ALADAĞ, E. 2014: An Evaluation of Geographic Information Systems in Social Studies Lessons: Teachers' Views. *Educational Sciences: Theory & Practice*, 14(4), 1533–1539. DOI: <https://doi.org/10.12738/estp.2014.4.1804>.
- VOJTEKOVÁ, J., ŽONCOVÁ, M., TIRPÁKOVÁ, A., VOJTEK, M. 2022: Evaluation of Story Maps by Future Geography Teachers. *Journal of Geography in Higher Education*, 46(3), 360–382. DOI: <https://doi.org/10.1080/03098265.2021.1902958>.

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Viticulture in the Zielona Góra Region: a historical and statistical analysis and its implications for tourism development

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Keywords: enotourism, Zielona Góra, tourism potential, economic factors

This article presents an analysis of the development of viticulture in the Lubusz Region, with particular emphasis on Zielona Góra as a historical centre of grape cultivation. The study combines historical and statistical analysis based on available numerical data on wine production and tourist traffic. The analysis of tourist flows indicates growing interest in the region among visitors from, among others, Germany, the Czech Republic, and the United Kingdom. In the Zielona Góra region, as in Poland as a whole, no separate statistics are maintained for wine tourists. Nevertheless, accounts provided by visitors, including foreign tourists, suggest that a substantial proportion of arrivals to Polish wine regions are intentional and motivated by a desire to taste local wines and become acquainted with the regional wine tourism offer. In view of the region's evident viticultural potential, the author formulates the hypothesis that the local wine district has the potential to become one of Europe's most important centres of viticulture and wine tourism, potentially earning the designation of the "Polish Palatinate." The analysis shows that the contemporary revival of Zielona Góra's winemaking traditions results both from favourable natural conditions and from the post-war reconstruction of the sector after the devastation of the Second World War and subsequent demographic changes. The findings highlight that Zielona Góra possesses significant cultural, promotional, and economic potential, and that its future development may depend on the synergistic coexistence of tradition and the modern expectations of tourists.

Mixed participatory mapping approach in urban mobility research

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Keywords: urban mobility, participatory mapping, cycling, Olomouc, biosensors

Research on urban mobility requires active engagement with the public and a thorough understanding of everyday travel experiences. Combining multiple participatory methods can provide a more comprehensive perspective on mobility-related challenges and opportunities. This paper presents the methodology employed in a study examining how cyclists and scooter users perceive traffic conditions in the city of Olomouc, Czechia.

The research builds upon an earlier participatory mapping study focused on sustainable urban mobility (Ritterová & Pánek, 2026), in which respondents identified their most frequently used routes and mapped locations perceived as positive, negative, pleasant, or unpleasant. The resulting bivariate emotional map highlighted areas associated with positive, negative, and ambivalent experiences and subsequently informed the design of the field research route.

The current study employs wearable biosensors to measure skin conductance alongside eye-tracking glasses to capture participants' visual attention and real-time responses to the urban environment. The objective is to assess whether perceptions and emotions reported in previous participatory mapping exercises can be confirmed by physiological and behavioural data, including indicators of stress and recorded gaze patterns.

Both studies seek to identify spatial barriers that hinder the use of active and sustainable forms of micromobility, including bicycles, scooters, and their electric versions. More specifically, the research aims to detect recurring patterns in users' behaviour and perceptions. The expected outcome is the integration of skin conductance measurements, eye-tracking recordings, and GPS data to identify where and why particular emotional or behavioural responses occur along the route. These findings will be compared with the original emotional map, a pre-ride perception assessment, and a post-ride questionnaire focusing on safety and environmental characteristics of selected route segments.

The results are expected to provide evidence-based and spatially explicit insights that can support urban planning and transport policy aimed at improving conditions for micromobility users in Olomouc.

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Anthropogenic influence on the long-term morphological evolution of a tidal inlet in the Venice barrier island system (northern Adriatic Sea, Italy)

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Keywords: Tidal inlet, morphological evolution, human interventions, historical maps, Venice Lagoon

Human interventions have always had a significant impact on the morphological evolution of the Venice littoral area (northern Adriatic Sea, Italy) (Favero et al., 1988; D'Alpaos, 2010a; D'Alpaos, 2010b; Bondesan and Furlanetto, 2012), including several modifications to the tidal inlets. In particular, this study focuses on the long-term changes of the Lido inlet, which is one of the three openings that are currently present and provide a connection between the Venice Lagoon and the Adriatic Sea. The main aim of this work is to detect the impact of human activities on the evolution of the inlet. The modifications were identified by analysing historical maps dating back to the 14th century, as well as aerial photographs and satellite images, using a geographic information system (GIS) software. The results were interpreted in light of the anthropogenic processes that have affected the study area over the past centuries. Previous authors carried out investigations based on remote sensing and the analysis of historical maps to assess the evolution of this site. However, these studies generally focused on shorter time periods and aimed primarily to describe the digital transformation of the maps (e.g. Balletti, 2006). In some cases, significant changes caused by human interventions were explained without quantifying them through the overlay of georeferenced maps or images (e.g. D'Alpaos, 2010a). Unlike previous studies, this work uses the evolutionary maps created with GIS technology to demonstrate the direct cause-and-effect relationships between morphological changes and human-induced coastal processes and to quantify these modifications.

Important hydraulic works carried out since the 14th century have had a profound impact on the development of the inlet. These include the diversion of major river mouths from the lagoon to the sea to reduce the risk of the lagoon becoming marshland and to keep the inlets active, the construction of coastal defences to protect the coast from sea storms and high tides, to favour local sedimentation processes and to deflect marine currents, the dredging of tidal channels and the excavation of new canals. However, the most significant transformations observed since the end of the nineteenth century are mainly due to the construction of two jetties at the inlet at the end of the 1800s and, more recently, to the building of the MoSE (Modulo Sperimentale Elettromeccanico) defence structures to protect Venice from flooding, which have also altered sediment supply and transport pathways.

References:

- BALLETTI, C. 2006. Digital elaborations for cartographic reconstruction: The territorial transformations of Venice harbours in historical maps. *e-Perimetron*, 1(4), 274-286.
- BONDESAN, A., FURLANETTO, P. 2012. Artificial fluvial diversions in the mainland of the Lagoon of Venice during the 16th and 17th centuries inferred by historical cartography analysis. *Géomorphologie: Relief, Processus, Environnement*, 18(2), 175-200.
- D'ALPAOS, L., 2010a. *L'evoluzione morfologica della Laguna di Venezia attraverso la lettura di alcune mappe storiche e delle sue carte idrografiche*. Comune di Venezia, Europrint.
- D'ALPAOS, L., 2010b. Fatti e misfatti di idraulica lagunare. La Laguna di Venezia dalla diversione dei fiumi alle nuove opere alle bocche di porto. Istituto Veneto di Scienze, Lettere ed Arti, *Memorie*, 44.
- FAVERO, V., PAROLINI, R., SCATTOLIN, M. (eds). 1988. *Morfologia storica della laguna di Venezia*. Arsenale Editrice, Venezia.

Exploring primary school pupils' sense of place

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Keywords: sense of place, regional identity, geography education, environmental education, place-based education

Sense of place is widely recognised as a key concept in geography and environmental education because it shapes how people experience, interpret, and care for the places they inhabit. Although research on sense of place has expanded considerably in recent years, relatively little is known about how primary school children themselves construct relationships with place, what shapes these relationships, and how they perceive the influence of these relationships on their everyday lives. This poster synthesises findings from an ongoing programme of empirical research aimed at developing an empirically grounded framework for understanding children's sense of place in primary education.

Drawing on three complementary mixed-method studies conducted among two cohorts of fifth-grade pupils in Czechia (N = 257 and N = 339), the poster integrates evidence on children's meaningful places, the factors shaping their relationships with place, and the perceived role of these relationships in children's everyday lives. The first study (N = 257) examined children's favourite places, regional identity, and their relationship with nature. The findings show that meaningful places are primarily rooted in everyday landscapes—particularly natural environments, home, and cultural heritage. They further demonstrate that stronger regional identity is associated with greater knowledge of local places and a stronger connection with nature. Building on these findings, the second and third studies (N = 339) explored how children explain the development of their relationships with place and how they perceive the influence of these relationships on their everyday lives. Inductive thematic analysis identified five interconnected domains shaping children's sense of place: home and family, social relationships, environmental experiences, psychological processes, and functional characteristics of place. A subsequent analysis resulted in a developmental model comprising four interconnected pathways through which children perceive the influence of sense of place: emotional-regulative, moral-normative, behavioural-agency, and identity-formative.

Taken together, the findings suggest that children's sense of place can be understood as a dynamic developmental process in which meaningful places, everyday experiences, social relationships, and environmental encounters interact to shape children's identities, values, and actions. Rather than conceptualising sense of place solely as an emotional attachment, the proposed framework highlights its cognitive, socio-emotional, and behavioural dimensions while demonstrating how these emerge through children's lived experiences. By synthesising evidence across complementary empirical studies, this research presents an empirically grounded framework that contributes to the conceptualisation of children's sense of place while providing a foundation for future research and practical guidance for place-based education and sustainability-oriented teaching in primary education.

The authors would like to thank the teachers and students of the schools where the research was conducted. This work was supported by the Student Grant Competition of the Technical University of Liberec: SGS-2025-4531 Geographic Fieldwork Education in Schools in the Liberec Region.

From contexts to trajectories: development paths of Slovak regions since 2004

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Keywords: regional disparities, convergence, development trajectories, districts of Slovakia

The contribution focuses on the development of regional inequalities in Slovakia. Previous research has indicated that since 2016 a possible shift has begun to emerge from increasing regional inequalities towards their decline. The main question is therefore not only whether Slovak regions are converging, but also what type of convergence this development represents. We work with the economic aggregate of districts, derived from employment and average wages, and analyse its size, population and territorial dimensions. The aim is to identify the districts that create regional inequalities and the districts that absorb them. The results indicate that the decline in inequalities cannot be interpreted as a simple catching-up process of lagging regions. Rather, it is a combination of several development trajectories: the weakening of the extreme dominance of Bratislava, the strengthening of selected secondary centres and metropolitan hinterlands, the partial improvement of some weaker districts, and the persistence of stagnant peripheral clubs. This research may contribute to a better understanding of the development trajectories of Slovak regions and to a more targeted setting of regional policies.

3D river channels for future riparian biodiversity assessment

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Keywords: point cloud, river system, granulometry, bathymetry, digital twin

Riparian zones rank among the most biologically diverse and productive ecosystems on Earth, shaped by river flow-related physical processes such as erosion, sediment deposition, periodic flooding, and groundwater-surface water interactions. Feedback among flow, sediment dynamics, channel forms, and riparian vegetation underpins the function and spatiotemporal dynamics of the riparian ecosystem. The main aim is the seamless generation of 3D point clouds that encompass the biophysical characteristics of the riverine ecosystem, including species composition and properties, discharge, channel depth, and grain size. Challenges include mutual assessment, data combination, and process-oriented assessment based solely on traditional field methods. Three-dimensional stream morphology can be mapped at very high resolution (several cm), enabling inference of processes, detection of volumetric changes, channel bathymetry, flow velocity, or automatic grain-size calculation for gravel-bed or submerged channels. Here, we applied and compared methods for combining UAV-SfM point clouds (DJI Phantom and Mavic 3) with multispectral and RGB cameras, point clouds from a mobile laser scanner (FARO ORBIS), and traditional TLS measurements (Riegl VZ-1000) to generate a complex 3D virtual model of the channel. These datasets were co-registered and combined to extract physical factors and channel morphology, including flow parameters (velocity, depth), riparian vegetation, large woody debris detection, sediment distribution, tree detection, vegetation biomass estimation, morphological processes assessment, and uncertainty analyses.

This work was supported by the Slovak Research and Development Agency under Contract No. APVV-23-0265 and grant VEGA 2/0016/24.

SLAM LiDAR as a tool for identifying changes in vegetation structures of forest stands invaded by *Ailanthus altissima*

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Keywords: Lidar, invasive plant, vegetation structures, forest stands

Biological invasions represent a primary driver of changes in regional and global biodiversity, leading to ecosystem degradation and the potential extinction of native species. The rapid expansion of invaders across diverse landscapes makes it challenging to assess their spatial distribution and abundance in a cost-effective and timely manner at the required spatio-temporal scales. Effective management necessitates a comprehensive understanding of how these species alter ecosystem architecture and function. Tree-of-heaven (*Ailanthus altissima*) is recognized as one of the most aggressive and widespread invasive woody plants in Europe, classified as a species of Union concern due to its high competitive ability. Fully developed stands of *A. altissima* drastically alter forest structure and reduce canopy diversity through a combination of intense shading and the release of ailanthone, a potent allelopathic toxin that inhibits germination and growth of neighboring native vegetation.

Despite growing research, the precise effects of its widespread spread on the structural heterogeneity and seasonal dynamics of native forests remain poorly understood. This study utilizes Simultaneous Localization and Mapping (SLAM) LiDAR technology, which offers a powerful alternative to traditional forest inventory methods by enabling high-resolution 3D mapping in dense environments where GNSS signals are often degraded or unavailable. We analyzed two distinct stand types: a native stand characterized by *Cornus mas*, *Acer campestre*, *Fraxinus excelsior*, and *Carpinus betulus*, and a second stand heavily invaded by *A. altissima*. Data were collected across three subplots per type using a multi-temporal approach on March 27, May 21, August 28, September 10, and November 13, 2025, to capture structural changes across different phenological phases.

Preliminary results indicate that plots invaded by *A. altissima* exhibited significantly higher canopy cover and reduced vertical heterogeneity. This dominance led to a lower density of under-canopy vegetation, as the invasive canopy acts as a "shading machine," displacing native taxa and altering the light environment. Furthermore, the study explores how SLAM-derived metrics, such as Canopy Height Models (CHM) and vertical leaf distribution, can quantify the displacement of native species and the formation of homogenous monocenes, providing essential data for long-term ecological monitoring and targeted restoration efforts.

This research was supported by the grant agency VEGA, project 2/0107/25 Development and strengthening of long-term ecological research of selected types of ecosystems.

AI-Assisted geological prediction in the Central Saharan Atlas reliefs (Southwestern Algeria): A Geo-AI and Remote Sensing approach to weathered basalt detection and CAMP eastern boundary mapping within triassic diapir structures

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Keywords: Saharan Atlas, Algeria, diapirs, Triassic, CAMP, multispectral remote sensing, Geo-AI, Random Forest, ASTER L2, Sentinel-2, InSAR

The Ksour Mountains constitute the western branch of the Algerian Saharan Atlas and offer outcrops of a series of Triassic diapiric structures whose geological characterization remains incomplete. Previous work (Medah, 2010) established that some basaltic intrusions within these diapirs belong to the Central Atlantic Magmatic Province (CAMP). However, the Sfisifa and Djebel Souiga diapiric structures have not been studied, partly due to alteration of the basalts, which makes conventional petrological identification unreliable. The eastern boundary of the CAMP in this part of North Africa has thus remained unclear.

This study directly addresses this gap in knowledge. Rather than relying on fresh rock samples, we apply multispectral satellite imagery to characterize the geochemical signature of the altered basalts at the surface. ASTER L2 and Sentinel-2 data are processed using Google Earth Engine, and machine learning classifiers—Random Forest and Support Vector Machine—are trained on field-validated ground truth points in areas where basaltic affinity is already known. The trained models are then applied to unclassified diapiric formations to assess whether their spectral response is consistent with CAMP-type volcanism.

A second objective focuses on the current state of the diapirs themselves. Recent work by Nedjari et al. (2024) has highlighted evidence of active upwelling in at least one structure during the Quaternary. We use InSAR time series analysis (MintPy) to quantify surface deformation across the entire diapiric field and determine whether this activity is isolated or more widespread.

The results should help to define the eastern extent of the CAMP in the Saharan Atlas and provide the first satellite record of the deformation of these structures. Methodologically, the study illustrates how remote sensing and machine learning can be combined to solve mapping problems in arid terrain where field access is difficult and rock weathering limits traditional approaches.

The author gratefully acknowledges the University of Salamanca (Spain) and the University of Oran 2 Mohamed Ben Ahmed (Algeria) for their institutional and financial support of this research. Sincere thanks are extended to the thesis supervisors, Prof. Yolanda Sánchez Sánchez, Prof. Mercedes Suárez Barrios, and Prof. Ouali Mehadji Abdelkader, for their valuable guidance. The author also acknowledges the use of ASTER, Sentinel, datasets made freely available by NASA/USGS, ESA/Copernicus.

Geographical aspects of gender inequality: an intersectional analysis of topophilia and topophobia among female Muslim international students in Bratislava

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Keywords: Gender, topophilia, topophobia, Bratislava, female Muslim international students, post-socialist

The study focuses on how female Muslim international students (FMIS) in Bratislava experience urban public spaces, with an intersectional lens on gender, religion, migrant status, and racialized visibility, which are influenced by topophilia and topophobia. While gendered fear, Muslim women's visibility, and international student mobility have been explored separately in existing research, scholars have paid little attention to how these processes intersect within post-socialist (PS) Central European cities. The present study pertains to this gap by evaluating how emotional attachments to place and experiences of fear, belonging, and exclusion are generated through everyday encounters in urban environments.

A qualitative interpretivist approach will be employed in this work, comprising semi-structured interviews, participatory mental mapping, and field observations with the FMIS. Particular emphasis is given to how participants construct forms of risk cartography through which movement is assessed, negotiated, and adapted. The study is informed by feminist geography, emotional geography, and intersectionality.

The focus is on an understudied population within an understudied regional context. The study participants are theoretically in intersectional emotional geographies, empirically in studies on FMIS, and regionally in Central and Eastern European urban spaces. Additionally, the research will contribute to the debate on urban inequality, spatial justice, and inclusive city planning by focusing on a central European city that remains relatively underexplored in this field. The study's findings are expected to advance our understanding of FMIS experiences in Bratislava. While providing insights, it will also provide important perspectives for scholars working on gender, Muslim women, migration, inclusion, and exclusion.

Firstly, I would like to give a special thanks to my supervisor Mgr. Pavel Šuška, PhD, for his constant guidance, support, and time. He has served many roles as a mediator, editor, leader, and patient mentor. Secondly, I must also thank Prof. RNDr. Vladimír Ira, CSc, for his motivation, recommendations, and for lifting me up during my work.

Spatial differences in attitudes toward family values in Hungary

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Keywords: fertility, population geography, spatial differences, social attitudes

Population dynamics in Hungary show significant spatial differences, and within this context, fertility trends can vary by region and landscape due to the diversity of social and economic conditions and cultural traditions. People's ways of thinking, value systems, and lifestyles are all influenced by their spatial environment—the sociocultural context that surrounds them based on where they live or work—which is why spatial differences are also evident in attitudes.

The research* aimed to understand the spatial patterns of these attitudes by analyzing data from a large-scale questionnaire survey conducted in 2021 that covered 60,000 people. The specific objective of the research was to identify spatial correlations in attitudes toward having children and the importance of family. At the same time, the study also examines the regional distribution of religiosity, whose impact on the willingness to have children is supported by international empirical studies. The analysis covered two simpler dimensions of spatiality: urbanisation, measured by settlement size, and regionality, measured at the NUTS3, county level. The series of analyses attempts to uncover the geographical correlations of these attitudes by comparing them with variables characterising the socio-economic spatial structure, and also attempts to measure attitudes toward family and children, as well as interpretations of the family at the regional level, using a single composite indicator. While Hungary is characterised by strong regional differences across various dimensions of socioeconomic development despite its small size, the country is significantly more uniform in terms of attitudes toward family values, particularly with regard to differences by settlement type and, above all, by county, as revealed by the study. Only religiosity shows strong regional differentiation. At first glance, it is true that as one moves up the settlement hierarchy toward larger settlements (with increasing urbanization), society's focus on children and family decreases somewhat, and acceptance of a more dynamic, flexible understanding of the family increases. The acceptance of flexible family forms correlates more strongly with per capita economic development, but its negative correlation with family- and child-oriented attitudes is much weaker. There are counties (Vas County, Győr-Moson-Sopron) where relatively high family- and child-oriented attitudes are coupled with high levels of family and child orientation as well as relatively high levels of economic development. At the same time, looking back, the majority of people in Budapest said that if they could start their lives over, they would have more children.

Reference:

SALAMIN, G., BOCZ, J., UHLJÁR, P. 2023: *Területi különbségek a családi értékekkel kapcsolatos attitűdökben Magyarországon*. In: Pári, A. -Gyorgyovich, M. (eds.) *Család - Érték - Tér : Tanulmányok a családi értékekről*. Budapest, Magyarország: Kopp Mária Intézet a Népesedésért és a Családokért. pp. 237-265.

Multisensory landscape: is the landscape perception through various senses a function of age and changing civilizational conditions?

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Keywords: landscape, multisensory perception, direct comparison method, respondent, civilizational conditions

The evolution of the concept of landscape is a dynamic process. More and more research draws attention to the significant contribution of all the senses at human disposal to perception. Sight is still considered the most important perception tool, but other receptors (hearing, smell, touch, taste) for information emitted by the landscape are gaining increasing importance. The complementarity of stimuli received by individual senses is also important.

The purpose of this presentation is to determine the extent to which respondents' age and changing civilizational conditions influence multisensory perception and the level of acceptance of individual stimuli that may negatively impact landscape perception. The survey was conducted on a representative group of respondents in 2025. The direct comparison method based on Kendall coefficients was used.

The obtained results clearly confirm the awareness of different age groups regarding the multisensory nature of landscape, which is fundamental to its modelling. Additionally, such results can be the basis for decision-making in the process of planning and developing space. Location decisions for residential and recreational functions are particularly important here. The research results are of an applied nature and can be a valuable guide in landscape shaping processes in dynamically changing civilization conditions.

Sustainability of the transformation of old coal mine regions as a subject of competition between the main political forces in Czechia and Poland

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Keywords: transformation of coal-mine areas, Ostrava region, Upper Silesia

Areas of heavy industry disappearing after more than two centuries require sustainable transformation all over Europe. In Western Europe, this transformation is completed or has even already taken place. In Central Europe, it is currently in full swing. This paper focuses on its manifestations in the coal basins in Czechia and Poland. It describes the main features of this process and identifies the problems that both countries are facing. All relevant political parties in both countries are also concerned with it because of the profound societal consequences of this process. The approach to solving the problems of old industrial areas often becomes the subject of political competition. The paper describes the relationship of selected political parties in Czechia and Poland to the sustainable transformation of closing coal basins and compares their positions, especially in terms of how the proposed solutions are affected by the fact that a given political party is in government or in opposition and what expectations their voters have on this issue.

The comparison is provided on the election manifestos and statements of key representatives of political parties regarding the transformation of coal-mining regions - specifically Upper Silesia in Poland and the Ostrava region in Czechia. The fundamental difference identified between the two countries is in the perception of the problem: in Czechia exists a consensus across the political spectrum that this is primarily an economic question and nobody wishes to return to coal-based economy; conversely, in Poland, some segments of the political elite (predominantly national conservatives – today in opposition in Polish parliament) call for - if not a return to the past – but at least a slowdown in the transformation of coal regions in order to preserve them as a symbol of national independence and local identity of these areas, a stance with which a portion of the local population undoubtedly agrees.

Project REFRESH - Research Excellence For Region Sustainability and High-tech Industries.

Soil carbonate content at the Háj research site (Háj Valley, Slovak Karst) determined using Janko's calcimeter

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Keywords: soil carbonate content, Háj Valley, Slovak Karst, Janko's calcimeter

Carbonate dynamics in soils represent a key process influencing the development and morphology of karst landscapes. Although karst relief develops primarily on carbonate bedrock, the overlying soils often exhibit significant carbonate depletion due to intense leaching. This paper examines the spatial and vertical variability of carbonate content (CaCO_3 and MgCO_3) within the soil profile, which is controlled by primary geographical drivers such as topographical position, precipitation gradients, and vegetation cover. We present the initial results of a two-year monitoring program (2024–2026) conducted by the Institute of Geography (Pavol Jozef Šafárik University in Košice) at a representative karst research site in Háj (Slovak Karst). Soil samples were collected quarterly at three distinct depth intervals (surface, 20 cm, and 50 cm) and analyzed using Janko's calcimeter to assess vertical carbonate migration. The laboratory findings reveal remarkably low carbonate concentrations in the upper solum: ranging from 0.33% to 4.38% at the surface, 0.93% to 2.71% at 20 cm, and 0.95% to 2.95% at 50 cm. Given that typical carbonate soils exceed 60% carbonate content, these baseline data confirm intensive vertical leaching and descending migration of dissolved calcium bicarbonate within the local profile. To contextualize these spatial dynamics, these results are integrated with parallel micro-climatic measurements of evaporation, soil water content, soil temperature and conductivity. Future research will focus on spatial correlation with soil pH, chemical denudation using limestone tablets and digital elevation models to map the toposequence control on karst soil evolution.

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Metropolitan governance without metropolitan government: EU cohesion policy and the urban dimension in Budapest, Prague and Warsaw

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Keywords: metropolitan governance, Integrated Territorial Investment (ITI), EU Cohesion Policy, functional urban areas, EU funds

This paper examines how EU Cohesion Policy engages with capital cities and their metropolitan areas in three Central and Eastern European countries: Budapest (Hungary), Warsaw (Poland), and Prague (the Czech Republic). It analyses how national governance choices, political conditions, and formal CP instruments have shaped the capacity of these cities and metropolitan areas to act as strategic agents in EU-funded urban development across the 2014–2020 and 2021–2027 programming periods.

All three metropolitan areas share a fundamental structural condition: intense suburbanisation pressure without formal metropolitan government. None of the three countries has established a statutory metropolitan authority with legally defined competences, so metropolitan governance depends on voluntary inter-municipal cooperation. The central question is how EU Cohesion Policy instruments have shaped metropolitan governance institutions in this vacuum.

The paper's main analytical contribution is a comparative account of the ITI (Integrated Territorial Investment) instrument as the primary mechanism for formalising metropolitan cooperation where formal metropolitan government is absent. The paper traces two critical historical moments: the introduction of ITI for 2014–2020; and the 2021–2027 revision, when the SUD earmark was raised to 8% of ERDF but ITI's weakness as a soft, programme-based instrument without binding powers in spatial planning, transport, or fiscal governance remained unresolved. The three cases span the full range of national responses. Poland made ITI mandatory for voivodeship capitals in 2013, with Warsaw evolving toward an association-based metropolitan model covering 79 local government units, though CP remains a soft substitute for metropolitan reform rather than its resolution. Prague adopted ITI across both periods but governing cooperation across two separate NUTS 2 regions with different cohesion categories has limited its metropolitan reach. Hungary did not adopt ITI at all, and the 2021 administrative separation of Budapest from its functional hinterland has structurally prevented any FUA-level coordination.

This analysis is set within a broader examination of how national institutional frameworks condition metropolitan CP agency. All three national governments function as gatekeepers with sharply different intensities. Warsaw maintained CP absorption despite sustained political friction; Prague experienced milder tensions cushioned by its regional institutional architecture; Budapest faced a near-complete freeze of EU CP implementation from 2019, compounded by systematic reductions in local financial autonomy. A further structural constraint affects all three: capital city regions classified as more developed attract lower co-financing rates, creating financial disincentives for CP engagement precisely where metropolitan investment needs are greatest and generating intra-metropolitan equity problems as coordination costs fall on ITI holders while financial benefits flow disproportionately to transition-region suburban municipalities.

The paper concludes with lessons for post-2027 CP: mandatory FUA-level coordination instruments, binding decentralisation requirements protecting metropolitan actors from national exclusion, and revision of co-financing parameters that currently work against metropolitan CP engagement in more developed regions.

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Public transport accessibility and rural left-behindness: case study from Krupina district (Slovakia)

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Keywords: public transport accessibility, rural left-behindness, economic efficiency versus spatial equity, Krupina district

At the end of 2025, (only) passenger rail transport on the Zvolen-Šahy line in central Slovakia has been closed. In the official statement of the decision-makers (Železničná spoločnosť Slovensko as a national carrier for passenger rail transport in Slovakia, and Ministry of transport and construction of the Slovak republic) has been declared the main reason of such radical change: the economic inefficiency of its operation which has been caused by low passenger demand. The line passes through the territory of the predominantly rural Krupina district, which at the same time was included among the priority (new term for the least developed) districts of Slovakia and thus has the opportunity to draw financial support with the aim of the reduction of spatial disparities and creation of more balanced spatial development. Problem of closure passenger rail transport, which is defined as a problem between state and regional self-government, has been negatively perceived by the representatives of all (36) local governments from the Krupina district. They officially criticized the top-down decision to close passenger rail transport, emphasizing that the decision will have an impact on further deepening of the district's left-behindness and the "public transport-related social exclusion" of local people.

The aim of the study to analyse the public transport accessibility between urban and rural areas in Krupina district (Slovakia) with the aim to identify relatively isolated rural municipalities which inhabitants are confronted with the insufficient public transport availability of their urban centres of economic activities, education and health possibilities. The conflict really exists between the economic efficiency and spatial equity of organization of public transport in predominantly rural Krupina district which can be characterized by the prevalence of the very small rural villages together with an extremely low level of density of population. Rural public transport (service of the general interest) on such territories is generally unprofitable, and therefore the question of its economic supporting as a partial way from left-behindness of places and people is still open.

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Spatial patterns of energy poverty in Hungarian urban areas

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Keywords: energy poverty, segregation, energy certification, spatial distribution

The housing stock in Hungary is highly diverse, reflecting the architectural, social, and economic transformations of the past centuries. Within a single settlement, residential buildings range from traditional rural houses and prefabricated apartment blocks to bourgeois residences and modern detached houses. The quality and comfort of the Hungarian housing stock have improved considerably over the past decades. However, many households continue to experience energy poverty. The use of biomass for residential heating is still widespread among Hungarian households, and according to the national housing reports, more than 80% of residential buildings fail to meet current technical and energy efficiency standards. Reducing the energy demand of buildings has therefore become a key challenge, as households—particularly those belonging to the lower and middle classes—remain highly vulnerable to rising energy prices. Improving the energy efficiency of residential buildings is essential for reducing energy consumption while maintaining an adequate standard of living. The aim of my PhD research is to map the energy efficiency characteristics of selected study areas, representing different urban morphological zones in major regional cities. The study addresses two main research questions. First, it examines whether the Energy Performance Certificate (EPC) system, introduced in Hungary in 2008, can serve as a reliable source for analyzing micro-scale housing market dynamics and residential segregation. Second, it investigates the spatial patterns of EPC ratings within selected study areas of Szeged and Pécs, two major regional centers in Hungary.

It focuses on whether EPC ratings exhibit spatial clustering or spatial concentration. The study also explores the relationship between traditional urban morphological–functional zones and the variation in the energy performance of residential buildings.

The empirical analysis investigates the spatial distribution of Energy Performance Certificates across selected neighborhoods of Szeged and examines the relationship between the prevalence of air-conditioning systems and the occupational structure of the resident population. For this purpose, a database containing more than 40,000 Energy Performance Certificates between 2012 and 2024, and it was collected through automated script-based data collection. The resulting dataset was geocoded, visualized, and integrated with data from the 2022 Hungarian Population Census.

The results demonstrate that neighborhoods with different urban morphological characteristics display distinct energy performance profiles, with suburban residential areas exhibiting the greatest internal diversity. K-means cluster analysis was performed using residents' occupational structure (based on the International Standard Classification of Occupations – ISCO) together with the valid EPC ratings of residential buildings. The resulting spatial clusters provide insights into broader housing market dynamics and socio-spatial processes shaping the city.

Long-term suburbanization around large Polish cities

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Keywords: suburbanization, urban sprawl, morphological changes, Poland

This presentation examines long-term suburbanization processes around the largest Polish cities, focusing on their morphological development prior to the contemporary post-1989 suburbanization wave. The study investigates how suburban zones evolved under changing socio-economic and institutional conditions between the nineteenth century and the late socialist period, highlighting the historical depth of processes often considered recent.

The analysis covers eight major Polish urban agglomerations and is based on a combination of historical cartographic materials, archival descriptions, and contemporary spatial databases (BDOT10k). The methodological framework integrates multi-scalar spatial analysis, including macroscale identification of spatial development dynamics, mesoscale quantification of transformation intensity, and microscale interpretation of morphological change. Analytical procedures include hotspot analysis, interpolation methods (IDW), and Conzenian urban morphology approaches, enabling both quantitative and qualitative assessment of suburban change over time.

The temporal framework distinguishes five key periods (1800–1841, 1842–1880, 1880–1918, 1918–1945, and 1945–1989), capturing major stages of urban-industrial development, interwar restructuring, and socialist-era spatial transformation. The results demonstrate that suburbanization processes were already present well before the contemporary wave of urban expansion, although their intensity, spatial reach, and structural expression varied significantly across time and socio-economic contexts.

Four dominant morphological models of suburban development are identified: leap-frog development, multiple nuclei structures, concentric expansion, and ribbon development. These patterns reflect differing logics of urban growth, from discontinuous settlement diffusion to corridor-based linear expansion along transport infrastructure.

The findings confirm that suburban zones around large Polish cities underwent substantial and heterogeneous morphological transformation long before 1989. This challenges simplified narratives that associate suburbanization exclusively with post-socialist transition and demonstrates the importance of long-term historical processes in shaping contemporary metropolitan structures. The study contributes to research on historical suburbanization by providing a comparative, multi-scalar framework for analysing the evolution of urban fringe landscapes in Central and Eastern Europe.

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Absolute and relative hierarchies of cities in the Visegrad Countries

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Keywords: urban hierarchy, polycentricity, monocentricity, hinterland areas, V4 countries, FUAs

This study examines urban hierarchies and the degree of polycentricity in the Visegrad Four (V4) countries (Poland, Czechia, Slovakia, and Hungary) by comparing the relative positions and functional roles of their cities at both national and supranational scales. The main objective is to identify whether these urban systems are predominantly monocentric or polycentric and to assess how country size influences observed spatial patterns.

The analysis is based on 81 Functional Urban Areas (FUAs) with more than 100,000 inhabitants, using a set of eight indicators reflecting demographic, economic, and functional dimensions, including population size, GDP, labour force, higher education, and transport accessibility. These indicators were standardised and aggregated using the Perkal method to construct a synthetic urban hierarchy index. Additionally, weighted travel-time accessibility was applied to delineate zones of influence of major urban centres.

The results confirm that all V4 countries exhibit strongly monocentric urban systems dominated by their capital cities. Prague, Budapest, Bratislava, and especially Warsaw clearly outperform other cities in their respective national contexts. Although Poland displays a relatively more polycentric structure, this is primarily due to its larger territorial and demographic scale rather than a fundamentally different development model. Alongside Warsaw, several large Polish cities (e.g., Kraków, Katowice, Wrocław, Poznań, and the Tricity) form a secondary tier with significant functional capacity.

At the supranational level, three first-tier cities (Warsaw, Budapest, and Prague) emerge as dominant nodes, while second-tier cities include Bratislava and major Polish urban centres. The spatial organisation of the V4 region can be divided into several large zones of influence, each structured around these key cities. However, even within these zones, internal structures remain highly monocentric.

Overall, the study highlights the persistence of hierarchical and monocentric spatial patterns in Central Europe, despite ongoing processes of economic integration and regional development.

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Temporal variability of forest stand factors influencing bark beetle infestation in Veľká Fatra National Park, Slovakia

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Keywords: forest stand characteristics, bark beetle, logistic regression, Veľká Fatra

Bark beetle (*Ips typographus*) infestations are determined by a complex interplay of environmental factors, among which forest stand characteristics play a crucial role. The importance and effects of these stand attributes, however, are not constant over time and may change during different stages of an outbreak.

In this study, six forest stand characteristics were selected as explanatory variables: mean stand age, maximum stand height, mean tree diameter, stand density, number of tree species in the stand, and the proportion of Norway spruce (*Picea abies*) in the stand. Their effects on the occurrence of infested forest and their temporal variability were inspected using logistic regression models in Veľká Fatra National Park, Slovakia, and its buffer zone. To capture changes throughout the outbreak, separate models were developed for each predictor and each year from 2017 to 2021. Annual response-variable rasters were derived from semi-automated classification of Sentinel-2 imagery.

The proportion of Norway spruce was the strongest predictor of infestation throughout the study period (AUC = 0.69 – 0.83). Together with the number of tree species, maximum stand height, and mean tree diameter, it exhibited a marked decline in both predictive performance and regression coefficients over time. In addition, the characteristics of newly infested stands gradually shifted from highly susceptible conditions towards stands with lower spruce dominance, greater tree-species diversity, and smaller tree dimensions. These results suggest that infestations were expanded from the most susceptible stands into a broader range of forest conditions as the outbreak progressed.

The observed patterns indicate that the selected study period covered the peak of the outbreak (in 2018) and then its gradual decline. The decreasing influence of stand characteristics, together with the expansion of infestation into less susceptible stand conditions, may reflect both high bark beetle population pressure and progressive depletion of the most suitable host resources.

Because the study area is large and topographically complex, encompassing multiple local outbreaks at different developmental stages, the detected trends predominantly reflect the dynamics of the most active outbreak located in the southwestern foothills of the mountain range.

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Participative mapping of cultural landscape values

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Keywords: *landscape values, participative mapping, web application, landscape vision, Central Bohemia*

The paper deals about participative approaches of the landscape heritage and landscape memory assessment. It presents an ongoing research and preliminary results. The main aims of the whole project are studying landscape memory and formulating landscape vision using participative approaches. Different methods of participation as well as data mining and interpretation were used and will be presented in the paper.

The model area is located in Central Bohemia, northern from Prague around the town Mnichovo Hradiště. Different driving forces formed the landscape: designed activities and forestry of the Wallenstein noble family, early modern industrial activities, military training area in the vicinity during the second half of the 20th century. Traces of several past activities are present and visible in the landscape, some of them well known, other hidden.

Different participative approaches were used to gain information from local people which traces of the history they identify in the landscape – local stakeholders were interviewed, web based application similar to maptionnaire was used. The web application was filled primarily by adult people. Physical participative workshop was organized for young peoples in collaboration with local schools, three school classes were engaged, ca 75 students in age 14-16.

The results show that the most known are aristocratic and religious monuments (e.g. castles, chateaus, churches, crosses). Especially for the associative landscape values that are closely related to local knowledge and practice is participation inevitable to gain information about these values. On the other hand, the values connected to historical economical activities such as former queries and ponds are underestimated and invisible for many locals.

Now, the story map is preparing to present the results of this first phase of the research, and it will be one of the tools for formulating the landscape vision in accordance with the European Landscape Convention. Different approaches how to work with data and explain them are testing.

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Queer temporalities and spatialities in the Czech context

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Keywords: queer geography, queer temporality, safe spaces, generational differences, Czech context

The paper examines the spatio-temporal behaviour of queer individuals in the Czech context. Drawing on perspectives from queer geography and queer theory, it aims to identify specific aspects of queer temporalities and spatialities through semi-structured interviews with two groups of communication partners. The first group consists of contemporary queer seniors and older adults who underwent socialization and the formation of their sexual and gender identities under the socialist regime or shortly after its collapse, while the second group comprises queer young adults who experienced these processes under entirely different social and cultural conditions. Comparing these two generations allows for an exploration of both continuities and transformations in queer experiences over time. The findings suggest that queer individuals often perceive only certain places, environments, and routes as safe spaces, although these perceptions have changed considerably in the Czech context, reflecting a gradual increase in social openness and acceptance. Furthermore, queer individuals exhibit distinctive understandings of time and key life milestones, which are often less straightforward and linear than those of the majority population. These differences are manifested in the timing and sequencing of significant life events, intimate relationships, and family lives.

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Identifying problem areas in agricultural fields using remote sensing

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Keywords: precision agriculture, remote sensing, NDVI, yield variability

Precision agriculture is a modern management strategy that uses advanced technologies to collect and analyze data from various sources in order to optimize crop production and take into account spatial variability within individual fields. The main objective of this work was to identify low-production areas on a selected agricultural area near the village of Jasová and subsequently analyze their relationship to vegetation indices such as NDVI (Normalized Difference Vegetation Index), MCARI (Modified Chlorophyll Absorption in Reflectance Index), NDMI (Normalized Difference Moisture Index).

The analysis was based on harvester yield data, satellite and drone imagery. Harvester data which had to go through a filtering process (removal of GNSS (Global Navigation Satellite System) errors, elimination of erroneous data from harvest sensors, and elimination of overlaps of cutting paths), thus increasing their accuracy for further processing. Sentinel-2 satellite imagery and detailed drone imagery (DJI Matrice 350 RTK) equipped with a multispectral camera (MicaSense RedEdge – M) were used.

The analysis confirmed that the common agricultural practice, which uses the average yield value for the entire field, is insufficient because it ignores the existing variability and leads to the loss of information about problem locations.

The results of the analysis identified 6 specific low-production areas and one high-production area. The most significant relationship was demonstrated between crop yields and the NDVI index (Sentinel-2) from 25.6.2025, where the coefficient of determination reached a value of 0.814. After optimization using the interquartile range (IQR), this relationship increased to a value of 0.9, which demonstrates the high ability of remote sensing methods to predict yield variability almost a month before harvest.

Another limiting factor was the lack of moisture (NDMI index), which was conditioned by the microrelief of the territory. Areas located on gentle slopes showed earlier maturation and stress from water shortage compared to the high-production area in the accumulated part of the field. These findings highlight the potential of integrating GIS solutions and multispectral imaging as key tools for effective identification of problem zones and decision support in modern agriculture.

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Pre-primary education in Slovakia from the perspective of local governments: implementation, challenges, and inequalities

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Keywords: pre-primary education, kindergarten, municipalities, local governance, educational inequality, Slovakia

Pre-primary education is widely recognised as a key instrument for promoting equal educational opportunities and reducing social inequalities. However, the successful implementation of policies aimed at expanding access to early childhood education depends not only on national legislation but also on the capacities, resources, and decision-making of local governments. In Slovakia, municipalities play a central role as founders and administrators of public kindergartens, making them key actors in translating national education policy into local practice.

This paper examines the implementation of compulsory pre-primary education in Slovakia from the perspective of local governments. It aims to analyse how municipal representatives perceive the implementation of this policy, identify the main barriers they encounter, and explore how these challenges differ according to the demographic and institutional characteristics of municipalities. Particular attention is paid to the relationship between local governance, territorial disparities, and inequalities in access to pre-primary education.

The analysis is based on a nationwide questionnaire survey conducted among 537 representatives of Slovak municipalities. The study combines quantitative statistical analyses with qualitative analysis of open-ended responses, enabling the identification of both the frequency of reported challenges and the broader context in which they arise. The analytical framework draws on perspectives from policy implementation and local governance, emphasising the role of municipalities as active actors rather than merely administrative executors of education policy.

The findings reveal substantial differences in the implementation of compulsory pre-primary education across municipality types. Smaller municipalities more frequently report insufficient financial resources, limited institutional capacities, and difficulties in maintaining sustainable provision of kindergarten services. In contrast, larger municipalities and cities are more likely to identify socio-cultural barriers affecting children's participation, including limited parental engagement, irregular attendance, and challenges associated with socially disadvantaged communities. Capacity constraints and shortages of qualified teaching staff represent additional challenges, although their importance varies across local contexts. The paper highlights that the implementation of pre-primary education policy is strongly shaped by local conditions and governance capacities. It contributes to the ongoing discussion on the role of municipalities in education policy implementation and provides new empirical evidence on the territorial and institutional factors influencing equitable access to pre-primary education in Slovakia.

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When distance decays differently: weekly variation in population mobility in Slovakia

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Keywords: distance decay, population mobility, mobile phone data, weekly mobility patterns, Slovakia

Although distance remains one of the fundamental determinants of spatial interaction, its influence is not constant but reflects the temporal organisation of everyday mobility. Daily commuting, education, shopping and leisure activities generate distinct mobility patterns throughout the week, potentially modifying the spatial reach of settlements. Despite extensive research on distance decay, relatively little attention has been paid to its variability between individual days of the week.

This paper examines day-specific changes in the distance-decay radius of Slovak municipalities using anonymised mobile network data covering approximately 90% of the national population. For each municipality and each day of the week, we model the decline in interaction intensity with increasing distance and estimate municipality-specific distance-decay functions. The resulting parameters are used to compare temporal changes in the spatial reach of municipalities across the Slovak settlement system.

Preliminary results indicate that the weekly variability of distance decay is far from uniform. The largest cities exhibit the greatest day-to-day changes in their interaction radius, reflecting the influence of commuting and other recurrent mobility routines, whereas many smaller municipalities display relatively stable spatial interaction patterns throughout the week. The findings suggest that distance decay should be understood not only as a property of spatial interaction, but also as a temporally dynamic process shaped by the weekly rhythms of everyday life.

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The relationship between municipality size and selected population characteristics in Czechia (and Slovakia)

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Keywords: degree of urbanisation, rural-urban continuum, municipalities, population density, employment in agriculture, university educational attainment, ageing index, femininity index, gender parity index

The relationships between different measures of rurality or urbanity on one hand and different population characteristics on the other hand are generally perceived to be known. For example, the more urban a settlement is, the higher its population density. However, the detailed shapes of such relationships are not widely researched.

The classification of municipalities according to their degree of urbanisation into three categories (cities, towns and suburbs, and rural areas) or seven categories (cities, dense towns, semi-dense towns, suburban and peri-urban areas, villages, dispersed rural areas, and very dispersed rural or mostly uninhabited areas), which is used by Eurostat and derived from 1 km² population density grid, offers a number of advantages over classifications based solely on municipality population size, for example better comparability across countries and over time and much lower susceptibility to the modifiable areal unit problem. On the other hand, one of the disadvantages of the Eurostat classification is that the resulting categories of municipalities are often not comparable in terms of population totals and, consequently, in terms of the values of indicators describing population characteristics, as smaller categories are more likely to exhibit extreme values. Another disadvantage is that three or seven municipality categories cannot reveal as detailed shape of population characteristic variation across rural-urban continuum as a few dozen municipality population size bins (each representing approximately 250,000 inhabitants in this contribution).

The preliminary results show that the population characteristics, which tend to change monotonically (albeit not perfectly) with the changing municipality population size, include population density and university educational attainment (that increase with size) and the share of persons employed in agriculture, forestry and fishing in totally employed (that decreases with size). However, the shapes of relationships between most of the population characteristics and the municipality population size are usually more complex and they tend to evolve over time. For example, in Czechia during the last about 35 years the relationship between the femininity index (female-to-male ratio) and the municipality population size gradually evolved from positively monotonic into a slightly complex shape, and the relationship between the aging index and the municipality population size evolved from slightly complex into a more complex shape. Similarly, in 2021 in Czechia the shape of the relationship between gender parity index for gross enrolment ratio in university education (gross enrolment ratio for women divided by gross enrolment ratio for men) on one hand and the municipality population size on the other hand exhibits differences across age groups: It is essentially monotonically decreasing in the 20-54 age group, monotonically increasing in the 60+ age group, and remains relatively constant across all size bins in the 55-59 age group.

This contribution was financially supported through institutional funding for the long-term conceptual development of the research organisation for the period 2023–2027 and forms part of the internal research project (IRP) “Segmentation of Rural Areas in the Czech Republic for Smart and Precision Rural Development Policy”, conducted by the Institute of Agricultural Economics and Information.

Geoenvironmental suitability and engineering-constraints model for the Štiavnické vrchy protected landscape

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Keywords: GIS, geoenvironment, engineering model, Štiavnické vrchy, assessment

To support the development of tourism and engineering infrastructure within the Štiavnické vrchy Protected Landscape Area (Slovakia), a geoenvironmental suitability and engineering constraints model was developed based on a comprehensive geoinformation analysis of engineering parameters related to the meteorological, hydrological, geomorphological, hydrogeological, engineering-geological, geodynamic, and seismic conditions of the study area. The primary aim of this study is to identify areas with varying degrees of suitability for the construction of tourism infrastructure. Particular attention is given to unsuitable and hazardous zones, which must be excluded from development and equipped with modern engineering protection measures that are environmentally friendly and compatible with the ecologically sensitive character of the protected area. This study does not seek to promote large-scale development within the Štiavnické vrchy, as such activities would contravene Slovak environmental legislation. Instead, it aims to identify engineering constraints relevant to landscape planning and to determine suitable point and linear locations for tourism infrastructure with minimal impact on the sensitive landscape of the protected area. The results of the study may be useful for landscape planners, design engineers, ecologists, and engineering geologists, and are also of interest to local authorities.

Exploring the use of the open-source AvaFrame platform for avalanche simulation: case studies from Slovakia

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Keywords: avalanches, AvaFrame, spatial modelling, GIS, Western Tatras

Snow avalanche modelling has become an essential tool for assessing avalanche hazard, supporting spatial planning, and reconstructing past avalanche events in mountainous regions. While operational practices are well established and widely used, many of the available software solutions are proprietary and financially demanding. In this context, the open-source platform AvaFrame has emerged as a promising alternative, providing a transparent and reproducible framework for dynamic avalanche simulation. This contribution introduces AvaFrame and evaluates its applicability under the specific environmental and geomorphological conditions of Slovakia. The analysis is based on simulations of three real avalanche events from the Western Tatras (Jakubina, Madajov žľab, and Príslop), using the com1DFA module implemented via the AvaFrameConnector plugin in the QGIS environment. Simulated avalanche extents were compared with reference polygons provided by the Mountain Rescue Service of Slovakia, enabling a basic assessment of model performance. The results indicate that AvaFrame is capable of reproducing the spatial extent of avalanche paths with relatively good agreement, demonstrating its practical usability in local conditions. At the same time, the study highlights several key factors influencing the reliability of the outputs, particularly the calibration of model parameters and the quality and resolution of input geographic data, especially the digital terrain model. Inappropriate parameter settings or insufficient terrain representation may lead to overestimation or underestimation of avalanche runout distances, underlining the importance of expert-based model configuration. The open-source nature of AvaFrame offers substantial advantages, including reproducibility, flexibility, and accessibility, making it a valuable tool for both research and applied hazard assessment. However, its effective use requires a certain level of technical expertise and careful methodological approach, especially when applied outside the alpine regions for which many default model parameters were originally calibrated. The findings suggest that AvaFrame represents a suitable and promising tool for avalanche modelling in Slovakia, thereby contributing to the development of accessible and transparent approaches in avalanche risk management.

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Pathways to high performance in geography: perspectives of geography olympiad finalists and their teachers

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Keywords: gifted student, geography competition, domain-specific expertise, academic performance

High performance in geography is an important topic in geography education, as it shows how some students develop deeper understanding of geographical concepts, the ability to work with different types of geographical information, and the ability to solve complex geographical tasks. Nevertheless, in both national and international contexts, the factors contributing to this level of geographical knowledge and skills have not yet been sufficiently described. In this contribution, we understand the Geography Olympiad as a selective context in which students with high domain-specific performance can be identified. Success in the competition is not seen only as a result of knowledge of regional geography, but also as an indicator of the ability to use geographical concepts, work with visual materials, and solve tasks requiring higher-order cognitive operations.

The aim of the contribution is to describe how competition-successful students reflect on the emergence and development of their geographical knowledge, skills, and ways of geographical thinking. At the same time, we examine how these students describe the role of school, teachers, their own preparation, family, and extracurricular sources. A second perspective is provided by interviews with their geography teachers, which enable comparison of student and teacher interpretations of the development of domain-specific expertise and competition success. This is an exploratory qualitative study based on semi-structured interviews, with elements of a multiple-case study. The data consist of 16 interviews: 10 with students successful in the national or international round of the Geography Olympiad and 6 with their teachers. Respondents were selected purposively, with a focus on students who ranked among the top competitors and on schools from which successful competitors repeatedly emerge. The interview analysis is complemented by an analysis of the students' competition trajectories and teaching materials used in instruction. This approach enables triangulation of student and teacher statements with contextual information about school instruction and competition experience.

The preliminary results suggest that high domain-specific performance in geography cannot be explained by a single type of instruction or one supportive factor. The interviews do not indicate that a modern or inquiry-based approach to instruction is a necessary condition for competition success. On the contrary, several successful students described rather traditionally oriented school instruction. However, some specific elements of this instruction appear important, especially work with current world affairs, emphasis on understanding basic geographical principles, and, in some cases, more systematic work with regional geographical knowledge. Students also often interpreted success in the competition as the result of the ability to "logically" infer answers, rather than merely reproduce learned information. The role of the family does not yet appear in the interviews as a dominant systematic factor, although for individual students it may create a broader background of interest and motivation. The contribution opens the question of how students with high potential can be identified and supported in school geography. It shows that the Geography Olympiad can serve not only as a competitive environment, but also as a research context for studying the development of geographical thinking and domain-specific expertise.

How can participation lead to transformative change: The co-design of tactical urbanist greening actions

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Keywords: Nature-based solutions, transformative co-design, participatory urban planning, tactical urbanism, climate anxiety

In the 21st century, cities have emerged as the primary hotspots for climate change adaptation, where interventions aimed at transforming public attitudes and behaviours are becoming increasingly important alongside infrastructural developments. The successful implementation of such interventions is often associated with bottom-up initiatives, which have become a key component of cost-effective municipal governance relying on community resources and participation. Moreover, these initiatives often incorporate nature-based solutions (NbS) that reinterpret human-nature interactions and play a critical role in advancing urban climate resilience and achieving transformative change.

We conducted a systematic literature review focusing on nature-based solutions with the potential to facilitate transformative change, in which we collected and analysed 132 articles from Scopus and Web of Science. The review identified several important research gaps. First, most studies addressing the relationship between NbS and transformative change are theoretical in nature and lack empirical case studies or practical measurements. Second, the limited number of empirical studies are strongly concentrated geographically, with very few examples originating from post-socialist contexts. Furthermore, there is no consensus regarding the definition of transformative change: while conceptualizations proposed by Palomo et al. (2021) provide valuable foundations, many studies use the notion without clearly defining it. Consequently, transformative change may refer to a process, a state, an outcome, or a goal, while existing definitions often remain difficult to operationalize in empirical research or urban planning.

To address these gaps, we designed a pilot study in Szeged, Hungary, based on the literature evidence that the greatest potential for transformative change through NbS lies in co-production processes (Cousins 2024). During the pilot, we co-designed a tactical urban greening intervention called Parking Day Szeged with 83 local high school and university students. The participatory process employed a range of deliberative democratic methods, as well as thematic gamification methods such as the ecosystem service toolkit or community mapping exercises, while also containing field-based walking group interviews. To examine potential attitude changes of the students, we implemented a pre-post survey method measuring connectedness to nature, readiness to change, climate anxiety, and perceived barriers to action. Initial results indicate statistically significant shifts not only in participants' knowledge but also in their trust and behavioural intentions. Our findings highlight the importance of participatory greening initiatives in transforming the widespread climate anxiety experienced by young people into tangible environmental action and place-based transformations. Overall, the results demonstrate that transformative co-production processes centred on tactical urban greening can shift local youths' mindsets even within a post-socialist context.

References:

- COUSINS, J. J. 2024: Just nature-based solutions and the pursuit of climate resilient urban development. *Landscape and Urban Planning*, 247, 105054.
- PALOMO, I., LOCATELLI et al. 2021: Assessing nature-based solutions for transformative change. *One Earth*, 4(5), 730–741. DOI: <https://doi.org/10.1016/j.oneear.2021.04.013>.

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Multi-source, multi-resolution DEM analysis of catchment hypsometry and morphometric age estimates in the Malá Fatra Mountains: controls and limitations

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Keywords: Drainage basin, catchment hypsometry, DEM

Morphometric methods are essential tools for studying geomorphological landscape evolution with respect to both erosional processes and neotectonic activity. This study applies a DEM-based morphometric approach proposed by Demoulin (2011, 2012), developed to estimate the age of recent tectonic perturbations preserved in fluvially eroded landscapes. The method is based on hypsometric integrals derived from drainage basins and associated R and Sr morphometric indices. In the landscape adjusting to tectonic disturbance, the R index values correlate with catchment size, and this relationship, expressed through the slope of the R-Ln regression (i.e., Sr index), forms the basis for dating the signal propagating across the landscape. While this method works effectively over broad areas, encompassing catchments spanning several orders of magnitude, analysed using coarse-resolution DEMs, its effectiveness in small catchments (up to 50-100 km²) remains questionable. It also remains unknown how the results obtained are affected by different DEM resolutions and accuracies. We applied this method to a relatively small, uplifted massif in the Malá Fatra Mountains, where the limited extent of the region also constrains the size of the individual river basins studied. We focused on testing the consistency of the extracted indices across DEMs with different resolutions (generated via resampling) and data sources (DMR5.0, DMR3.5, SRTM1, SRTM3). The results indicate a high degree of variability among values derived from different DEMs, which is propagated into the R and Sr indices, thereby biasing the age estimates. Particular attention was then given to disentangling the influence of DEM resolution from the effects of terrain characteristics, including basin lithology and geometric properties, on hypsometric integrals and derived outputs. This advanced analysis was performed using Generalized Additive Models (GAM) to identify an optimal DEM resolution that minimizes resolution-induced effects on the extracted integral values. The study confirms the limited applicability of the method to small drainage basins. It demonstrates a strong influence of specific catchment properties on hypsometric indices, even if the effects of DEM resolution were successfully managed.

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Scaling climate diplomacy: Brazil's discursive construction of climate leadership across the UN, BRICS, and MERCOSUL

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Keywords: climate diplomacy, geopolitical identity, critical discourse analysis, Brazil, multilateral governance

Brazil has become an increasingly visible actor in global climate governance, particularly following the return of President Luiz Inácio Lula da Silva and the country's renewed emphasis on environmental diplomacy. While previous research has examined Brazil's climate policy, foreign policy, and environmental discourse, less attention has been devoted to how Brazil's climate narratives are adapted across different multilateral institutional settings.

This paper investigates how Brazil constructs and negotiates its geopolitical identity through presidential speeches delivered at the United Nations, BRICS, and MERCOSUL. These institutions represent distinct political and geographical scales of climate diplomacy, ranging from global governance to South–South cooperation and regional integration. Rather than assuming a coherent and stable foreign policy narrative, the study explores how institutional context and audience shape discursive strategies of climate leadership.

The analysis draws on Critical Discourse Analysis, combining the Discourse-Historical Approach with van Dijk's sociocognitive perspective. The research focuses on strategies of nomination, predication, and legitimation, together with metaphorical representations of climate change, environmental responsibility, sovereignty, and the Global South. The empirical material consists of presidential speeches delivered by Luiz Inácio Lula da Silva in multilateral forums since 2003.

By comparing discursive practices across different institutional arenas, the paper seeks to identify both recurring and context-specific patterns in Brazil's environmental diplomacy. It argues that climate diplomacy is not only expressed through policy commitments but is also performed through the strategic construction of geopolitical identities that respond to different institutional audiences and political objectives.

The research contributes to debates on the political geography of climate governance by linking critical discourse studies with questions of scale, identity construction, and the changing role of emerging powers in contemporary environmental diplomacy.

Hunting tourism in Slovakia as a significant form of tourism development

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Keywords: adventure tourism, hunting, Slovakia, tourism

Hunting tourism has become an increasingly important component of nature-oriented tourism, creating opportunities for rural development while contributing to the sustainable utilization of wildlife resources. This study investigates the current state of hunting tourism in Slovakia, with particular emphasis on its economic contribution and its relationship to sustainable resource management. The research evaluates selected statistical and economic indicators associated with hunting activities, including the number of hunters, hunting grounds, visitor attendance, and financial returns from commercial hunting services. A descriptive and comparative methodological approach was applied using official national statistics and sectoral data.

The analysis shows that hunting tourism provides an additional source of revenue for rural regions and supports the multifunctional use of forest and agricultural landscapes. During the 2022/2023 hunting season, 2,822 visitors participated in hunting activities within state-managed hunting grounds. In 2023, Slovakia recorded 68,446 registered hunters, of whom 2,863 were women, while 1,886 hunting grounds occupied a total area of 4,457,448 hectares. Income generated from fee-based hunting reached EUR 4.94 million, confirming the sector's growing economic importance. Although the COVID-19 pandemic temporarily reduced tourism demand, recent data indicate a gradual recovery and renewed growth.

The findings highlight the potential of hunting tourism to enhance regional competitiveness, diversify rural economies, and strengthen the economic value of ecosystem services. At the same time, its future development depends on responsible wildlife management, effective biodiversity conservation, and policy measures that reconcile economic interests with environmental sustainability. Despite the identified economic benefits, hunting tourism cannot be regarded as a standalone indicator of rural development based on tourism; rather, it should be considered one of its complementary components, whose significance lies in its synergy with other forms of rural tourism and regional development. The study provides additional evidence for incorporating hunting tourism into sustainable tourism planning and natural resource management strategies in Slovakia.

References:

- BUCKLEY, R. 2010: *Adventure Tourism Management*. Butterworth-Heinemann, 286 p.
- ČECH, V., VAŠKOVÁ, J. et al. 2025: *Dobrodružný cestovný ruch. Dobrodružné a extrémne športy a aktivita*. Vysokoškolská učebnica. 2. vyd., Prešov: Vydavateľstvo Prešovskej univerzity, 377 p.
- PETROMAN, I., PETROMAN, C., MARIN, D. 2015: Place of Hunting Tourism in the Structure of Modern Tourism Types. *Animal Science and Biotechnologies*, 48, 2, 199-202.
- PRENTOVIĆ, R., ŽIVKOVIĆ, B., CVIJANOVIĆ, D. 2016: Hunting tourism in the function of rural development of Homolje. *Economic of Agriculture*, 63(1), 71–87. DOI: <https://doi.org/10.5937/ekoPolj1601071P>

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Changes in the tourist and recreational use of the Vltava River and its impact on the long-term development of municipalities and the local landscape

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Keywords: tourism, recreation, Vltava River, landscape changes

The aim of the paper is to discuss the development of tourist, recreational and other leisure activities and the related transformations of villages and landscapes along the upper and middle course of the Vltava River in the last approximately 100 years. Tourist and recreational activities have long been an integral part of the overall development and demographic, economic, political and socio-geographical changes of the area around the Vltava River. The paper discusses and interprets their development based on the use of several methods. Changes in the management of marked tourist trails from the middle of the 20th century to these days are presented. The nodes of these hiking trails are defined and their detailed analysis and characteristics as important tourist attractions are carried out. On the basis of the coefficients of the area burdened with accommodation capacities and the coefficients of the recreational (Defert) function, localized map diagrams were created for municipalities on the entire territory of the banks of the Vltava River. In addition to the traditional data for collective accommodation facilities, including camping places (CZSO), data on the number of objects of individual recreation (second homes) were used. Selected recreational areas (e.g. at the Slapy water reservoir) were also subjected to a detailed field survey. Attention was also paid to the traditional phenomenon of canoeing and kayaking. It turned out that the common factors in the development of tourist and recreational activities were changes directly linked to the changes in the riverbed of the banks of the Vltava River. These were mainly caused by the construction of dams of the Vltava Cascade from the end of the 1920s to the 1990s. Significant demographic changes took place on the upper reaches of the Vltava, mainly associated with the displacement of the German population after the Second World War and with long-term processes of urbanization throughout the territory. After 1989, with profound political, socio-economic changes, some traditional types of tourism (organized, corporate, trade union) declined, commercialization and internationalization of activities, and an increase in the popularity of new ways of spending free time (e.g. yachting, private motor boats, cycling, skating at Lipno). However, traditional activities such as hiking (an increase in the length of marked routes), canoeing and kayaking, cottages, camping still persist, albeit in modified and more modern forms.

The paper is based on research carried out as part of the NAKI DH23P03OVV055 project "Vltava II – Transformations of the Historical Landscape, River as a Link and Barrier" (2023–2027) supported by the Ministry of Culture of the Czech Republic.

Where are the unheard voices hiding? The geography of electoral non-representation in Slovakia

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Keywords: electoral non-representation, IWA Index, invalid votes, wasted votes, abstention

Not every vote cast in an election is translated into political representation. Some ballots are invalid, some votes go to parties that fail to cross the electoral threshold, and many registered voters do not take part in elections at all. Although these phenomena are often studied separately, they all point to a similar problem: part of the electorate remains outside parliamentary representation. This paper examines the problem in Slovakia through the 2020 and 2023 parliamentary elections. Using municipal-level data, it applies the IWA Index, a synthetic indicator that combines invalid votes, wasted votes and abstention. The aim is to identify where electoral non-representation is concentrated, how its spatial pattern changed between the two elections, and which political, ethnic and socio-economic factors are associated with it. The findings indicate that electoral non-representation in Slovakia has a clear spatial structure. It is shaped by voter mobilisation, party-system fragmentation, electoral thresholds and regional inequalities. The paper pays particular attention to the difference between voters who participate but whose votes do not enter parliament, and citizens who remain outside the electoral process altogether. By focusing on voters who are absent, invalidated or left without parliamentary representation, the paper contributes to a more nuanced understanding of democratic representation. It shows that, even in a country with a single nationwide electoral district, representation has a distinct geographical pattern. The study therefore highlights how electoral rules, social inequalities and regional political contexts influence who is represented in contemporary Slovakia, and who is not.

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Selected political-geographical aspects of young people in Czechia

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Keywords: young people, political participation, elections, political geography, Czechia

Young people represent the future of every country and of human society in general. Therefore, their life prospects and level of political participation are frequently discussed among academic circles, political representatives, and among the general public as well. To what extent are they willing – and to what extent do they have the opportunity – to participate in decision-making that shapes the natural and political/social environment in which their generation will spend most of its life? This contribution focuses primarily on selected aspects of the participation and success of young people up to age 35 years in selected Czech municipal and parliamentary elections, as well as in certain other political activities. The presentation draws on some of the findings from the Atlas of Young People – Young Czechia (*“Atlas mladých lidí – Mladé Česko”*) and other publications produced as part of the project mentioned below and expand on them further.

The aim is to compare and identify a common geographical pattern in the distribution of young people aged 35 and under amongst candidates and elected representatives in the last three municipal elections. We should also compare the proportion of young people among candidates and elected MPs in the most recent parliamentary elections in Czechia, taking into account the differences between the main political parties; however, given the nature of the Czech electoral system, this comparison will be limited to the regional level.

Preliminary results have already revealed an exceptional concentration of political activity and electoral support among young people in the local elections in the Vysočina Region, which is also generally regarded by many researchers as the region with very high, possibly the highest level of social capital in Czechia, in contrast to north-western Bohemia, which exhibits largely opposite characteristics. However, the results should also be compared with the age structure of the population in the municipalities.

The research employs a quantitative approach using simple choropleth maps as well as local spatial autocorrelation (LISA) or bivariate spatial association analysis, such as Lee's L.

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Prediction of fluvial flood inundation using machine learning trained on hydraulically generated data

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Keywords: fluvial flooding, flood extent, water depth, machine learning, hydraulic modeling

Fluvial floods, caused by river overflow, are particularly complex due to the interactions between hydrological processes, river hydraulics, and topography. These processes are inherently nonlinear and spatially variable, making flood behavior difficult to predict, especially under changing climatic and land-use conditions. Consequently, accurate and timely prediction of flood inundation at high spatial resolution is essential for early warning systems, emergency response planning, and effective flood risk management. This study investigates the application of machine learning (ML) technique, specifically the eXtreme Gradient Boosting (XGBoost), for predicting fluvial flood extent and water depth along a 17.0 km reach of the Teplica River, which is located in western Slovakia. The ML models were trained on the hydraulic simulation outputs generated in MIKE+ for five flood scenarios (Q10, Q20, Q50, Q100, and Q1000). Seven predictors with 0.5 m resolution were created for the ML-based classification and regression: slope, stream power index (SPI), topographic wetness index (TWI), height above the nearest drainage (HAND), distance from river, surface roughness, and the normalized difference vegetation index (NDVI). Multicollinearity among predictors was tested using the Pearson correlation and Variance Inflation Factor (VIF) with thresholds for Pearson correlation ≤ 0.7 and VIF ≤ 5 . In contrast to conventional ML workflows based on pixel-wise or randomly selected training samples, this study introduces a novel training strategy that combines longitudinal river segmentation with balanced sampling within individual river segments, thereby preserving the hydrological continuity and spatial structure of the river network during model development. Furthermore, the influence of different river-segment-based training and testing partitions, particularly 22/3, 20/5, 18/7, 16/9, and 14/11, was examined. The model performance was evaluated using relevant quantitative metrics for classification and regression tasks. The findings indicate that the XGBoost algorithm provides computationally efficient predictions of both flood extent and water depth across the evaluated flood scenarios and segment configurations. The highest F1-score values were achieved for the Q10 flood scenario (between 0.87 and 0.92). The RMSE values ranged from 5 to 14 % and MAE values from 3 to 10%. The highest R2 value was achieved in case of Q100 flood scenario and 22/3 split (88%) while in case of Q1000 flood scenario (14/11 split), the R2 value was the lowest (79%). Based on the Bias metric, all the ML-predicted water depth values slightly underestimated the hydraulically derived water depths, with values ranging from 2 to 9%. The most important predictor was HAND with values ranging from 46.0 to 72.8% across the splits and flood scenarios. The second and the third most important predictors were distance from river and roughness with values from 15.1 to 20.2% and from 3.1 to 14.4%, respectively. Computational requirements remained low, with the longest training times reaching only 2.45 minutes for the classification models and 3.69 minutes for the regression models, highlighting the suitability of the proposed approach for rapid flood inundation assessment.

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GIS in the education of University Teachers in Natural Sciences: experiences from a project

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Keywords: GIS, education, university teachers, natural sciences, KEGA project

The present era is characterized by the continuous development of information technologies that affect virtually all areas of life. Geographic Information Systems (GIS) represent a typical example of such technologies. Due to their interdisciplinary nature, they influence a wide range of scientific disciplines and professional fields, while their development is driven by advances in multiple areas of research and practical applications. Consequently, the need for education and training in this field is becoming increasingly important. Geoinformation technologies have significantly accelerated and improved the organization of spatial data, as well as the possibilities for their analysis, interpretation, and further application. This paper focuses on GIS training provided for academic staff at two faculties of the Constantine the Philosopher University in Nitra and Matej Bel University in Banská Bystrica. The training courses are organized within the framework of the KEGA project and are delivered by members of the geography departments at both universities, specifically, the Department of Geography, Geoinformatics and Regional Development at the Faculty of Natural Sciences and Informatics, Constantine the Philosopher University in Nitra, and the Department of Geography and Geology at the Faculty of Natural Sciences, Matej Bel University in Banská Bystrica. The project runs from 2025 to 2027. The training was open to all academic staff from the natural sciences, except for departments where GIS is already included in the curriculum. A total of 18 academic staff members are participating in this kind of education. The training is divided into two parts. During the first part, participants learn the fundamentals of GIS and acquire practical skills in collecting spatial data in the field. The second part focuses on solving practical, discipline-specific tasks using GIS methods relevant to the participants' respective fields of expertise. The first phase of the training is implemented during the first and second year of the project, while the second phase takes place during the second and third year. Upon completion of the courses, a questionnaire survey will be conducted to evaluate participants' satisfaction with the training. The aim of this paper is to inform the geographical community about the ongoing KEGA educational project focused on GIS training for academic staff working in the field of natural sciences.

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Shifting geopolitical priorities and the transformation of Kosovo's development paradigm

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Keywords: Kosovo, geopolitical priorities, development paradigm, diaspora

For more than two decades, Kosovo has represented one of the most prominent examples of internationally supported post-conflict state-building. External assistance provided by the United States, the European Union and other bilateral donors has played a central role in institution-building, democratic reforms and socio-economic development. While international assistance continues, the geopolitical context surrounding Kosovo is undergoing a profound transformation.

This presentation examines how changing geopolitical priorities are reshaping Kosovo's development paradigm. Rather than signalling the end of external assistance, current developments reflect a broader shift in the international environment. The Russian invasion of Ukraine, increasing competition for political and financial resources, and evolving foreign policy priorities have reduced Kosovo's relative strategic importance for its traditional Western partners. At the same time, the EU remains Kosovo's principal development partner, although enlargement has become increasingly complex and politically contingent. The result is a more uncertain and less predictable framework for Kosovo's future development.

This changing geopolitical landscape raises a broader strategic question: where does Kosovo turn when its principal partners become less engaged? Unlike many developing countries, Kosovo has only limited opportunities to diversify its geopolitical partnerships. China does not recognise Kosovo's independence, Russia actively opposes its international recognition, and other emerging powers have shown little interest in assuming a significant developmental or political role. Consequently, Kosovo has increasingly begun to look inward, placing greater emphasis on domestic capacities, national development priorities and, above all, the potential of its diaspora.

The presentation focuses on this emerging shift towards diaspora engagement. Once perceived primarily as a source of remittances, the diaspora is now increasingly framed by policymakers as a strategic actor capable of supporting investment, innovation and long-term development. Nevertheless, field evidence suggests that important structural obstacles persist. Productive investments remain limited, institutional cooperation with diaspora communities is fragmented, and diaspora capital continues to concentrate predominantly in real estate and household consumption.

The presentation draws upon field research conducted in Kosovo in 2023 and 2024, including semi-structured interviews with representatives of government institutions, international development agencies, think tanks, civil society organisations and the media. The findings suggest that Kosovo is entering a new stage of post-conflict development in which the central challenge is no longer the availability of international assistance itself, but adaptation to a changing geopolitical environment. The presentation argues that the growing emphasis on domestic ownership and diaspora engagement reflects not only evolving national development priorities but also Kosovo's search for a sustainable development strategy in a geopolitical landscape where traditional Western support can no longer be taken for granted.

Teaching geography through virtual reality: teachers' perceptions of potential, barriers, and classroom integration

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Keywords: virtual reality, geography education, teachers' perspectives, systematic review, integration barriers

Virtual reality (VR) is increasingly discussed in geography education for its potential to support immersive, visual, and experiential learning. In a discipline where fieldwork, spatial thinking, and the visualisation of distant or complex environments are central, VR may offer new opportunities for teaching and learning. However, the successful integration of VR into geography classrooms depends not only on technological availability but also on teachers' perceptions of its pedagogical value and the barriers to its use. To address this, a systematic review has been conducted.

Following PRISMA guidelines, searches were conducted in Web of Science, Scopus, and ERIC. The initial search identified 385 records, from which 17 empirical studies were included in the final synthesis after screening, eligibility assessment, and citation tracking. The analysis focused on two dimensions: teachers' perceptions of VR's pedagogical potential and their perceived barriers to classroom implementation.

The findings show that teachers generally view VR as a promising pedagogical tool for increasing students' motivation and engagement, supporting spatial thinking, and strengthening conceptual understanding of geographical phenomena. They particularly value VR's capacity to make distant, abstract, or three-dimensional environments more accessible and experientially meaningful. At the same time, teachers identify persistent resource-related and human-related barriers. These include limited access to hardware, high costs, insufficient infrastructure, connectivity problems, lack of suitable educational content, time pressures, classroom management challenges, and limited technical and pedagogical confidence. Across the reviewed studies, these barriers appear interconnected rather than isolated.

The review highlights a clear tension between VR's educational promise and the practical realities of implementing VR in geography classrooms. For VR to contribute meaningfully to geography education, teachers need sustained professional development, institutional support, accessible resources, and pedagogically grounded models for integrating VR into curriculum and instruction.

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Childcare deserts in Bratislava

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Keywords: childcare deserts, kindergarten accessibility, socio-spatial inequalities, spatial justice, human capital

Access to early childhood education constitutes an important dimension of spatial justice and a prerequisite for equal opportunities in human capital development. Although Bratislava has sufficient overall kindergarten capacity, its uneven spatial distribution may create significant inequalities in access to compulsory pre-primary education. This contribution examines the geography of kindergarten accessibility and identifies childcare deserts as urban areas where limited access to preschool facilities intersects with socio-economic disadvantage. The analysis combines kindergarten capacity, the residential distribution of preschool-aged children, and housing market data (asking prices) across a 100 × 100 m spatial grid. Accessibility was modelled using the Balanced Two-Step Floating Catchment Area (B2SFCA) method with walking as the primary transport mode. Areas with poor accessibility were subsequently classified using local housing prices to distinguish potential childcare deserts from "real" childcare deserts, in which inadequate access is accompanied by less favourable socio-economic conditions.

The results reveal substantial intra-urban disparities despite sufficient citywide kindergarten capacity. Nearly one-quarter of preschool-aged children live in areas with inadequate spatial access to kindergartens. While many accessibility deficits occur in newly urbanised neighbourhoods experiencing rapid residential growth, approximately 8% of children reside in socio-economically disadvantaged childcare deserts, where poor accessibility is likely to reinforce existing inequalities. These findings demonstrate that aggregate capacity indicators alone are insufficient for evaluating equitable access to early childhood education. The study contributes to debates on socio-spatial inequalities by demonstrating how the spatial organisation of educational infrastructure may reproduce unequal opportunities during the earliest stages of educational trajectories. The proposed methodology provides a transferable framework for identifying vulnerable neighbourhoods and supporting evidence-based planning of educational infrastructure. From a policy perspective, the findings underscore the need to integrate accessibility and social equity considerations into urban planning and education policies to reduce spatial barriers that affect children's educational opportunities and, consequently, long-term human capital development.

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Industrial structure and self – rated health in European regions: a multilevel analysis

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Keywords: self-rated health, regional industrial intensity, spatial health inequality, multilevel modelling, age gradient

Population ageing in Europe is accompanied by persistent spatial inequalities in health, and the industrial legacy of a region is one candidate source of this variation. This study examines whether the industrial structure of European regions is associated with self-rated health and whether it modifies the age gradient in health. The study distinguishes between two dimensions of regional industrial intensity: the employment share of industry, defined as the share of employment in NACE sectors B–E, and the output share of industry, defined as the share of gross value added generated by the same sectors. This distinction is important because industrial intensity may operate through several partly competing pathways: occupational exposure, environmental burden, and the economic advantages associated with productive industrial regions.

Individual data are drawn from the European Social Survey Round 11 (2023-2024) and linked to regional indicators from ARDECO and Eurostat. The analytic sample comprises roughly 35,000 respondents in about 226 regions across 30 countries. Three-level random-intercept models with individuals nested in regions and countries are estimated in linear and cumulative proportional-odds ordered logit specifications. The models adjust for individual demographic and socioeconomic characteristics, regional controls and a cross-level age-by-industry interaction. At the individual level, age, income and education are the strongest predictors.

The results suggest that the health implications of industrial intensity depend on how industrial intensity is measured. Employment-based industrial intensity shows no clear association with self-rated health. In contrast, output-based industrial intensity is positively associated with self-rated health. However, this apparent regional health advantage is not uniform across age. The interaction between age and output-based industrial intensity is negative, indicating a steeper age gradient in self-rated health in regions where industry accounts for a larger share of gross value added. This pattern is consistent with the interpretation that productive industrial regions may provide economic advantages for the population, while older cohorts may also reflect cumulative exposure to industrial working and living environments.

The findings should be interpreted cautiously. The study is cross-sectional, lacks individual residential and occupational histories, and relies on self-reported health, which may be affected by cultural and reporting differences across countries. Nevertheless, the results indicate that industrial regions should not be treated as a homogeneous category.

References:

- AUDUREAU, E., RICAN, S., COSTE, J. 2013: From deindustrialization to individual health-related quality of life: multilevel evidence of contextual predictors, mediators and modulators across French regions, 2003. *Health & Place*, 22, 140-152.
- CURTIS, S., REES JONES, I. 1998: Is there a place for geography in the analysis of health inequality? *Sociology of health & illness*, 20(5), 645-672.
- IDLER, E. L., BENYAMINI, Y. 1997: Self-rated health and mortality: a review of twenty-seven community studies. *Journal of health and social behaviour*, 21-37.
- MACINTYRE, S., ELLAWAY, A., CUMMINS, S. 2002: Place effects on health: how can we conceptualise, operationalise and measure them? *Social science & medicine*, 55(1), 125-139.

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At the edge: peripheralization in Czechia's westernmost region

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Keywords: Population dynamics, regional development, Karlovy Vary, Peripheralization

Karlovy Vary Region, located on the western edge of Czechia and bordering Germany, is the country's smallest self-governing region by population. Despite its strategic location and renowned spa towns, it has long struggled with demographic decline, selective outmigration, and limited access to key services. These challenges are shared by many peripheral regions across Central and Eastern Europe, and particularly by Czechia's borderlands, which underwent radical demographic and structural transformations in the 20th century. Drawing on detailed migration data from 1991 to the present and recent local surveys, this contribution analyses migration patterns into and out of the region from a socio-geographical perspective. Migration flows are categorized according to the main urbanization processes of the post-transformation period: urbanization (or metropolization in the form of out-migration from the region), but also suburbanization within the region itself, and partially, counter-urbanization in recent years. Particular attention is paid to the structural drivers of emigration and the often-overlooked dynamics of immigration, including international arrivals. We reflect on how such regions navigate long-term demographic decline and discuss implications for regional development and policy in the context of Central and Eastern Europe.

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Post-Soviet space and Slovakia

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Keywords: Slovakia, Post-Soviet space, geopolitics and cooperation

The paper applies the theoretical and methodological framework of critical geopolitics to analyse Slovakia's political, security and economic relations with the states of the former Soviet Union, excluding the Baltic states. Its central argument is that Slovakia's approach to the post-Soviet space is undergoing a structural transformation: the formerly dominant focus on Russia is being replaced by a more differentiated policy shaped by the war in Ukraine, Slovakia's membership of the European Union and NATO, changing energy relations, and the search for new economic partners. The war directly affected Slovakia's national security, energy policy, domestic political discourse and eastern border regions. The paper identifies the war not merely as an external geopolitical crisis, but as the principal factor restructuring Slovakia's relations with the entire post-Soviet space.

The region nevertheless remains a relatively marginal market for Slovakia's export-oriented economy. Trade with Russia and Belarus has declined considerably because of sanctions, political tensions and the disruption of established economic relations. By contrast, Slovakia's trade with countries in the South Caucasus and Central Asia has increased in recent years. These developments indicate a territorial reorientation rather than a uniform decline in Slovakia's economic engagement with the post-Soviet region.

The European Commission's initiatives to strengthen the resilience and development of the EU's eastern border regions are particularly relevant to Slovakia's regions bordering Ukraine. The dedicated resources proposed within the 2028–2034 EU budget could help address their structural disadvantages, security pressures and insufficient cross-border infrastructure. Slovakia therefore has an interest not only in implementing these measures, but also in actively shaping EU policies on regional development, cross-border connectivity, Ukraine's reconstruction and future enlargement.

The paper concludes that Slovakia is moving from a predominantly reactive and Russia-centred approach towards a more diversified, although internally contested, policy towards the post-Soviet space. Future developments will depend primarily on the outcome of the war and the establishment of regional stability. Under an optimistic scenario, Ukraine's reconstruction and prospective accession to the European Union could strengthen Slovakia's geopolitical position, stimulate the development of its eastern regions and create new opportunities for investment, connectivity and the territorial diversification of economic relations.

References:

- BRÜLHART, M. et al. 2004: Enlargement and the EU periphery: The impact of changing market potential. *World Economy*, 27(6), 853–875.
- EUROPEAN COMMISSION 2026: Commission supports the EU's eastern regions bordering Russia, Belarus and Ukraine. Brussels (European Commission), 24 February 2026. URL: https://ec.europa.eu/commission/presscorner/detail/sk/ip_26_433
- ŠANDOR, F., GURŇÁK, D. 2023: Development of the geopolitical orientation of the Slovak Republic since 1993. *Geografický časopis*, 75(3), 219–233. DOI: <https://doi.org/10.31577/geogrcas.2023.75.3.11>
- ŠANDOR, F., GURŇÁK, D., BILKA, M. 2023: Do interstate visits matter? Political-geographic analysis of Slovak economic diplomacy. *The Professional Geographer*, 76(1), 24–36. DOI: <https://doi.org/10.1080/00330124.2023.2223256>.

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Social acceptance of battery recycling plants in old industrial regions

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Keywords: battery recycling, social acceptance, localization, old industrial regions

The authors develop a conceptual framework for understanding the social acceptance of battery recycling plants in old industrial regions and its principal individual and regional-scale determinants. As the transition to low-carbon technologies accelerates demand for critical raw materials, battery recycling has emerged as a key component of the circular economy and European industrial policy. Yet the development of recycling facilities increasingly depends on public acceptance, particularly in regions marked by long histories of industrial activity, environmental degradation, and economic restructuring. The contribution is focused on the question how perceptions of risk and benefit, place attachment, institutional trust, and industrial legacies shape local responses to new recycling infrastructure. It argues that conventional explanations based on proximity or NIMBY dynamics are insufficient for understanding acceptance in old industrial regions, where collective memories of industrialization and expectations regarding economic revitalization play a central role. The authors propose a multi-scalar conceptual model linking technological transitions with place-based social dynamics. The framework contributes to emerging debates on the societal dimensions of the circular economy and offers a foundation for future empirical research on the governance and location of battery recycling facilities.

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Limits of microgeography? Spatial patterns of software industries in Ostrava and Košice

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Keywords: ICT firms, localization, microgeography, urban morphology, knowledge-intensive business services (KIBS)

This study examines the conditions under which neighbourhood-scale microgeography matters for the intra-urban location of software firms, compared with building- and city-scale determinants. Focusing on Ostrava (Czechia) and Košice (Slovakia), two medium-sized post-socialist old industrial cities with contrasting urban morphologies and substantial FDI-driven ICT development, we compare localisation factors operating at three spatial scales. The analysis draws on a verified database of 532 ICT firms in Ostrava and 1,055 in Košice, covering NACE divisions 62–63 and combining field mapping with Orbis and FINSTAT firm and employment data. Using spatial mapping and regression analysis, we examine the distribution of firms and employment in relation to building characteristics, neighbourhood morphology, accessibility and centrality. Although both cities display strong inner-city concentrations of ICT activities, software firms in Ostrava tend to occupy mixed-building environments, whereas those in Košice are concentrated within estates and high-rise environments. The results show that building characteristics and city-scale accessibility and centrality generally provide stronger explanations of firm location than neighbourhood morphology. These findings suggest that the importance of microgeographic agglomeration is conditional rather than universal: neighbourhood-scale morphology appears less influential where software activities are dominated by larger, externally coordinated firms with relatively standardized property and locational requirements.

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